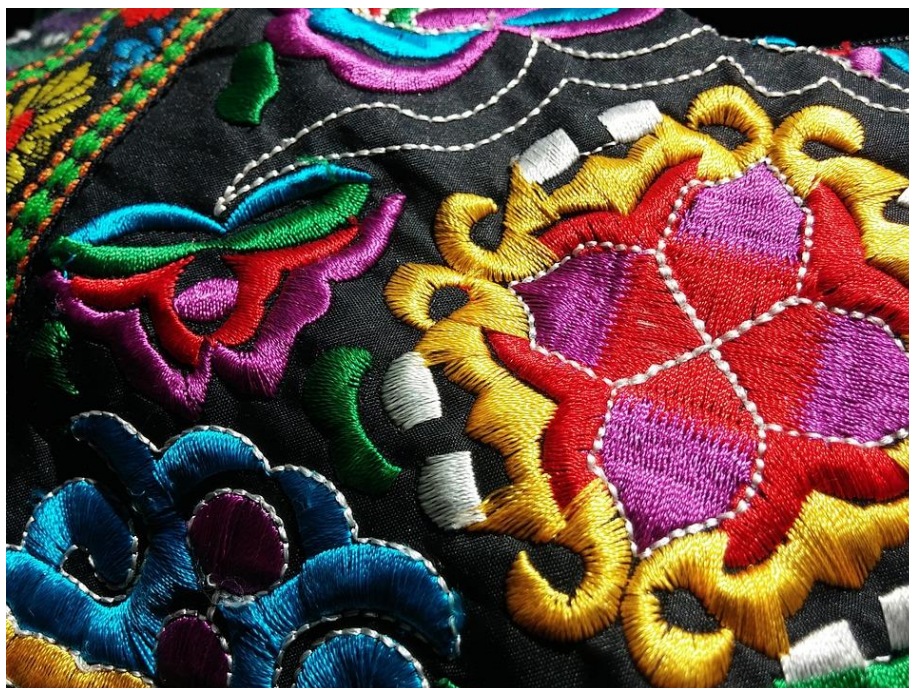


DRAFT STUDY MATERIAL



EMBROIDERY MACHINE OPERATOR (ZIGZAG MACHINE)

**(Qualification Pack: Ref. Id. AMH/Q0801)
Sector: Apparel, Made-ups & Home Furnishing**

(Grade XII)



PSS CENTRAL INSTITUTE OF VOCATIONAL EDUCATION

(A constituent unit of NCERT, under MOE, Government of India)

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Preface

Vocational Education is a dynamic and evolving field, and ensuring that every student has access to quality learning materials is of paramount importance. The journey of the PSS Central Institute of Vocational Education (PSSCIVE) toward producing comprehensive and inclusive study material is rigorous and time-consuming, requiring thorough research, expert consultation, and publication by the National Council of Educational Research and Training (NCERT). However, the absence of finalized study material should not impede the educational progress of our students. In response to this necessity, we present the draft study material, a provisional yet comprehensive guide, designed to bridge the gap between teaching and learning, until the official version of the study material is made available by the NCERT. The draft study material provides a structured and accessible set of materials for teachers and students to utilize in the interim period. The content is aligned with the prescribed curriculum to ensure that students remain on track with their learning objectives.

The contents of the modules are curated to provide continuity in education and maintain the momentum of teaching-learning in vocational education. It encompasses essential concepts and skills aligned with the curriculum and educational standards. We extend our gratitude to the academicians, vocational educators, subject matter experts, industry experts, academic consultants, and all other people who contributed their expertise and insights to the creation of the draft study material.

Teachers are encouraged to use the draft modules of the study material as a guide and supplement their teaching with additional resources and activities that cater to their students' unique learning styles and needs. Collaboration and feedback are vital; therefore, we welcome suggestions for improvement, especially by the teachers, in improving upon the content of the study material.

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Module 1**Selection of Machine Attachments
as per Embroidery Techniques/
Stitches****Module Overview**

Machine embroidery is an integral part of apparel production. Domestic and industrial machines have witnessed a major makeover over the last few years in their functioning and attachments. These days high tech and automated systems are used to make the process more labour efficient and organised. The next generation of embroidery machines are characterised by various presser foot attachments that allow the access of different embroidery stitches with high speed and ease in changing these attachments. Hand embroidery is a traditional method which requires lot of patience and time to complete, on the other hand the new machines can process substantial quantity of similar embroidery in reduced time. With these advanced combinations, embroideries can be done on the surface of fabric or other material very easily with bulk production. The knowledge of various advanced stitches can help in better creative and uniform designs with faster production.

Learning Outcomes

After completing this module, you will be able to:

- Perform advanced embroidery stitches
- To select machine attachments as per Embroidery Techniques/ stitches
- To learn understand contribution of basic and advanced stitches to create innovative patterns

Module Structure

Session 1: Advanced embroidery stitches

Session 2: Selection of machine attachments as per embroidery techniques/stitches

Session 3: Contribution of basic and advanced stitches to create innovative patterns

Session 1: Advanced Embroidery Stitches

The art of embroidery can be defined as the ornamentation of textiles where various stitches are used to decorate and enhance the surface of fabric or other material. In ancient history various basic and similar embroidery stitches were used throughout the world as the language of stitches are infinitely adaptable. New stitches are being constantly reinterpreted by contemporary embroiderers, who are producing their new work as part of continuing tradition. Embroidery was initially considered an essential part of women's life before mass production. People in different parts of the world practice diverse/various types of embroidery with their specific names which gave birth to various combinations and new stitches. Advancement in the industry and new embroidery equipment's have led to an increase in a wide range of advanced stitches which can be easily performed on various ranges of fabrics or other materials instantly. Advanced stitches include a range of basic stitches used together to create an innovative pattern in a selected motif. The process of working on advanced stitches is explained below, but it is very important to keep in mind the selection of stitches that are to be used as they will require different attachments.

- Trace the design on the selected fabric or other material using a fabric pencil.
- Choose the attachment as per the stitches to be used on the design. For example: Applique presser foot for applique work or embroidery presser foot for embroidery.
- Thread the embroidery machine with embroidery thread
- The bobbin thread is brought up by moving the wheel towards the front.
- Adjust the upper thread and the lower thread tension.
- Try to test the stitch on a rough fabric to check the thread tension.
- Trace the embroidery design and stretch the fabric on the hoop.
- Keep the hoop/frame under the machine needle below the presser foot.
- Embroider over the design lines traced on the fabric.
- First work over the outline of the design and slowly start filling each area within the design.

NOTE: Since advance stitches are done using combination of stitches it is important to decide the type of stitches that will be used before starting

machine work. The presser foot attachments and the tools for changing the presser foot should be kept handy to get desired results

QUILTING

Quilting is a technique where two or more fabrics are layered and stitched together to make a thicker padded material. The whole process of quilting involves a sequence of steps such as designing, collecting pieces and binding the layers together as quilt. A person who does quilting is called Quilter. Construction of a quilt mainly involves three layers: The top layer, padding or insulating material and the last layer that is the backing material. Running or straight stitches are used to sew the pieces together. These stitches can serve many purposes from decorative to functional. A range of home textile products like bed sets, wall hangings, jackets, accessories and much more are curated using this technique.

Machine quilting can be done using a basic sewing machine with which the layers can be roughly tacked or hold together before the final quilting. The layers are laid on a flat surface and pinned together to secure the pieces as per the design. A longarm machine can also be used in which, layers are placed on various frames containing bars. These layers are rolled on bars thus cancelling out the need for pinning the layers. The main difference between a home sewing machine and longarm machine is that in longarm machine, the machine moves across the fabric where in sewing machine the fabric moves through the machine. Using a Longarm machine makes the work simpler and faster. Another method which is frequently used for quilting is by tying the three layers together using multiple strands of yarns. This is mainly applied on quilts which are needed on urgent basis. The tying ensures that the knots do not open while handling.

Nevertheless, no matter which method is used to sew the quilts, it is of utmost importance to use the right needle and thread for the process. Various errors can occur if a wrong needle is used such as puckering, bumps, or tearing of the layers or fabric. There are various quilting designs which are very popular all around the world.

Stitches used in quilting:

1. Horizontal Quilting
2. Square or diamond Quilting
3. Template Quilting

4. Stipple Quilting
5. Corded/Italian Quilting
6. Crazy Quilting
7. Outline Quilting
8. Free form Quilting
9. Echo Quilting



Types of quilting:

1. **Horizontal Quilting:** This is the simplest and easiest of all quilting stitches. In these straight-line stitches are done in parallel rows at regular intervals.



Fig.: 1.1 - Horizontal Quilting: Square or Diamond Quilting

In these rows of parallel stitches are made in horizontal and vertical or diagonal directions. These lines cross each other at right angles forming square shapes. If these parallel stitched rows are made diagonally, they create diamond shapes.



Fig.: 1.2 - Square or Diamond Quilting

- 2. Template Quilting:** When the quilts are made by professionals or have very intricate complex looking designs then template shapes are used to make the designs which are easy to replicate throughout the quilt. Template shapes or stencils are made in metal or plastic or card. Computerized sewing machines are also used to make pre-designed stitches on the quilt which looks identical to ones made with templates.



Fig.: 1.3 - Template Quilting

- 3. Free form Quilting:** As the name says stitches are done in a random fashion. Darning foot is used for making these types of stitches as there

is no marking done for any design and stitching is done in a random manner.

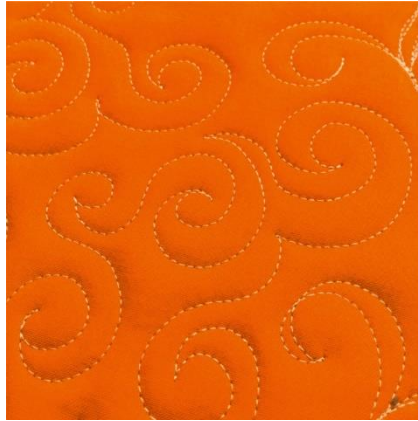


Fig.: 1.4 - Free form Quilting

4. **Stipple Quilting:** This is also called as meandering stitch. In this type of quilting, the larger quilted areas are also filled from within. Stippling stitches tend to flatten the fabric. It gives raised effect to the areas where stippling is not done. Special care has to be taken to maintain the uniformity.

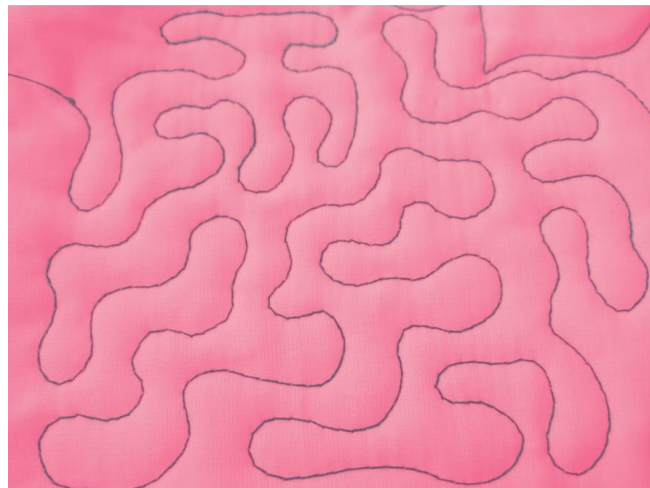


Fig.: 1.5 - Stipple Quilting

5. **Corded Quilting or Italian Quilting:** In this type of quilting, the design is perceived in such a manner that it has thin double lines all over. Stitching is done over these lines which create a channel in between. A thick soft Italian quilting wool is inserted in this channel forming a corded look.
6. **Crazy Quilting:** Crazy quilting involves various types of decorative embroidery stitches such as quilting stitches over a crazy quilt. This can be done using a combination of decorative stitches using a sewing machine or border stitches used in hand embroidery.



Fig.: 1.6 - Crazy Quilting

7. **Outline Quilting:** Here the stitching is done along the outline of an appliqued design or a motif. In this type of quilting the padded effect accentuates the design.



Fig.: 1.7 - Outline Quilting

8. **Echo Quilting:** Echo quilting is quite similar to outline quilting. There is an echo effect which is created by the repeated stitching around the design that make it different from the outline quilting. Repeated quilting stitches are done around the design mostly with a distance of 1/4th inch.



Fig.: 1.8 - Echo Quilting

Steps of doing Quilting-

- A.** Three layers of fabric are required in quilting and are kept one over the other in the following manner.
 1. First layer- Backing fabric which should be of good quality.
 2. Middle layer- Padding which can be foam or fiber.
 3. Last layer- It is the topmost layer which may be patchworked, appliqued or embroidered fabric or other material. This layer should be finished before placing these three layers for final quilting and the quilting design lines should be traced on it.
- B.** These layers are temporarily stitched together by machine or hand basting stitches or with pins to keep them in place.
- C.** The machine is set by threading with a good quality thread
- D.** Check the thread tension and start working over the traced lines carefully.
- E.** After the completion of design, finish the product/sample by trimming off the stray threads and ironing.

APPLIQUE WORK

Applique is an embroidery that employs small patches or fabric pieces which are sewn on a larger fabric surface. Applique derives its roots from French culture meaning ‘something applied’ or a thing that has been applied.

It is also considered as a type of needlework technique, where various pieces of embroidery, fabric, or other materials are sewn on another piece of fabric to create different designs, abstract patterns or pictures. Applique can be created using three different methods i.e. machine appliqué, hand appliqué and fused appliqué.

A wide variety of colourful fabrics with different textures, print, checks, stripes are used and are arranged in an interesting manner to create uniqueness in the product. Cotton, poplin, gingham denim, broadcloth and many other finely woven fabrics are excellent choices for applique.

In applique work a number of stitches are used to attach pieces on to the base material. Most commonly used stitches are straight stitch or running stitch which mainly helps in attaching the patches onto the base material. Other embroidery stitches such as buttonhole, satin, couching, darning, zigzag stitch are used to enhance the overall look and decorativeness of the pattern. Beads, sequins and different colours of embroidery threads enhance the look of applique work.

Other things like pins or bonding material, ready cut to shape base or backing fabric and adhesive material which is optional will be required to hold the appliqué on the base fabric before sewing.

Types of Applique:

The appliques are usually named after the treatment given to their raw edges:

1. **Raw Edge or Straight Stitch Applique:** The Edges of the fabric are not finished and secured using straight stitches. The emphasis on the edges is not there as it merges with the fabric.



Fig.: 1.9 - Raw Edge or Straight Stitch Applique

2. **Lettering and Zigzag Stitch Applique:** This technique is normally used in formation of letters or geometric shapes where multi stitch zig zag or free motion stitching is done.



Fig.: 1.10 - Lettering and Zigzag Stitch Applique

3. **Satin Stitch Applique:** Satin / Zigzag stitches placed very closely and tightly to each other are used in this type of applique work. The stitch forms a ridge around the cut pattern or motif focusing the edges and giving a neat thick outline around them.

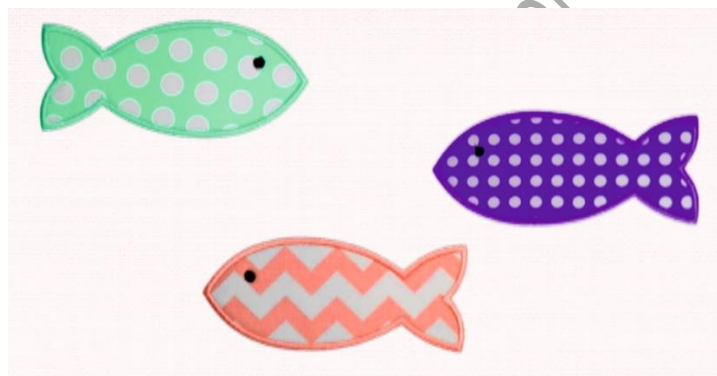


Fig.: 1.11 - Satin Stitch Applique

1. **Buttonhole Applique:** In this the raw edges are finished using blanket/buttonhole stitch giving an outline to a motif and a secured look of the patterns.



Fig.: 1.12 - Buttonhole Applique

2. **Chain stitch applique:** In this type of applique, chain stitch is used as an outline to finish the raw edges of the motif.

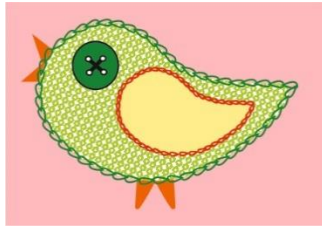


Fig.: 1.13 - Chain stitch applique

3. **Decorative Stitch Applique:** Different categories of decorative stitches can be used in combination to create a unique and different pattern of applique.

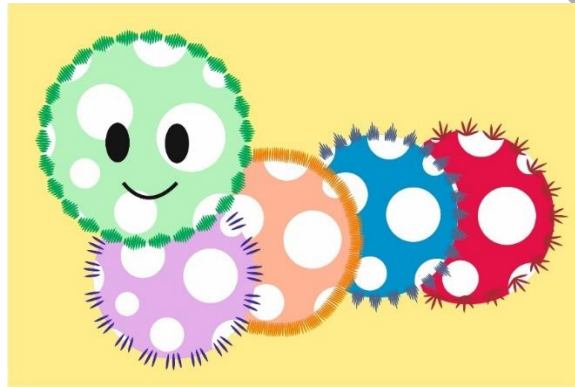


Fig.: 1.14 - Decorative Stitch Applique

4. **Negative or Reverse Applique:** This is achieved by using two layers of fabric. Design is traced using heat soluble or water soluble fabric pen. After the design is traced both the layers are kept one on top of the other. Stitching is done on the outline of the design and then top layer is cut from inner of the design, thus, bottom layer becomes visible.



Fig.: 1.15 - Negative or Reverse Applique

Steps of doing Applique work:

- A.** Trace the design selected for applique work on the fabric. Cut the pieces for applique work in desired shapes. Attach a fusing on the applique pieces if required. The applique patches are first fixed accurately on the base fabric using a fabric glue or by basting stitches. Hoop the fabric firmly ensuring applique is in the centre of the hoop.
- B.** Set the machine and attach the foot. Since applique work requires usage of various stitches thus an, applique presser foot functions most suitably for it. This is a short presser foot (3/4 of the straight presser foot) which helps in creating and stitching better curves along the pieces. Since it has a clear base, it helps in viewing what is being sewn. The pin that is at the back keeps the presser foot horizontal and also stabilizes it while stitching.



Fig.: 1.16 - Applique work

- C.** A wide zig zag stitch can be selected, with a short stitch length, to attain a compact stitch like satin stitch. Check the thread tension before starting the stitch. Keep the outer edge of appliqué fabric aligned with the opening of the toe, towards right of centre. Go very slow while stitching around the curves and stop, drop the needle, raise the presser foot and pivot around sharp corners.
- D.** After completing the stitching, finish the fabric by cutting the stray thread, removing the hoop and ironing the fabric.

SEQUIN WORK

Fashion with sequins have always been a sight of style and elegance. Sequins are the adornments used on fabrics, bags and footwear. Sequins are made of metal or plastic. Nowadays more of plastic sequins are used as they are easy to use and are very cost effective. Sequins can be stitched on the fabric

towards the front or can be stitched at a point for an adorning effect. Sequin attachment is done with sequin attaching machines as well as ‘hands’ which is popular with the name of “adda work”. Though it is difficult to differentiate between the two types, the garments which have sequin work done with hands are more expensive than the machine work. However, the art of embellishing fabric with sequins has taken on various forms with grand to quirky patterns to the simple ones. Though with the help of machines the work has been made more easier and faster. Machines like automatic and computer aided ones contains softwares which run on command basis , whereas in semi automated machines presser foot attachments can be of great help.



Fig.: 1.17 – Sequin Work

The word ‘Sequin’ comes from the Arabic word “*Sikka*” meaning a coin. *Sikkas* were used to decorate clothing in the Middle East around the 13th century. Gold sequins were used as decoration on the garments during the Indus valley civilization in 2500 BC. Rich Indian craft forms in Indian ethnic wear like stone work, *zari*, bead work, *resham*, are natural progression to use these craft forms for the sequins effect. Sequins are normally small, flat and round, but are also available in different sizes, shapes, and colors. They can be easily embroidered on various types of fabric such as Silk, Cotton, Georgette etc. Sequined attires require a lot of care and maintenance as they can rip off easily. It is advisable not to pull any thread from one loose sequin as this could damage and break the entire row. Nowadays there are lot of glossy sequin fabrics which are available in the market. The most popular backing fabrics for sequin are tulle chiffon and lycra.

Using a Ribbon and sequins foot, one can attach sequins and sequins lace as per the steps given below:

- A.** Trace the design selected for sequin work on the fabric. Attach a fusing on the wrong side of the fabric if required. Place the sequin or sequin lace on the fabric and fix them with hand or machine basting. Then hoop the fabric firmly.
- B.** Set the machine and attach the sequin, ribbon or braiding foot. Check the thread tension before starting the stitch.
- C.** The round shaped sequins with a hole in the middle can be stitched using one or two short or long straight stitch across the sequins. A long line of sequins can be sewn with back stitches applying one sequin to each back stitch where all the sequins face the same direction.

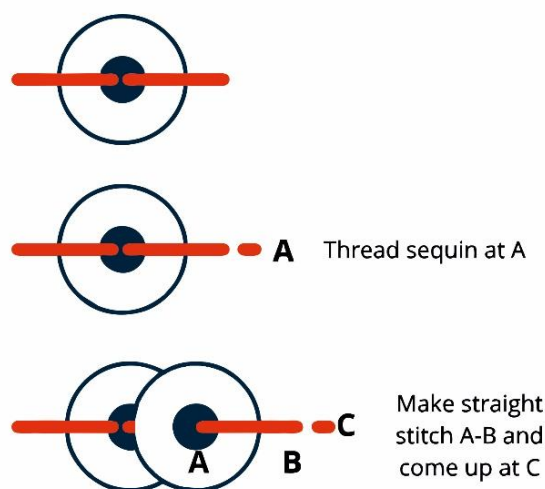


Fig.: 1.18 – Attaching Sequin using a ribbon and sequin foot

If a design includes satin stitches, the stitches should be long enough to float over the sequins so that there is sufficient density where shifting sequins will not easily poke through them. Long satin stitches may cause snagging while wearing and tension issues during stitching.

- D.** After completing the stitching, finish the fabric by cutting the stray threads, removing the hoop and ironing the fabric.

MIRROR WORK

Mirror-Embroidery is a beautiful form of embroidery also known as '*Shisha Work*' where pieces of mirrors are attached to the fabric. It is one of the most famous craft of Gujarat. Many other states particularly the dry desert sands along with sunny areas of India, like Gujarat, Rajasthan, Haryana and Delhi are often spotted with bright colors and *shisha* embroidery. This work is mostly seen on apparels, home furnishing, accessories and much more. There

is a huge range of mirror in different shapes and sizes, like spherical, square, triangular etc. Mirror work is always combined with some other stitches to enhance its look.



Fig.: 1.19 – Mirror Work

There is a huge demand in the market for various apparel, & textile products with mirror work. The Gujarat mirror work has many variations in various community of artisans. The Jats of Banni community cut the glass in various different shapes and use it for embroidery. Whereas in the Kathiawar embroidery the mirrors are used in the patterns like centre of a flower or an eye of a bird.

The machine mirror attachment is an easy process as compared to the hand attachment as this function can be performed with the help of machine needles which gives a very fine edge and stability to the mirror on the fabric. Mirror embroidery can be done using a variety of decorative and basic stitches as per the requirement, size and shape of the mirror. It also depends on the design that how much visibility is needed or required for the mirror which also determines the category of the stitch. Satin stitch, chain stitch, buttonhole stitch, zig zag stitch and other decorative stitches can be used for the edge finishing or creating design around the mirror. This embroidery calls for lot of precautions as while working with mirrors if the needle is not attached properly in the needle bar, it might break. Before starting to fill around the mirrors, the mirrors should be pasted to the fabric using a fabric glue so that they do not move while embroidering.

Steps of doing mirror work:

- A.** Trace the selected design on the base fabric and attach the mirrors on it using a fabric glue to keep them in place. Hoop the prepared fabric on embroidery frame or hoop.
- B.** Set the machine by removing the presser foot and covering the feed dog with an embroidery plate. Check the thread tension before starting the stitch.

- C. Fill around the mirrors using satin stitch and outline with chain stitch.
- D. Add some more additional stitches if required to complete the design and then finish the product by removing the hoop, trimming the extra thread, applying glue on the wrong side of embroidery for securing and ironing.

CUTWORK

Cutwork- also known as Punto Tagliato, is an Italian word which means a needle work technique. The concept of filling the spaces with stitches originated around 14th century in Italy which later continued as an embroidery technique during the Victorian era (Elizabethan times) when ruffles were often decorated in cutwork. Cutwork is related to a drawn thread work. In some cutwork both warp and weft are withdrawn and then they are bounded with some stitches.

It is a very unique technique in which different pieces of textiles, mainly cotton and linen are cut away, resulting in a hole which is then filled with an embroidery stitch or decorated with a lace at the edge. Running stitch, buttonhole stitch and satin stitches are the most common stitches used in cutwork embroidery. Another method to decorate these spaces/holes was joining the fabric pieces with the help of connecting bars of the thread.

Types of Cutwork:

1. **Hand/Machine Cutwork:** This is one of the traditional techniques which can now be done using machine attachment as well. Here the fabric is cut in the specified design and the edges are later stitched to prevent fraying of edges.



Fig.: 1.20 – Hand/Machine Cutwork

2. **Lace Cutwork:** This form of cutwork is more precise and uses more intricate patterns and helps in sealing and melting the edges with heat or laser technique. Ultimately the end product is unique and has an etched look. Mainly cutwork produces an open cut away areas whereas cutwork lace work produces intricate connective stitching.



Fig.: 1.21 – Lace Cutwork

Steps of doing cut work:

- A. Trace the selected design on the base fabric and hoop it on an embroidery frame.
- B. Set the machine by attaching the darning foot and check the thread tension before starting the stitch.
- C. Outline the area to be cut using zig zag or satin stitch and then cut over the areas within it using a small sharp scissors. Burn the small fraying threads within the cut area using an essence stick or candle.
- D. Add some more additional stitches as required to complete the design and then finish the product by removing the hoop, trimming the extra thread, and ironing.

GOTTA PATTI

Gota patti is one of the most popular art and craft of Rajasthan. Gota is a metal, gold or silver lace initially used in Rajasthan. Some researchers also say that gota patti is an origin of Pakistan embroidery which was initially practiced in Punjab before partition. Gota, the golden or silver colour ribbon is used for decoration as border in many traditional garments, turbans, juttis and many other products.

Small pieces of gota or zari in different shapes of a leaf are pasted onto the fabric using a fabric glue and the cord is stitched around these leaves with a cording technique giving a 3D effect. A simple running stitch or chain stitch can be used for attaching the cord or metallic thread along the designs of the patti.

Gota is normally woven with a gold/silver/copper/metallic base in the set where warp and weft yarns used are normally silk or cotton. There are different types of gota patti, such as, seekhi, phool, bijiya, mothda, bakhandi and lappa. Seekhi gota is used as a lace trim made of silver and gold ribbon of gota, while phool gota are gota circles that are pleated together.



Fig.: 1.22 – Gotta Patti Work

Steps of doing Gota patti work:

- A. Trace the selected design on the base fabric and paste the *Gota* leaves on it using a fabric glue to keep them in place. Hoop the sample on embroidery frame.
- B. Set the machine by attaching the darning foot. Check the thread tension before starting the stitch.
- C. Outline the *Gota* leaves with the cord and finish with overcasting stitch around it.

- D.** Add some more additional stitches as required to complete the design and then finish the product by removing the hoop, trimming the extra thread, and ironing.

EYELET

An eyelet is a hole created on the fabric by piercing the fabric using a knife with a slender blade similar to a needle point, also called as stiletto. It is also known as the eye stitch and found in canvas work. The fabric is held under tension on a hoop and stitches are arranged in square format. Often a metal ring is attached on the reverse side of the fabric to give strength to the edges of the hole. The hole is embroidered with running stitch, overcast stitch or buttonhole stitch. This type of eyelet can be often seen on embroideries and called as eyelet embroideries, eyelet work or eyelet hole work. It is also sometimes known as Schiffli embroidery which is a type of lace that is embroidered on Schiffli machine.

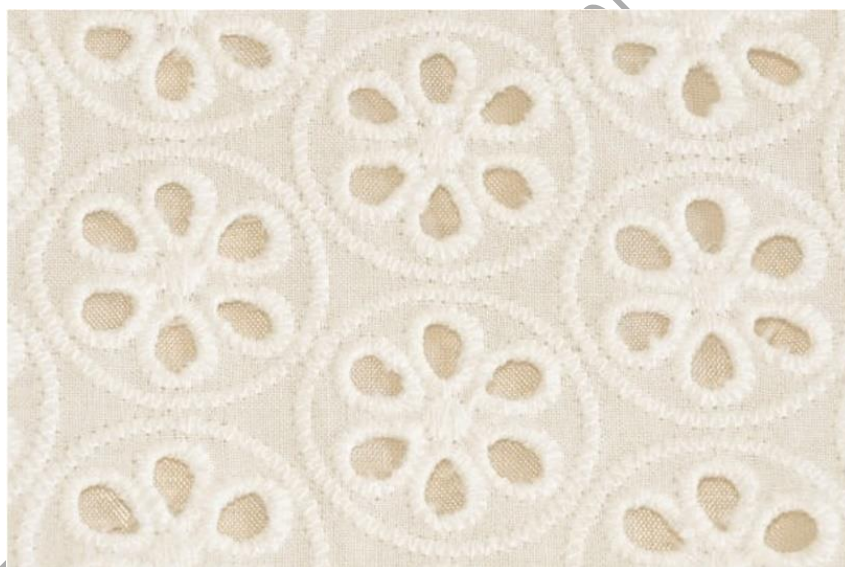


Fig.: 1.23 – Eyelet

Steps of doing Eyelet Stitch:

- A.** Trace the selected design on the base fabric and mark the place where eyelet stitch is to be done in form of tiny circles.
- B.** Set the machine by attaching the darning foot. Check the thread tension before starting the stitch.
- C.** Using the straight stitch, start filling the eyelet by inserting the needle at the centre point of the small circles drawn for embroidery.

- D.** Finish the product by removing the hoop, trimming the extra thread, and ironing.

LACE WORK

Lace is a term used for very delicate, unique patterned fabrics made with open holes. The holes which are formed in the lace are created by removing threads from a woven fabric or by leaving spaces and connecting loops of stitches on light weight fabric like net. It can be made by using different fabrication methods with the help of yarns. These yarns are twisted to create an openwork effect. They are created using hand, machines, lace machines or Rachel knitting machines. Laces play an important role in the apparel and home furnishing industry. Lot of new patterns of laces on the net fabric, lace braiding and many more are created in lace work. There are many types of laces based on their construction.

The construction of lace work normally is done on very closely made net fabric lot of times where satin and zig zag stitches are used very closely to each other creating continuity of loops. Other decorative stitches like chain, buttonhole, running stitch can also be used depending on the lace pattern to be created. A variety of designs can be selected in creating lace which mainly depends on consistency of combining motifs of similar visual weight. In creating loops for an outside border asymmetrical motifs are used with slight curves. Pointed and angular patterns when done on machine normally curl up creating instability in the border. Asymmetrical designs when used with sharp curves can be easily filled with satin stitch making the edges look more beautiful. It is important to understand the loop connectivity in patterns when lace is created using machine embroidery.



Fig.: 1.24 – Lace Work

CORDING

Cording is a technique of sewing on materials, patterns made of ribbons, beads, cords or decorative chains (e.g. metal or plastic chains). Cording creates a 3D effect on the garment which allows the designer to create unique designs with the help of different cords by using them in different combinations. It can also be combined with other techniques with different decorating materials such as pearls, traditional embroidery etc.

Straight Stitch and Zig Zag stitches are used in creating two different effects of the cords for example: using the straight stitch one can sew on cord passing through its middle point which makes the appearance of cord flatter and wider which is also called taping. The zig zag stitch on the cord is sewn from left to right, i.e. once from left, once from right which makes an illusion of a wave.

Types of cording:

With the help of modern machines and technology, decorating and using these materials have become very easy simple and precise. Various types of cords that are used are:

1. Cords
2. Tapes
3. Beads
4. Decorative chains

Steps of doing Cording stitch:

- A.** Trace the selected design on the base fabric and attach the cord on the design or embroidery motif using glue or simple basting stitch. Hoop the fabric on embroidery frame.
- B.** Set the machine by attaching the cording foot and threading it with thread and needle appropriate for cording stitch. Check the thread tension before starting the stitch.
- C.** Stitch the cord by following two methods:
 1. Stitch on cord passing through its middle.
 2. Stitch with zigzag stitch on the cord.

- D. Finish the product by removing the hoop, trimming the extra thread, and ironing.

BEAD WORK

Beads are found in the form of decoration as jewellery. In the ancient time, beads were used for ornamentation in accessories made up from the fish bones, animal teeth and shells. But with growing technology and modernization, the range of beads have diversified. It is not only used in accessories but also in garments equally. Beads work as an ornamentation on the fabric that adds on a limelight and a dazzling effect to the garment with its texture, shape, and sizes. There is a huge range of beads that are available like shells, pearls, wooden, beetle wings, ceramic, metal etc. Today the wide range gives us many options to select unique category of beads as per the need of the garment. As mirror work is used in the western part of the country in Rajasthan and Gujarat, similarly the tribes in these areas spread the usage and popularity of bead work. It is very important to choose the right size, colour, weight and shape of the bead in a particular design, as it can either make the garment look extraordinary if right selection takes place.



Fig.: 1.25 – Bead Work

Long and short running stitches or straight stitches or zigzag stitches are normally used to attach the beads or a string of beads on the fabric. The length of the stitches is long and short as per the size of the beads used. Darning/Satin stitch can also be used in case of attachment of single medium/big size of beads. A beading foot is used to attach beads on the fabric.

FANCY EMBROIDERY

Fancy embroidery is the term used for decorative add-ons or decorative materials which are added to enhance the look of the embroidery. Many decorative pieces like fancy buttons, shells, metal decorative adornments,

coins etc. are used for making a garment look more exclusive and appealing. Fancy embroidery is not only used for increasing the aesthetic appeal of the garment but also sometimes used for functionality as well. This also increases and aligns the garment with latest trend and fashion. They can be superficially or structurally incorporated in the garment.



Fig.: 1.26 – Fancy Embroidery

Fancy embroidery itself means using a lot of different decorative techniques to create a different style. A variation of long and short length of stitches in different categories of stitches like satin, zigzag, stem, buttonhole, running creates a fancy look on the surface of the garment. All these stitches can be used in a combination of different shapes and sizes to create a decorative effect.

Activities

ACTIVITY

Create a sample of Quilting.

Materials required:

1. Scissors
2. Scale
3. 3 different types of fabric for creating layers
4. Foam
5. Stitching thread

6. Fabric pencil

Procedure:

Sample Size 10”x10”

1. To make a ready 10”x10” sample we need to cut the fabric 12”x12” as during construction the fabric might shrink, so always take some extra fabric.
2. 3 layers will be used:
 - i. Top layer of any fabric sample
 - ii. Middle layer of 4mm foam
 - iii. Last or bottom layer of cotton or muslin fabric.
3. Placing all the layers one top of the other, pin them to hold all the layers together while stitching.
4. Make diamond pattern on it with tailor’s chalk or pencil.
5. Stitch on these lines.
6. Finish the sample by clipping extra threads and ironing.
7. Paste the sample in your practical file.

NOTE: Also prepare samples of Applique work, mirror work, cut work, bead work as explained above in the session under the guidance of your teacher.

Check Your Progress

A. Fill in the Blanks:

1. _____ is a technique where two or more fabrics are layered and stitched together.
2. _____ is an embroidery that is done using small patches sewn on a larger fabric surface.
3. Sequin work when practiced with hands or manually is also called _____.
4. _____ is one of the most popular art and craft of Rajasthan.
5. Shells, Beads and Buttons are used in _____.

B. State whether the following statements are True/False:

1. Stipple Quilting is also called as meandering stitch.
2. In Buttonhole Applique the raw edges are finished using running stitch.
3. Cutwork is known as Punto Tagliato, is a Russian word which means a needle work technique.
4. An eyelet embroidery is a hole which is created by piercing the fabric with a long slender blade/knife also called stiletto.
5. Cording is a technique which creates a 2D pattern using ribbons, beads, cords or decorative chains.

C. Write shorts answers for the following:

1. Differentiate between stipple and free-form quilting.
2. Write steps for doing chain stitch applique.

Session 2: Selection of Machine Attachments as Per Embroidery Techniques/ Stitches

Innovation in the field of embroidery has always been a segment of interest for the textile & apparel industry. Initially the machines and attachments that were developed were mainly focused on high speed with a higher production rate, but nowadays with an increase in demand of different range and varieties of products the machines also provide a range of detachable attachments which helps in catering towards the demand of customers at an affordable price. Manufacturers now focus on the versatility and user-friendly features in a machine, which can help them in creating a range of embroidery patterns. Automated machines and Computer Aided Designing (CAD) software machines are in greater demand in the market as they are very cost and labour effective and at the same time they create very intricate and accurate patterns. With the help of various attachments in the machine embroidery one can achieve uniformity in each pattern that is stitched. There are various range of presser feet, needle attachments, feed dogs which help in creating beautiful and wide range of patterns. So it can be said that by doing machine embroidery, one can attain his/her goals in a more professional manner and in less time which normally takes hours with hand. The broad selection of attachments and needles is what is needed for every small scale / freelancing / industrial business.

USING ATTACHMENTS AS PER DIFFERENT TYPES OF EMBROIDERIES

1. **Cording:** Cording embroidery technique is used to sew various materials like ribbon, beads, cords or any decorative chains on the fabric/embroidery. It is used for attaching 1-3 cords on the fabric surface as per the design. This technique gives a 3D effect on the fabric surface and is mostly used for surface ornamentation/decoration. This technique is mostly used/seen in products like cushions, curtains, blouses, on pockets etc. The grooves in the front and back of the machine help in the insertion of the cords. The metal bar helps in fixing the cords so that they do not move and are held in the position under the needle.
2. **Cording foot:** This foot grips cords and threads to attach them well on the embroidery design and get perfect embossed shapes. Various decorative stitches can be stitched over the cords to attach them onto the base fabrics. The final effect of the embroidery depends on the choice of cord, thread and stitch.



Fig.: 1.27 – Cording Foot

After stitching, the cord can be pulled to gather the fabric and can be adjusted later while securing the cords with the help of tying knots at the end. Different types of cords like tapes, beads, decorative chains, are moreover used with taping or zigzag method. Both the techniques give a completely different pattern or design. There are two versions by which the cords can be attached. Firstly, the sewing is done on the cord along its middle so that the cord becomes flatter and wider. Another version is the zigzag sewing form. In this the cord is sewn alternatively, first from left side and then from right side creating the illusion of wave.

As explained above piping foot can also be used for attaching tapes or cords in between two fabrics. It can attach up to 5mm cord which is used in many upholstery products like cushions, mats for giving a custom piping finish to the final product. It is designed with two grooves on the underside which helps in customizing the cording or piping as per own choice and specifications.

3. **Ribbon & Sequin Work:** With the advancements in the technology, sequin application has become an automated process using various categories of specialized equipment. Sequin attaching machines are also available with an ability of attaching sequins at a speed of 1000 RPM, while being very cost-effective as well.



Fig.: 1.28 Ribbon & Sequin Work

The ribbon or sequin foot is used to attach ribbons and sequins and thin laces on the fabric. This foot is designed with guides through which ribbon or sequins string can be inserted and it will allow them to feed through evenly as sewing is performed.

The Ribbon or Sequin Foot allows to sew even a small embellishment on the fabric surface very smoothly and evenly throughout the specified design. It is very easy to attach sequin and ribbon with the help of this foot as it is designed with the guides through which the ribbon or string of sequins can be inserted easily and fed through during stitching. The sequin and ribbon foot contains a guide with 1/4inch gap, that keeps the trim positioned directly below the needle and holds down the trim easily. By adjusting the guide's position one can stitch ribbon, ornamental upholstery, braids, elastic and other flat trims. The foot guides the trim underneath the needle so that one can easily concentrate on the material. The groove at the bottom accommodates the pearls, ribbons, sequin with very consistent feeding.

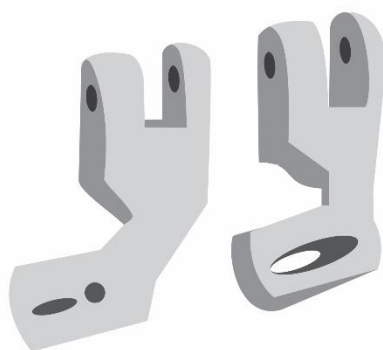


Fig.: 1.29 – Ribbon & Sequin Work Foot

Embroidering on a sequin means stitching through a metal or plastic, thus a sharp needle, such as a topstitching needle, works best. Using a large needle helps to protect the thread from abrasion with every pass from the metal and rigid plastic. Adjusting the embroidery foot height is important to keep sequins secured during stitching. If there is a shift in the sequins in spite of the topper, one should lower the foot to minimize the space between the foot and surface between stitches.

4. **Mirror:** Mirror work is one of the most beautiful embroidery where different sizes and shapes of mirror are placed on the fabric to enhance the overall look of the garment. Technically there is no special attachment that is required for attaching mirror through machine embroidery. The attachment is done solely using the needle, thus it is done without using any presser foot. The stitch covers the edges of the mirror and needs to be done very carefully.

5. **Darning:** Darning stitch is used in quilting and applique work and to implement this darning or free motion presser foot is used which is also called as an embroidery foot. It is popularly used for free hand embroidery stitches and free motion stitching mainly for quilts. It helps in minimizing puckering and skipped stitches. Some quilters prefer to drop or cover the feed dog and some prefer to keep the feed dog while stitching. There are various designs in darning presser foot like some have open toe, some are spring loaded, one can always choose amongst the design as per the need of the pattern.

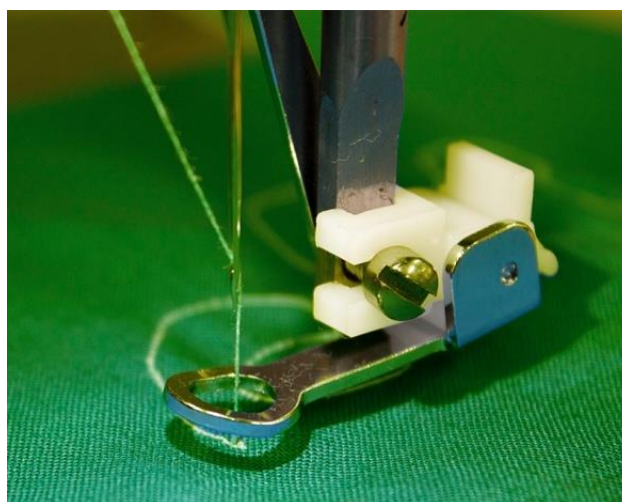


Fig.: 1.30 – Darning Foot

Multiple functions can be performed with this presser foot like Free Motion Quilting, thread painting i.e. using a straight stitch and free motion different shapes can be stitched in a unique manner to give a beautiful texture. With the help of darning stitch, holes can also be repaired in the fabric. Free Motion Monogramming & Embroidery can be done using zigzag stitch.

6. **Beading:** Beads and pearls add an ornamentation to the garments giving them a richer look. A beading foot is used to sew bead strings, pearls etc. which otherwise can be a tedious job. It is mainly used to embellish wedding wear, heavy gowns, accessories, evening wear etc. These come in two sizes, narrow groove and wide groove and can be selected as per the size of the beads.

The beading foot is used in attaching beads or pearls or chains to a fabric surface. It has a deep groove on the underside of the foot, but the width and the depth may vary on the underside which is mainly based upon the size of the beads. The beading foot comes in 3 sizes mostly 2-3mm, 4mm and 6mm.

The machine is set on a zig zag stitch and then securely it passes between the beads which ensures the stability of the beads as well.

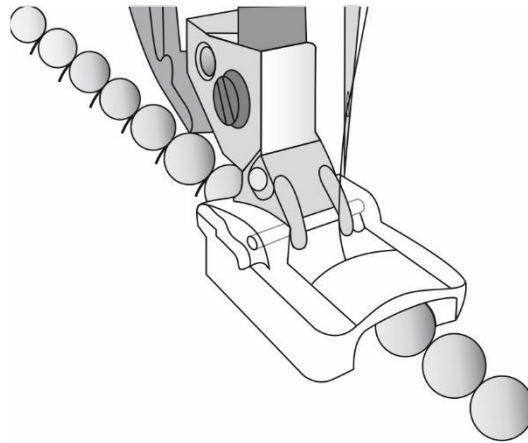


Fig.: 1.31 – Beading foot

7. **Applique work:** Applique work involves stitching together various pieces of fabrics to create a new pattern. Since it requires usage of various stitches the applique presser foot functions most appropriately for it. This is a short presser foot (3/4 of the straight presser foot) which helps in creating and stitching better curves along the pieces. Since it has a clear base it helps in viewing what is being sewn. The pin at the back keeps the presser foot horizontal and also stabilizes it during stitching. A wide zig zag stitch can be selected, with a short stitch length, to attain a compact stitch like satin stitch. The outer edge of the appliqué fabric is aligned with the opening of the toe, towards right of the center. While stitching around the curves the speed must be lowered and the presser foot should be raised giving a fine stitch around sharp corners.

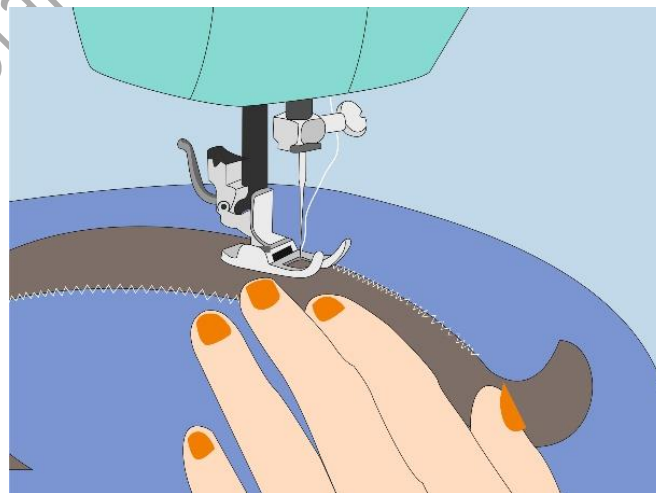


Fig.: 1.32 – Applique work

Another set of presser foot that is used for applique is Satin Stitch Foot. It is a longer version of the applique presser foot discussed above. It allows a groove in the back which allows raised thread of the satin stitches to pass through as compared to the other zig zag stitch.

Open Toe Applique Foot is also called the “Open Toe Embroidery Foot”. The open front in the presser foot allows great visibility in sewing. It has a wide stitching area for maximum stitch width without any control issues or problem which normally occurs in controlling. The rectangular shape depression at the bottom of the foot allows an even and easy application of satin/blanket stitch to glide under the foot without dragging. As compared to regular zigzag foot, the toes of the foot are shorter.

8. **Cutwork:** Cut work is an ancient embroidery technique used for giving beautiful edges in fabrics. Satin Edge Foot is used for cutwork. It has a metal pin which helps in guiding the fabric. At the edges one can simply press the fabric against the foot and sew beautiful patterns at the edge. It can be used for around 27 different techniques with adjustable seam width and various stitches needed for cut work.

INSTRUCTIONS FOR SETTING UP EMBROIDERY MACHINE

Before any embroidery starts, always check the machine settings according to the fabric, thread, and design selected for the project. Once this is done start setting the embroidery machine step by step as discussed below.

1. **Connect to the power supply-** Insert plug into the power socket and turn on the switch and activate the power and sewing light.
2. **Controlling sewing speed** – The harder the foot control is pressed, the faster the machine runs. The maximum sewing speed can be varied by the speed control slider.
3. **Adjusting the embroidery presser foot-** One can raise and lower the presser foot lifter. The darning foot is used to do machine embroidery, which is an essential tool for free motion. The presser foot dial should also be set.
4. **Attaching the needle-** Tighten the needle in the clamp screw firmly with the screwdriver.
5. **Winding and inserting the bobbin-** Fill the bobbin evenly and insert it in the bobbin case and pull out about 4” of thread. Set it in the hole of the case in position.

- 6. Threading the machine-** Lift up the thread take-up lever to the highest point to by turning the handwheel and raise the presser foot. Thread the machine from top to needle eye from front to back. Lightly draw up to needle thread forming a loop of the bobbin thread. Pull up bobbin thread back and press under the presser foot.
- 7. Balance needle thread tension-**The thread tension is adjusted depending on the sewing material, layers of fabric, and sewing method.
- 8. Adjust stitch length and width dial-** Set the setting mark at the desired stitch length on the stitch length dial. The higher the number, the longer the stitch length. The higher the number, wider the stitch width.

Before using the machine for embroidery place a waste fabric under the presser foot and run the machine for a few minutes. Wipe away any oil which may appear.

Activities

Activity:

To prepare a sample using cording presser foot.

Materials required:

1. Cording
2. A strip of fabric to wrap around the cording, approximately 2” wide
3. Fabric
4. Pencil
5. Scale
6. Thread
7. Cording foot

Procedure:

1. Place the cord in the centre of your fabric strip and secure with pins.
2. Using the cording foot place the wrapped cord in the left groove of the foot and place the fabric on the right of the presser foot keeping it outwards.

3. The needle should be snugged onto the cord but should not be sewing on the cord.
4. Sew to the length of your piping.
5. Place the cord in the desired shape or on the pattern designed using zig zag stitch.

Check Your Progress

A. Fill in the Blanks:

Identify the following machine attachments/stitches in an embroidery machine:

1. _____ presser foot is used for cutwork.
2. A compact _____ stitch is used in applique work for finishing.
3. A large needle helps to protect the thread from _____ when used on metal & rigid plastic.
4. In _____ we do not need any machine attachment and it works precisely with the needle.
5. Darning or free motion presser foot is also called as an _____ foot as it is mainly used for free hand embroidery stitches mainly for quilts.
6. _____ is used for attaching tapes/cords in between two fabrics

B. Write short answers for the following:

1. Briefly explain how an embroidery machine is setup for doing embroidery.
2. Which foot is used to attach ribbons on the base fabric?
3. List down the special features of a beading foot.

Session 3: Contribution of Basic and Advanced Stitches to Create Innovative Patterns

Creating an appealing design on the fabric is one of the most enduring and functional aspect of decorative arts. Fabrics with unique designs are created by applying the concept of proper placement of the motif and combining it with various types of embroideries to create a perfect combination. But creating a striking design is a very complex, and demanding process. A profound knowledge of the various facets of embroidery stitches, fabric, combinations and the right technique is what the market demands. This session talks about the various placements that are important and can be used to enhance and beautify the repetition of embroidery stitches. On the other hand, the concept of mixing various stitches and embroideries gives birth to new trends and brings a wide range of adaptations in various forms of embroideries together.

PLACEMENT OF DESIGN

There is both art and science involved in designing and creating different patterns on a fabric which are created using various repeats (not always) of the designs. These repeats specifications may differ depending on the end product category like apparel, home furnishings, etc. and technology used in creating it (dyed, printed, woven, etc.).

Design is an arrangement of part, form, colour, fabric, and line. In general, we define design as arrangement of putting together creative ideas on a piece of paper in a 2D or 3D form. In other words, everything has some or the other design in it whether it is a table, a glass or any other product. Design is not only used in the fashion industry but other areas like as industrial design, graphic design, textile design, fashion design, etc.

Designing is divided into two main divisions:

1. **Structural**
2. **Decorative**

Structural Design: As the name suggests it the structure of any design. It includes overall design of a garment with details like darts, pleats, tucks etc. It is the fundamental component of design.

Decorative Design: It refers to the surface enrichments of the structural design by adding embroidery or buttons, trims of different materials or any other decoration. It enhances the quality of the product by giving it a richer look.



Structural Design



Decorative Design

Fig.: 1.33 (a & b) – Decorative and Structural Design

Structural designs possess more durability and quality than the decorative ones. The base of any design lies in the structural part and to add luxury and richness to it decorative design is used. In textiles there are various techniques like printing, applique, quilting, embroidery, painting which are used for enhancing the look of the garment. Requirements of creating a good decorative design are as follow:

1. It should be able to enhance and strengthen the shape of the garment and must be placed at the structural point only.
2. The decorative design will look attractive when it is created in appropriate size and structure suitable with the fabric or material of the garment.
3. To give a proper effect of simplicity and dignity, the design must possess enough background space. It helps in creating a better visibility of the design.

There are various types of fabric patterns which focus on different types of repeats to form unity and harmony in the designs. Textile and print design can take on many forms in which the repeating patterns are very common. In simple words it is a motif that can be repeated vertically or horizontally in continuity without a break in the design.

Design repeats

Design repeat is obtained without boundaries, where the motif repeats without any interruption or break with a visual rhythm in a regular or irregular manner. The sides of the motif match perfectly only when the motif is duplicated. In this manner it can be printed on any fabric surface in an unlimited way. There are several types of repeat patterns in a textile motif which are: all-over patterns, semi-engineered patterns and engineered patterns.

All-over pattern means covering the whole area of pattern or surface. In this layout motifs are distributed all over the fabric in a randomly with regular or irregular spacing between them. Normally they are placed very close to each other in different directions.

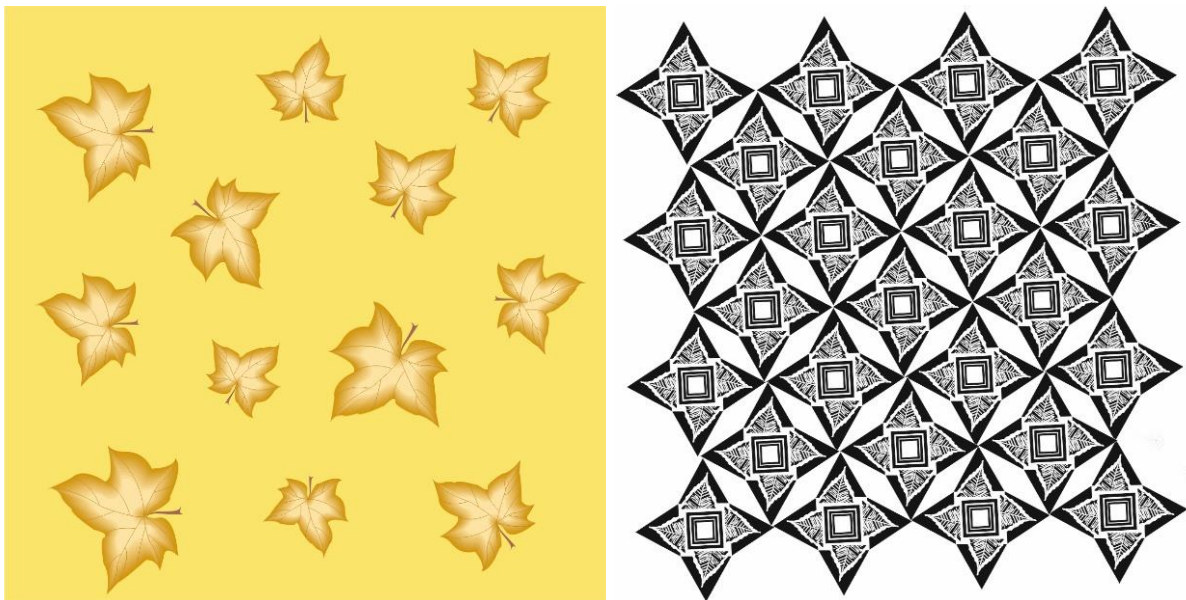


Fig.: 1.34 (a & b) – Design Repeats

The repeat is selected depending on the direction of the repeat:



1. Vertical repeat: In this the basic unit of repetition lies in the direction of the fabric height/ parallel to the selvedge.
2. Horizontal repeat: In this the basic unit of the repeat lies in the direction of the width of the fabric.

Types of repeats

Broadly speaking, placement of design on garments and various products can be done mainly in six different ways:

- Equidistant
- Half drop repeat
- Brick repeat
- Mirror repeat
- Diamond repeat
- Tossed/Random repeat

Equidistant

It is one of the simplest repeat or placement of design which is formed by placing the design in a basic grid repeat. It looks more elegant with simple floral and geometric motifs. It is considered to be one of the most common and simple form of repeats and is also known as block repeat, full drop or block surface repeat.

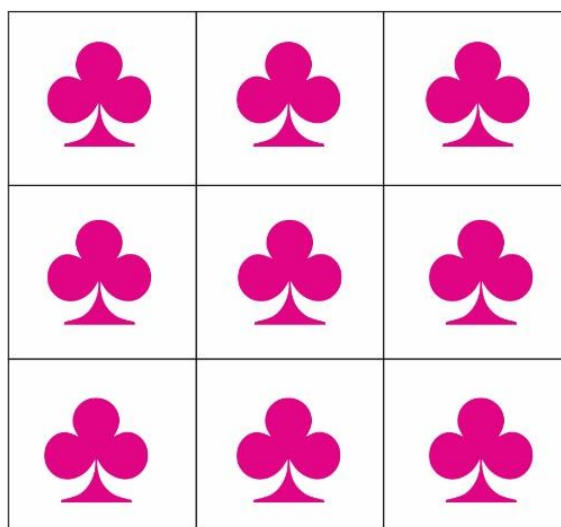


Fig.: 1.35 – Equidistant Repeat

Half Drop Repeat

In Half-drop repeat, design is placed vertically in a column format which is then offset by half in the next row vertical to it. They allow the design to look less formal due to its vertical dropping position in the grid.

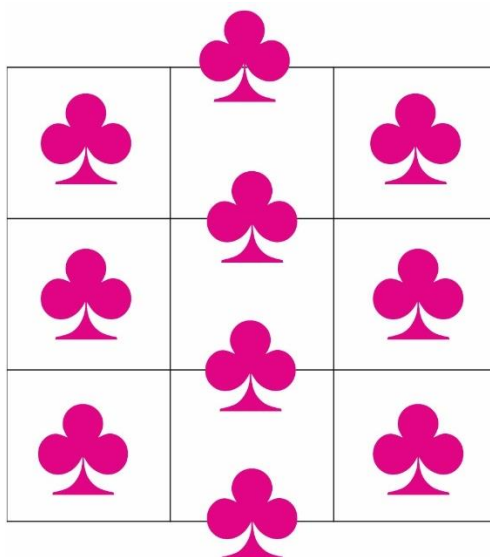


Fig.: 1.36 – Half Drop Repeat

Brick Repeat

This repeat is similar to the vertical half drop repeat. Here the design is placed in a horizontal column format instead of vertical column. The repeat unit is offset by half in the next horizontal row resembling a brick wall. This brick repeat also allows a design to look less formal.

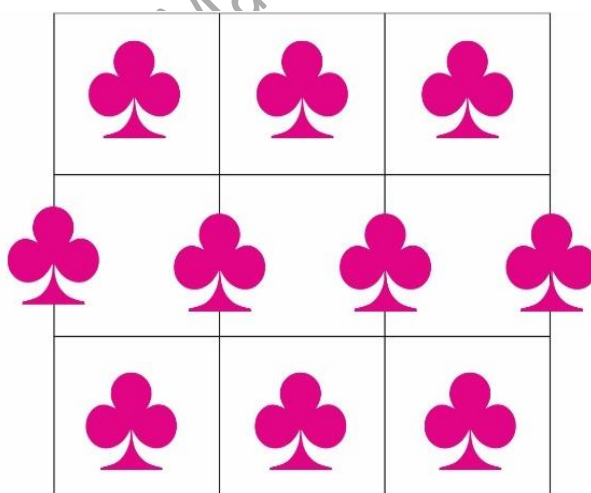


Fig.: 1.37 – Brick Repeat

Mirror Repeat

As the name itself depicts, in this type of repeat, the design is arranged in mirror image form. It provides an interesting look if done correctly. To create this repeat, the motif is duplicated horizontally and vertically to get an overall mirrored repeat on the surface or design.

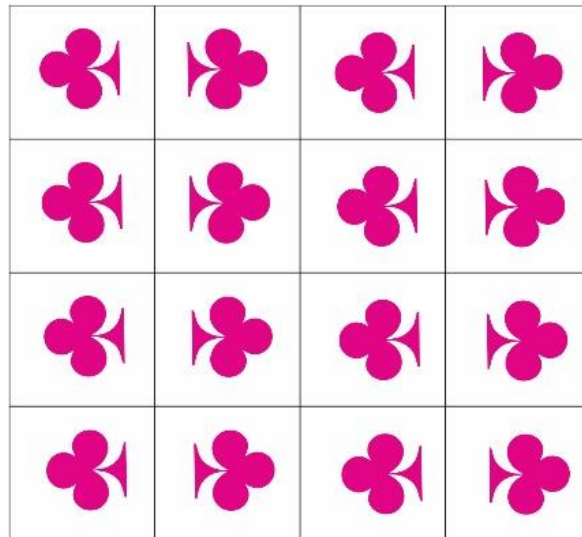


Fig.: 1.38 – Mirror Repeat

Diamond Repeat

The diamond repeat is a repeat of design in diamond shapes and is frequently used in embroidery work and textile design. It is created by repeating diamond shape in the grid format resulting in the design to be arranged in a diagonal row format.

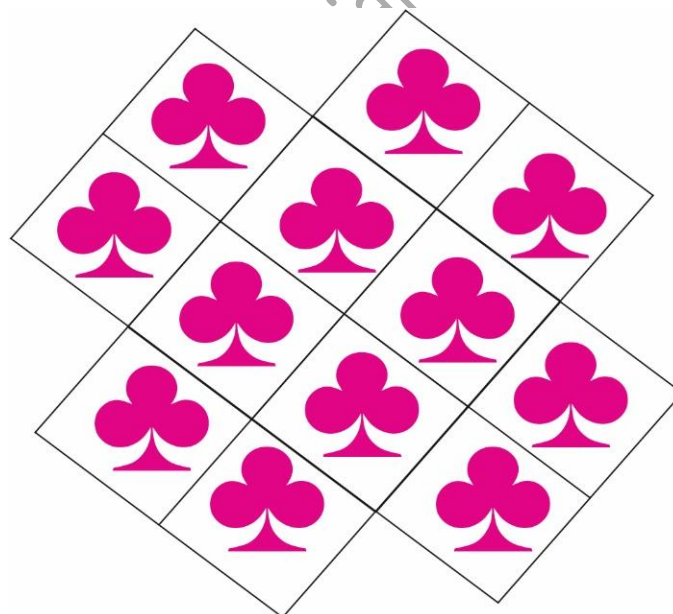


Fig.: 1.39 – Diamond Repeat

Tossed/ Random Repeat

A tossed/random repeat has scattered design in a repetitive form. The designs are scattered within the repeat unit in an irregular manner. The unstructured nature of a tossed repeat results in an organic or non-linear design. Even the size of the repeated motif in the design can be irregular.

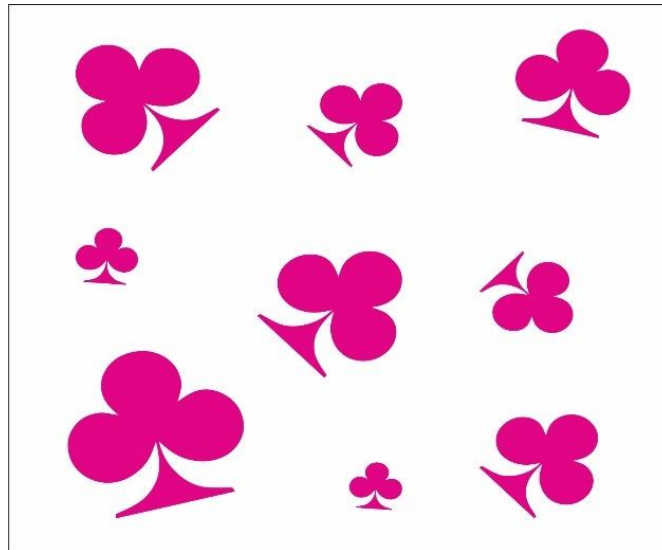


Fig.: 1.40 – Tossed/ Random Repeat

It is important to choose a right pattern for repeat in your design as each pattern has its own grace and charm.

The selection of repeat will also depend on the product that is designed and what one is looking for in their end product.

But these repeats give an opportunity to experiment different variations in the placement of motifs which helps in achieving a unique variety of surface design patterns.

MIX AND MATCH OF DIFFERENT TYPES OF EMBROIDERIES

Indian embroidery includes a wide variety of regional embroidery styles. Every state enjoys its own style and will have a different material and set of stitches to be used in creating an end product.

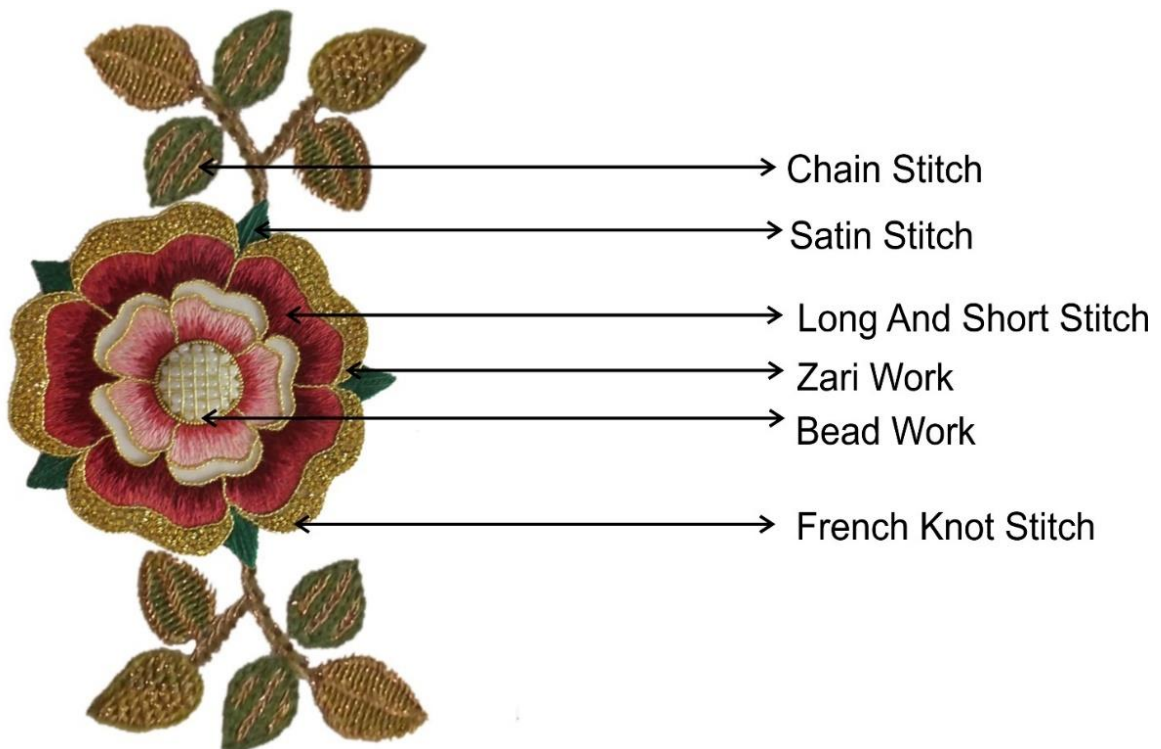
Embroidery is India's persistent eloquent tradition. When it comes to needle work, it is not just decorating fabric but also establishing and embellishing stories of a particular community with a range of its cultural motifs emerging from its natural surroundings, religious inscriptions, economic state, etc. Today many embroideries are being mixed to create innovative styles and to meet the demand and satisfaction of the customers.

Mixing of two or more embroideries enhances the beauty and uniqueness of the product. Examples of a combination embroidery are Chikankari embroidery clubbed with *gota patti* work or Parsi embroidery, phulkari and mirror embroidery, kantha and mirror work etc. to name a few.

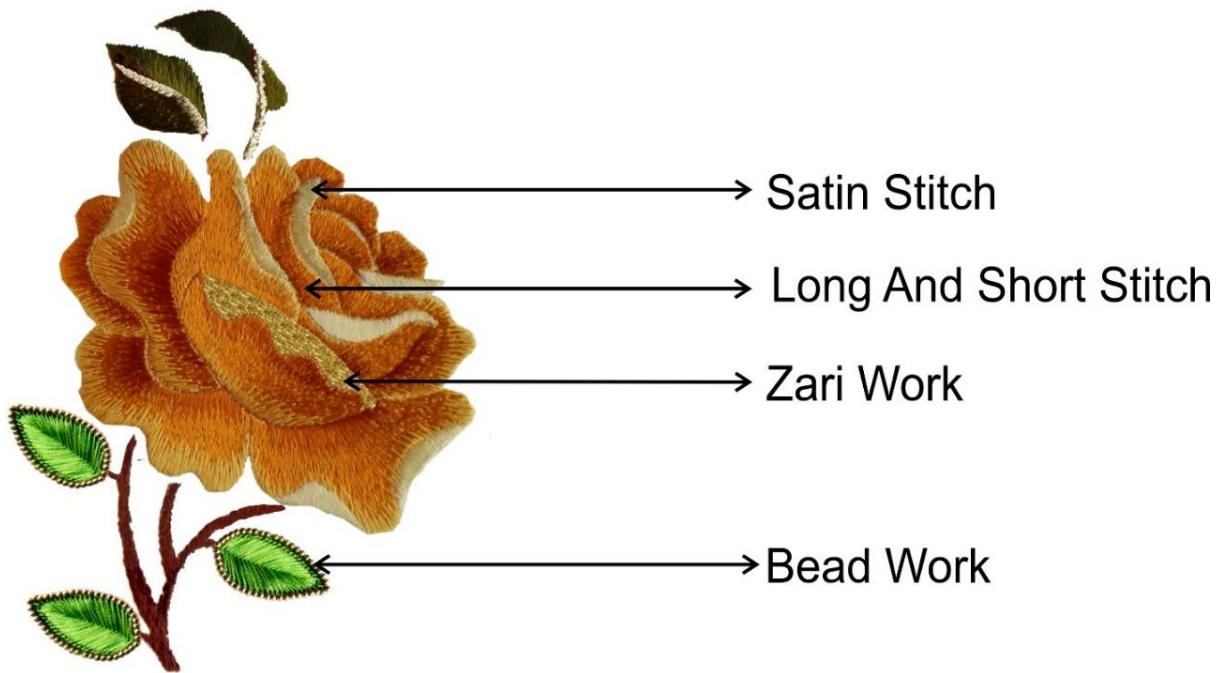


Fig.: 1.41 – Combination of Chikankari and Machine Embroidery

Embroidery doesn't come with a set of rules of using 1 or 2 stitches in a product, in fact it helps in showcasing one's creativity without any bar. It comes with a skill and personal creative thought process. To create a unique embroidered sample, one needs to think out of the box to combine a range of embroideries or stitches together. There are a lot of different ways in which different combinations can be incorporated using machine embroidery. There are many examples in the industry where the designers have made it possible for east to meet west. Thus, it is all about one's mind set for creation of a new innovation.



(a)



(b)

Fig.: 1.42 (a & b) – Combination of stitches

Fig: 1.44 showcases a combination of stitches and embellishments which are attached using machine embroidery. This shows the versatility of the machine embroidery combinations that can be used together to create different patterns. Different machine attachments as discussed in the previous session can create different types of stitches, thus, before one starts with their design, one must keep all the attachments ready and can also create a rough sample just to be sure if all the combinations will look good together or not.

Points to remember while working on combination designs:

1. Choosing the fabric, design and combination of embroideries as fabric is the main base for the pattern that will be created.
2. The next step is to draw a design/motif on the fabric and mark the points of different areas with different embroideries to be done.
3. Choose a good colour combination with stitches that will be used in the pattern and accordingly the threads will be selected to fill the bobbin case.
4. Make sure same colour or a darker tone of thread is used in the bobbin for highlighting effect.
5. Select small size of designs to be incorporated in a particular category of stitch. For example: 3” - 4.5” wide.

6. The hoop should firmly hold the fabric; and make sure that the tools are in order before making the final embroidery design.

CREATING EFFECTS WITH MACHINE SIMILAR TO HAND EMBROIDERY

Machine and Hand Embroidery

To reduce the cost and earn more profit, duplicates of hand embroidered products are produced using embroidery machines and are readily available in the market.



Fig.: 1.43 (a & b) Machine Embroidery and Hand Embroidery

It is sometimes very difficult for a person looking for the first time to differentiate between hand embroidery and machine embroidery. The above two pictures are of a shawl with similar pattern and embroidery concept. One is a hand embroidered shawl and another is machine embroidered. Take a look. Can you make the difference? Not sure? Here are some points/tests that can help to make out which one is hand embroidered and which is machine embroidered.

How to spot the differences:

A look at the reverse side: This is one of the most helpful method of identifying the garments. A first look at the reverse side of the garment reveals

clearly whether the product is embroidered by hand or machine. Machine embroidery involves employing of a multi-coloured thread for embroidery as it is a continuous stitching process. It will therefore have continuity in stitches with minimal breaks. Hand-stitches on the contrary involves a single-color thread for embroidery at a time and the craftsman takes time to time breaks from the earlier thread (color) to start a new thread (color) which also leaves behind a trail of threads hanging on the reverse side of the fabric.

A look at the front: To analyse the front part of the embroidered work, one needs to pertain good understanding regarding the familiarity of hand-stitch and machine-stitch.

Following are some machine embroidered and hand embroidered products available in the market:

Phulkari:

Phulkari is an ancient and traditional hand embroidery art of Punjab. It was initially done on raw cotton fabric called khaddar, with special threads (PAT) meant for this embroidery only.

Over the years, with an advent of machines, phulkari started losing the interest of the artisans. The main reason behind it was mainly because machine embroidery is faster and the end products immaculate in every stitch, which makes it much economical than hand embroidery. Thus, people started buying more of machine-made phulkari products than from the artisans.

A machine-made Phulkari will always have perfect stitches, with all the stitches of the same size and shape, whereas there will be some irregularities in hand made Phulkari.

Different threads are used for both the embroideries. A thinner and finer quality thread is used for machine embroidery than the one used in hand embroidery.

To identify the difference between machine and hand Phulkari, reverse and see it. Back side of phulkari will have full motif behind in a machine embroidered one whereas hand embroidered will have visibility of only dots of thread & knots.

Chikankari

Chikankari is an ancient form of white floral embroidery, practised mainly in the city of Lucknow, Uttar Pradesh. It is a very sophisticated embroidery with an intricate pattern worked with needle and raw thread. Like many other art forms there is huge demand of the Chikankari in the International market and among art lovers. Embroidery machines help in producing cheap imitation of Chikankari. There are a limited number of stitches which are possible to do with a machine which includes shadow stitch. In total there are around 36 stitches used in actual Chikanakri which are not possible to produce by machine.

Kutch Kathiawar

The Kutch Embroidery is a textile signature art and handicraft tradition of the tribal community of Kutch District in Gujarat, India. It's an embroidery rich in its design and pattern which has made a notable contribution to the Indian embroidery traditions. It was initially, practiced normally by women in the Kutch districts and community which was generally done on cotton fabric using cotton or silk threads. In certain patterns, it is also crafted over silk and satin. The types of stitches used are “square chain, double buttonhole, running stitch, pattern darning, satin and straight stitches”. The signature effect of the embroidery sparkles when small mirrors with colourful embroidery on it called *Abhla* are sewn over the geometrically shaped designs.

Kashidakari

Kashida is a popular Kashmiri embroidery from the beautiful valleys of Kashmir. In the 15th century, the Sultan- Zain-ul-Abidin introduced this art of Kashidakari which became popular because of its color, texture, design and techniques. Tilla is one of the most prevalent forms of embroidery in Kashmir. Historians believe that Tilla originated from a remote village of Zari in Iran. The craft was further uplifted by Mughal rulers who were impressed with its exquisiteness and they also used Tilla embroidery in their royal courts.

The reason behind the decline in this Kashmiri embroidery is mainly due to less wages to the artisans. This work requires lot of patience and accuracy involving huge time investment in every piece that is created. Thus, due to inappropriate wages for their work, the artisans switched to machines or changed the field.

Activities

Activity

Create any two repeat patterns using a motif of your choice.

Materials required:

1. A3 size sheet
2. Writing material
3. Coloured pens or pencils/poster colours

Procedure:

1. Take an A3 size sheet and draw an 8"x8" block. Select one symmetrical/asymmetrical motif and create vertical half drop pattern using 1"x1" grid. Render the motifs and remove the grid lines later.
2. Take an A3 size sheet and draw an 8"x8" block. Select one asymmetrical motif and create a mirror repeat using 1"x1" grid in that square. Render the motifs and remove the grid lines later.
3. Take an A3 size sheet and draw an 8"x8" block, now create an all over pattern in this box.

Differentiate between machine and hand embroidered samples.

Materials required:

1. A3 size sheet
2. Writing material
3. Embroidered samples (hand and machine embroidered)

Procedure:

1. Collect 2 samples of any embroidery available in nearby market or from your home of hand and machine embroidery. For example, one sample

of machine embroidered phulkari and one sample of hand embroidered phulkari.

2. Compare and differentiate between them.
3. Write a report pasting those samples in your practical file.

Check Your Progress

A. Fill in the Blanks:

1. _____ includes over all designs of a garment with details like darts, pleats, tucks etc.
2. Selecting the right fabric, design and combination of _____ is very important before working on any pattern.
3. In _____ the basic unit of repetition lies in the direction of the fabric height / parallel to the selvedge.
4. _____ is one of the most beautiful and popular embroidery of Kashmir.
5. A _____ repeat has scattered design in a repetitive form.

B. Write short answers for the following questions:

1. Explain the difference between hand and machine embroidery.
2. Explain the points to keep in mind while working on combination designs. (Any five)
3. What do you understand by structural design? Explain different types of repeats briefly. (Any four)

Module 2	Specifications Sheet and Handling of Different Fabrics While Embroidery
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Module Overview

Specification sheet, also known as “spec-sheet” is a very important document which contains the details of all mandatory elements and is required to manufacture any garment or any other stitched product. It consists of all the important data regarding its style, size, design placement, raw material used etc. Specification sheet is prepared by the designer after the buyer approves the design or if the buyer sends his requirements for the design.

Also, the buyer may send specification sheet to be followed for the development of the apparel or any stitched product of his designs. These specifications are to be followed for the production.

After the preparation and approval of the specification sheet, the first prototype sample is made to understand the construction, fit, desired look, embroidery and trims specified in the spec sheet. In essence, the style specification sheet is the “blueprint” for sample development and garment production, because it contains all mandatory elements which are required to manufacture it.

On the other hand, with the new developments in the industry by improving the labour productivity and reducing overall manufacturing costs, the clothing industry perceived the need of change. There has been a great impact of industrialisation in the textile industry, from embroidery, pattern making, stitching etc. in the category of machines and looms.

The technology has created new modes of clothing production which has led to an increase in the productivity and also promoting automated clothing production with flexible methods changing styles easily and quickly. Today, the industry is influenced by advanced computer technology. From big brands to companies, use of CAD & CAM for creating a wide variety of designs in accurate manner has become an important aspect. CAD, which is Computer Aided Design and CAM, Computer Aided Manufacture have changed the whole scenario of the fashion industry and have increased its value.

Learning Outcomes
After completing this module, you will be able to: <ul style="list-style-type: none"> • To learn use of design specification sheet as per embroidery work • Explain factors affecting the processing of embroidery work
Module Structure
Session 1: Use of design specification sheet as per embroidery work
Session 2: Factors affecting the processing of embroidery work

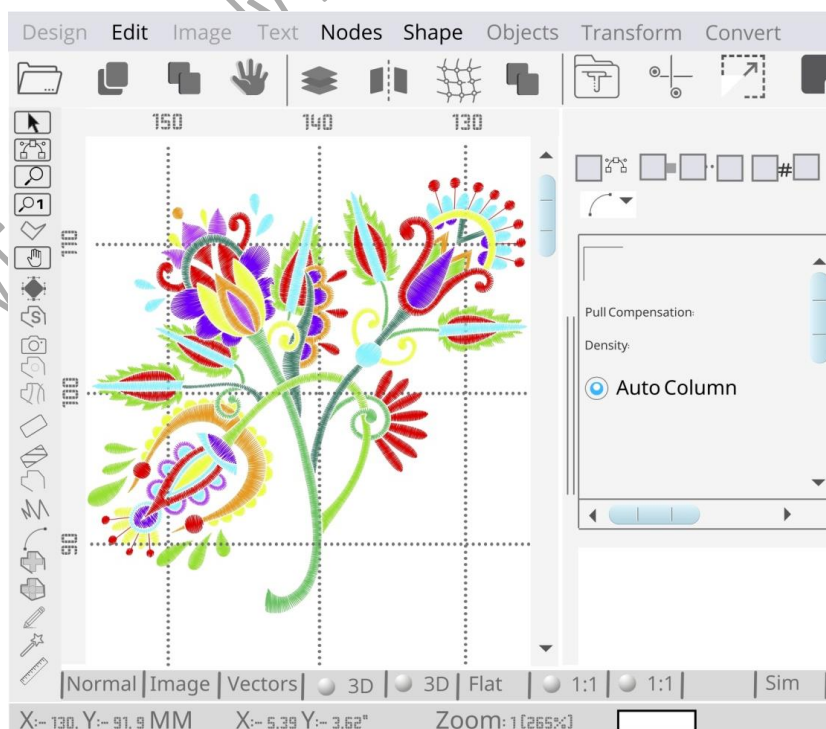
Session 1: Use of Design Specification Sheet as per Embroidery Work

Interpretation of the spec sheet and following the buyer's instructions to ensure the embroidery work matches the specification

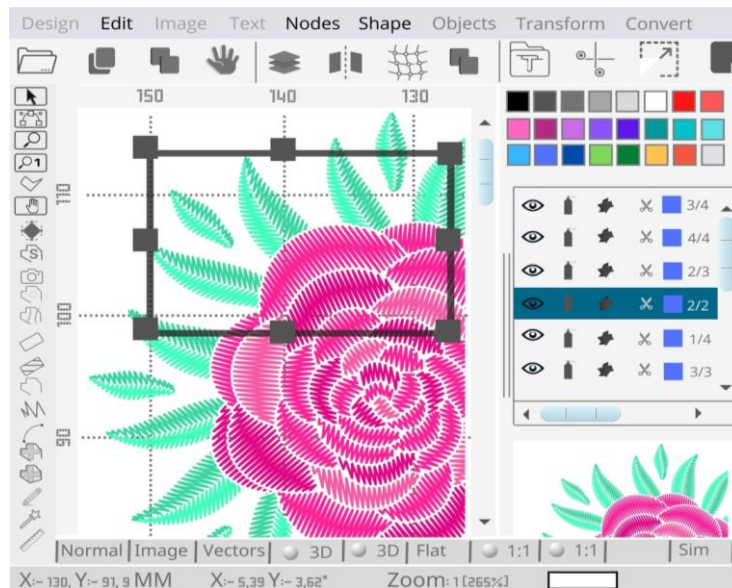
The textile industry works in different segments of production where there are different departments for different processes. The manufacturing of any product requires a spec sheet for creating a sample prior to production. Once the sample gets approved it gives an estimate to the manufacturer about the amount of yarn or fabric consumed for developing the sample along with details regarding printing, dyeing, embroidery, stitching, trims etc. to be used which further helps in the costing of the final product. All these details are studied with the help of creating the sample before one goes for a mass production. Fashion specification sheets embodies a set of technical sketches which are normally known as flat sketches, construction notes, exact measurements, seam allowances, trims, cuttings or any other accessible trims or materials. Often the spec sheet also includes the measurements grades between sizes along with detailed size gradation for the garments. The better and clear information a spec sheet has, easier it is for the development team to manufacture as it reduces the misunderstandings and confusions.

The embroidery spec sheet is a part of the final spec sheet. The embroidery spec sheet contains details of the embroidery specifying the requirements in that particular design. This design is further created on a white sheet using Computer Aided Design (CAD) software at the industrial level. Using such design software, the embroidery master very minutely works on the design,

selecting the colour details and using the best possible stitches to make a look alike of the sample shown in the embroidery spec sheet. Once the design is created on the white paper, it gives an exact calculation of the Stitch Per Inch (SPI), the gaps or distance between one stitch and another and the size & thickness of the embroidery. There are normally two ways of processing embroidery in a garment that is, either it will keep increasing with the gradation of the sizes or the embroidery pattern remains the same size in all graded patterns. In some cases, there is a shift in the placement of an embroidery with different sizes due to an increase in size of the garment but embroidery design being constant. All these things are discussed by the embroiderer, embroidery machine operator and the merchandiser. He/she provides with all these details along with samples on the white sheet and how it will look on the garment. At times the design given for embroidery doesn't fit in the specific area mentioned in the spec sheet, then it is informed by the curator and it is discussed with the buyer, and embroidery is done accordingly and a graphic sample is created. A graphic sample is a sample in which the garment has a single embroidered pattern which is constant in all sizes. In case there is gradation in embroidery with each garment size gradation, sample of all the sizes are created for the buyer. Once the buyer receives the samples, he or she will check those samples on a dummy to see the look of embroidery on the garment and will further discuss the changes in the embroidery part if required. After all processes are completed, the production starts, else, the buyer will discuss changes and all the processes will be repeated before going for mass production.



(a)



(b)

Fig.: 2.1 (a & b) – Computer Aided Designing

A spec sheet is a diagrammatic representation of the details required or used during production of a design or template. It contains following heads:

1. Product sketch: The design of the garment is showcased using a flat sketch also called technical sketch of both front and back with details marked on it.
2. Fabric details: Swatches of the fabric with color details or the fiber content is mentioned along with supplier details.
3. PoMs (Points of Measure): Size measurements of the required item, which assures the measurement of the final product. This is very important as it ensures the accurate execution of the garment during its production.
4. Design placement: Details of the design and its placement, count and repeat pattern is defined for the exact placement on the actual sample.
5. Embroidery placement: Information regarding the size, placement and type of embroidery and threads to be used.
6. Workmanship Instructions: Particulars of stitch type, seam diagram, thread size and SPI (stitch per inch).
7. Garment washing instructions: Details of different washes for finishing on the garment are specified for products like denim garments.
8. Accessories details: Details of trims, fasteners etc. required with product codes and supplier details.
9. Label placement: Placement details for brand logo labels and care labels in the garment.

10. Comment section: This section provides notes of small details to be followed during construction.

For embroidered products, embroidery specifications are a part of the design specification sheet. In the specification sheet, embroidery details include all the information which is required to execute the desired embroidery design on the product. This sheet is used as the base for standardising the embroidery designs on all the products. The embroidery details in the specification sheet generally includes:

1. Type of embroidery thread
2. The base fabric for embroidery
3. Type of other materials (beads, sequins, stones, cords etc.)
4. Placement of embroidery design on the fabric or product
5. Size of embroidery design
6. Colours of embroidery thread
7. Placement of different beads, sequins, stone, cords etc.
8. Stitch density
9. Estimated stitch length
10. Type of stitches

The specification sheet is passed to the operator who is responsible for doing machine embroidery on the product. The embroidery machine operator follows the specification sheet to embroider the product.

NOTE: The machine embroiderers who work on a small scale and produce products of their choice may or may not prepare or follow specification sheet. However, for mass production a rough unstructured specification sheet is made by the machine embroiderers for their reference.

The first step towards making a design is by analysing and interpreting the spec sheet carefully and understanding the instructions given by the buyer. Once the buyer shares the embroidery spec sheet with all the details as per his requirement, the merchandiser carefully goes through it and the embroidery machine operator creates a sample or mock-up of the embroidery pattern.

An embroidered spec sheet of a tunic to be added with Embroidery on the cuffs of the sleeves and splashes of small flowers in the front of the garment

Style No - 12345
 Type of Base Fabric - cotton
 Type of thread - Polyester thread
 Size of Design- 3" by 3"
 Colour - As indicated
 Stitch type - Satin and Herringbone
 Stitch Length - 1/4"
 Stitch density - As indicated

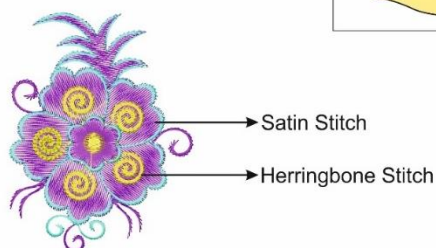
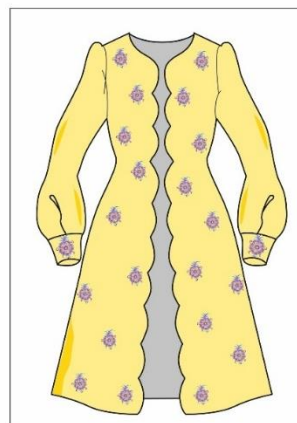


Fig.: 2.2 – Embroidery Specification Sheet

Let us understand embroidery specification sheet with the help of above specification sheet sample.

Assuming that the buyer sends a spec sheet, the manufacturer gets a sample of the embroidery on a white paper using CAD software. The design comes in a PDF format from the manufacturing unit. The estimation of number of flowers on the tunic, total no of SPI required in one flower and the thickness and spaces in between each stitch gives an estimate cost of making one flower is made by the embroidery machine operator under supervision of his supervisor and the merchandiser. Since in the above example, the design on the cuff area, being very small, is not possible to embroider completely. Thus, it needs to be cut and the design needs to be using CAD. This is also shared with the buyer. Once this gets an approval, the graphic sample of each size with ratio is made and sent to the buyer for checking and confirmation. A new spec sheet is created with the changes specified by the buyer. Further mass production is done after these changes are approved.

USE OF CAD TO DEVELOP DIGITAL DESIGN ON EMBROIDERY

Today with an increase in demand of textiles and apparels, it is important to come up with new fresh and innovative ideas to create saleable designs in affordable price range for target customers. The traditional hand embroidery craft which has been popular since many years has been in demand since long. But these hand embroidered articles are extremely expensive and are not affordable to many customers. With an increase in demand of these items machine embroidery is a more durable and cheaper method of production and

pocket friendly to many customers. The first software for embroidery was introduced in 1980 which was run on a minicomputer with a graphical user interface (GUI) and provided many benefits. Since then, Computer-Aided design –CAD, became one of the most important technology for designing and creating patterns and today it plays a major role in the field of embroidery. To create a digital embroidery pattern, the software's possess the basic features of designing different shapes, curves, two dimensional or three-dimensional surfaces, tolerances according to specific conventions and designs, to make selection of very precise outlines and objects with an ability to change colour size and other accessible tools. Today CAD is not only used in textile embroidery and designing but it is also widely used in areas aerospace industry, architectural designs, prosthetics, advertising media, movies etc.

It is easy to create digital blueprints that communicates the real concept of a design before manufacturing it. The embroidery design softwares are a boon to the textile industry as they help in the mass production of the commercial embroidered textiles. The designs and motifs can be easily created directly on the computer and they can further be changed easily for any specification. It is easy to create any category of embroidery adding letters, lines, objects, photo embroidery patterns at a faster and easier pace without increasing the cost of production. The whole concept can be easily brought into existence with huge range of stitches like cross stitch, hand woven designs, satin stitches etc. These patterns can be directly fed into sewing machines which further give an excellent finish to the garment. These software's performs various functions like connecting patterns, color changing, size changes, connecting with the sewing machines with versatile input file formats. There are many software's for embroidery are available in different product models. Each software fulfils the basic needs and a specific embroidery pattern.

Some basic features that a CAD software's needs to have are being discussed below:

1. **Vectoriser:** Converting the embroidery designs into vector images which helps in determining the type of stitch to be used and object type for different shape. It helps in converting vector designs to embroidery patterns as well.
2. **Auto-digitizing:** Advanced auto-digitizing mechanism aids professionals regulate important conversion settings needed for recognising shapes in vector, bitmap and artwork.
3. **Digitizer:** It helps in accuracy of stitch representation at the time of creating designs and also while converting the designs onto the machines to obtain the exact pattern.

4. **Lettering:** It helps in creating embroidery designs in a letter with different fonts and sizes and can create multi line or single embroidered texts.

The design created on the software is interpreted using the type of stitches by plotting the route of the needles of a machine connected to it which will also display the colour changing features. Once the design is complete it is transferred onto the machine in the supported format and stored in the memory of the embroidery machine. A trace function is run on the machine to check if there is any collision with the hoop or needles and then the problems are adjusted. After tracing the speed is adjusted and embroidery can commence. In case of any error the software will display the attention of operator. Once the sample is complete it is inspected for thread tension, colour and stitch length. Thus, the process becomes faster and easier. CAD has provided the industry with a huge range of products with new innovations in designs and creativity. It reduces the cost of production as compared to the traditional hand embroidery methods and makes it affordable for many people.

Activities

ACTIVITY 1:

Prepare an embroidery spec sheet.

Materials Required:

1. Writing material
2. Coloured pens/pencils
3. Practical File/ A4 size sheet

Procedure:

1. Create your own design/ motif on a flat garment taking inspiration from an image from internet.
2. Prepare an embroidery spec sheet.
3. Using the reference image from the internet create instruction as given in the reference like stitch length, thread, color, size of motif, placement on the garment.

4. Discuss the details with your teacher.

Check Your Progress

A. Fill in the Blanks:

1. A _____ is a sample in which the garment has a single embroidered pattern which is constant in all sizes.
2. A _____ is a very important document which contains the details of new styles/ designs.
3. _____ helps in accuracy of stitch representation and converting the designs onto the machines to obtain the exact pattern.

B. Short answer questions:

1. Explain the importance of CAD in the textile industry.
2. Explain the basic features of the CAD software.
3. Explain the embroidery spec sheet in detail.

Session 2: Factors Affecting the Processing of Embroidery Work

Machine embroidery involves a special embroidery technique as the process involves use of automatic machines, whose functioning and working is adjusted according to the programming and the need of the design. The design which is created by man is fed in the machine operation algorithm, which is repeated lot of times to create tons of fabrics with the same design. In this way the amount of manual labour cost decreases. The main feature of machine embroidery is the absence of manual labour with more possibility of sample duplication at a faster speed. The embroidery goes through mainly two processes where one is the designing stage and the other is the technical stage where the sample or product is manufactured using machines. Both stages are independent and different yet needs to be well coordinated with each other. At the time of manufacturing there are many problems one comes across and need to be handled with care for producing the desired results. Ranging from the technical and mechanical problems of dealing with different types of fibers to meeting the specifications, all needs to be handled with utmost care and precision. This is a continuous process that keeps moving in a chain and needs lot of experience. Selection of right fabric for the design, following the instructions as per the spec sheet and the machine attachments to be used is most important to get the desired result. Selection of fabric, thread and needle is very important aspect when embroidery is to be done with high-speed machines. Even though embroidery can be done on different fabrics but every fabric will have different results. Let's discuss these in detail.

PROBLEMS ENCOUNTERED WHILE WORKING ON DIFFERENT FABRICS

Fabrics play a very important role in the process of embroidery as it the base on which embroidery is done. A wrong selection of fabric can lead to an unsuccessful or untidy embroidery pattern. Since there is an advancement in the technology and resources, there are huge range of fabrics nowadays which are used in the industry, thus one needs to be very careful while selecting them keeping in mind the end use of the product. Fabrics can be Woven, Knitted or Non-Woven. Also, it's very important to understand the relationship of fabric and thread used for embroidery. A synthetic thread cannot be used on cotton fabric and vice versa. Before understanding fabrics, it's very important to know the origin from where it comes from i.e., fibres as their basic properties differ from each other. Also, it is important to know the steps involved in fabric manufacturing.

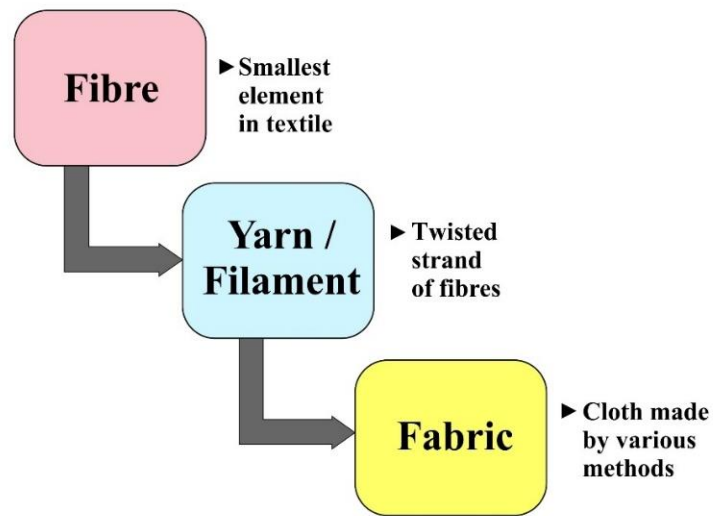


Fig.: 2.3 – Relation between Fibre, Yarn and Fabric

These fibres are then converted into yarns by spinning method in which fibres are twisted together to create a yarn. Higher the twist, stiffer will be the yarn and vice versa.

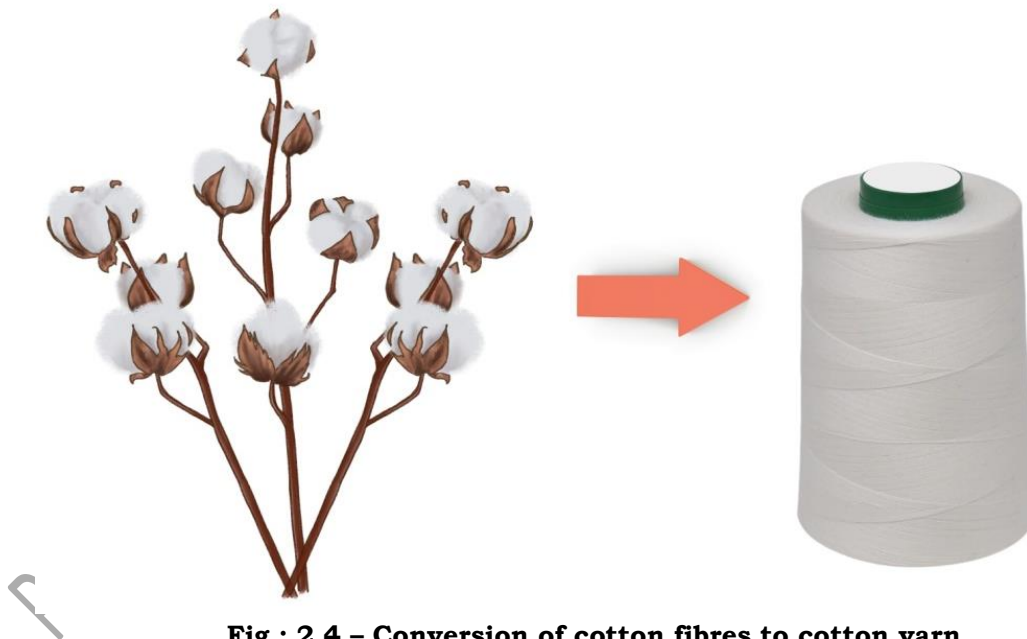
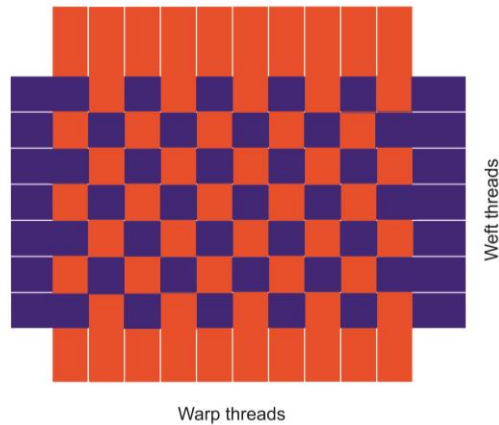
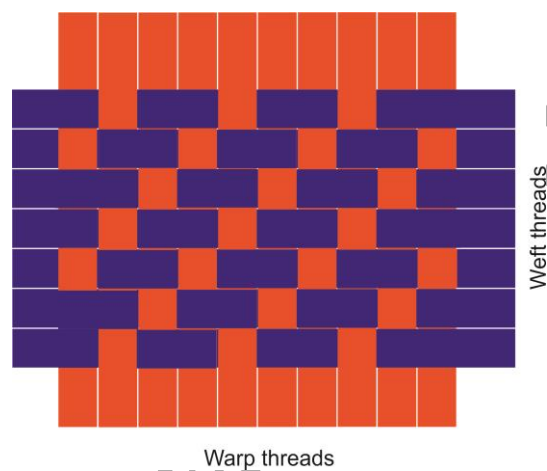
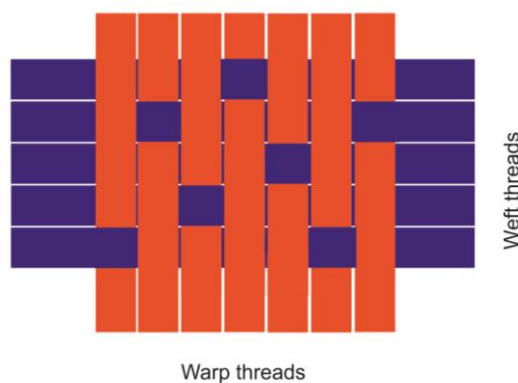


Fig.: 2.4 – Conversion of cotton fibres to cotton yarn

WOVENS

Variety of heavy weight and light weight fabrics are produced from these fibres. Construction process of manufacturing woven fabric from yarn is called weaving. There are three types of basic weaves- Plain, Twill and Satin. Each of them will have different surface texture created by different weaves.

**Fig.: 2.5 – Plain weave****Fig.: 2.6 – Twill weave****Fig.: 2.7 – Satin weave**

Every fabric behaves differently while handling due to type of fibre, yarn type and fabric construction. For example, if the fibre is silk which is a filament fibre, has average twist and woven as satin weave will have smoothest and shiniest surface as compared to another fabric which have any factor different. Fabrics having compact construction ensure a sturdy surface that easily supports embroidery work.

Let's know a little about fibres. Fibre is the smallest and basic unit of fabric. They are tiny hair like structure. They can further be divided into staple (short) or filament (long) fibres. Quality of fabric also depends upon the length of the fibres. Fibres can be classified as:

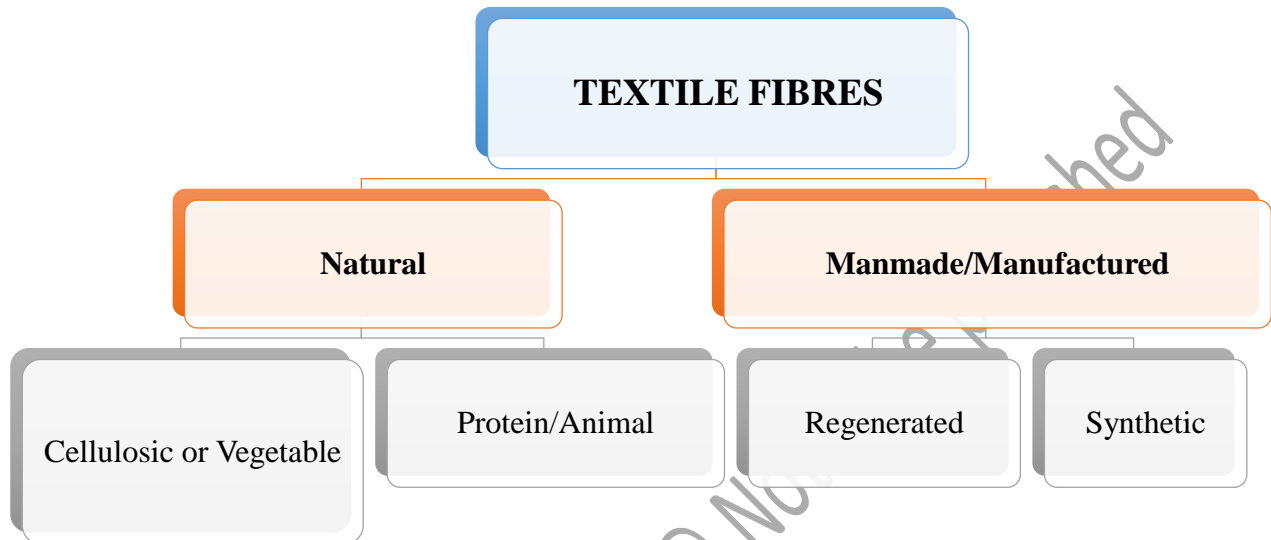


Fig.: 2.8 – Classification of fibre

Natural fibres

These are fibers which are obtained from natural sources. They come under two categories one is plant based like cotton, linen etc. and the other is animal based like silk and wool. All these fibres have different and unique characteristics of its own.

Today in the industry not only natural or organic fibres are available but it is flooded with wide range of manmade fibres too.

Some fabrics and the precautions which one needs to take while doing machine embroidery on them-

1. **Cotton:** Cotton is a smooth fabric and most easy to handle. It does not create any problem while doing embroidery. It has a property of wrinkling but can be smoothed after ironing.



Fig.: 2.9 – Machine Embroidery on cotton fabric

2. **Silk:** Silk is a soft shiny and smooth surface which needs attention while doing machine embroidery. A good quality backing material to be pasted under the embroidery to give strength to silk fabric. Care has to be taken while selecting the needle as lot of times it causes holes and snugs. It is not advisable to use frame but if required, while fixing the hoop/ frame, special care has to be taken as fabric might get stretched and leave its impression on the surface of fabric damaging it.



Fig.: 2.10 – Machine Embroidery on silk

3. **Wool:** Wool has rough surface as compared to other fabrics. Proper selection of needle and the style of embroidery is very important. If hoop/ frame is to be used proper care has to be taken as it might get stretched and does not revert back to flat look.



Fig.: 2.11 – Machine Embroidery on wool

4. **Fur and Velvet:** Fur fabric has a fuzzy surface and it is very difficult to do any embroidery on it as the loose fibres tend to hamper the stitch. To have a hamper free functioning a water soluble topping is used to make the surface smooth.



Fig.: 2.12 – Machine Embroidery on Fur

Velvet is a fabric which come under the category of pile fabric. It has a fuzzy surface which is lesser as compared to the Fur fabric. A base is required on top on which these fabrics are placed and on top water soluble topping is kept which is in the form of transparent sheet. After completion of the embroidery these top and bottom films are separated. Any extra film if left can be diluted by dabbing with any fabric or a piece of foam soaked with water. This film helps to hold the embroidery clean and clear on a fuzzy or piled surface.



Fig.: 2.13 – Machine Embroidery on velvet

5. **Satin:** Satin is an extremely slippery fabric due to its constructional weave where there is formation of floats on the surface. It results in lot of fraying at the edge due to these floats. While handling satin one needs to be extra careful as it slips a lot, so it's necessary to hold it with the hoop/ frame with some backing. Fixing of hoop/ frame should be done very carefully as it might leave its mark after it is removed.

Pure satin fabric is made using silk fibres but there is another consideration that if the fibre used is synthetic then lot of static charge develops in the fabric. While machine embroidery is done needle moves at high speed, thus an electric current is generated. This can be taken care by slightly moistening the fabric by spraying water on top layer.



Fig.: 2.14 – Machine Embroidery on satin

6. **Tissue, organza and organdie:** These are very stiff and are made with the use of highly twisted yarns which results in tearing of fabric while using machine embroidery due to yarn breakage. Since, they

have high twist and are light weight, lot of times the hoop/ frame leaves its marks, so while fixing hoop/ frame it should not be tightly stretched or the hoop should be dressed up with cotton fabric strips. As in many embroideries here also a proper backing has to be pasted underneath the embroidered portion to avoid any damage to the fabric.



Fig.: 2.15 – Machine Embroidery on organza

Synthetic Fibres

They are manmade fibres which are manufactured using chemicals. They are categorized into regenerated fibres where cellulose from plants is mixed with chemicals to develop fibres like rayon and acetate. Other fabrics like polyester, nylon, spandex etc. are made using petrochemicals. They are polymer based and possess high strength properties as compared to natural and regenerated fibres.

Since these fabrics are manmade, the functioning and specifications of the fabric performance can be modified during the manufacturing process.

When the embroidery is done on synthetics it is very important to hold the fabric in the hoop tightly as the fabric is very slippery. For embroidery purpose a thin polyester or synthetic thread should be used. Also, if any category of finish is applied on the fabric it can hamper the embroidery process. It is also important to know that as fabric is synthetic there are chances that static charge is produced while embroidery process is done. Care has to be taken by dampening the fabric with water or using a stabilizer on the area where embroidery has to be done.

KNITS

Knits are the product of knitting. Knitting is a process of inter-looping of yarns. It is a process where an elastic, porous fabric is made by interlocking the yarns using needles. Knitted fabrics can be produced more quickly and easily than woven ones at a lesser cost. These fabrics are light weight and comfortable in wearing and are mostly used for designing active wear clothing. Knitted fabrics are curated using two methods i.e., warp knitting and weft knitting. Each of them produces a different pattern creating variations in loops making each one different. Since these fabrics are stretchable, it is difficult to adjust them on the hoop, if they are placed too tightly, the stretch can destroy the shape of the garment and if it is loose, it can cause thread puckering during the embroidery. Paper foam is always used on the wrong side of the fabric during embroidery to avoid holes in the fabric. Sometimes stabilizers are also used to support the fabric during the embroidery process to avoid puckering or stretching.



Fig.: 2.16 – Machine Embroidery on knitted fabric

FELT

Felt is a non- woven fabric mostly made by using wool fibres. They are comparatively thicker thus easy to handle. Selection of needle and stitch to be used is very important. Fine needles will not be operational on a thicker fabric.



Fig.: 2.17 – Machine Embroidery on felt

Embroidery is a very delicate process which requires a proper procedure to be followed and needs proper handling of material, needle, stitch and machinery. There are some points one needs to keep in mind while handling machine embroidery on different fabrics along with how to select proper thread and needles for the same.

MISTAKES THAT ARE OFTEN ENCOUNTERED IN THE PROCESS OF EMBROIDERY

1. **Selecting a wrong fabric:** As discussed above different problems which occur with different fabrics, it is very important to select the appropriate fabric and know the problems and handling associated with it. It is also important to choose the base fabric which is strong enough and can carry the embroidery gracefully.
2. **Selecting wrong embroidery thread:** It is very important to select the right type of thread whether cotton, polyester, silk etc. It is also important to understand the relationship between thread and fabric. For example, cotton threads should be used on cotton fabric. While selecting a thread lot of times the number of strands that are taken are more or less in count resulting in a thicker or finer embroidery pattern as per desired. The fineness of the embroidery will depend on the texture and count of threads taken during embroidery. Even a wrong thickness of thread can ruin the embroidery.

Using a craft thread instead of embroidery thread: there are lot of inexpensive versions of craft threads which are sold in the market often having 6-strand floss or 5 pearl cotton which are used in fancy

embroidery for macramé, schiffli. These threads normally cause colourfastness issues in the fabric later when washed.

3. **Using a wrong size needle:** Needle again is an integral part in embroidery which can give any shape to the embroidery. Heavy fabrics like velvet, felts etc. requires a heavy ball point needle without piercing the layers of fabric and sharp needle when we need to pierce the fabric. A wrong selection of needle can cause holes, fuzz and unnecessary problem in the fabric.

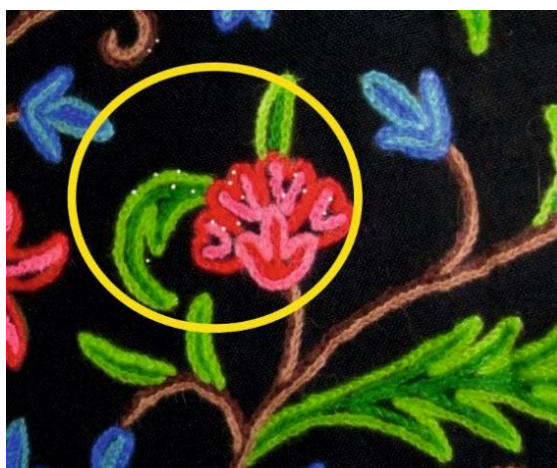


Fig.: 2.18 – Machine Embroidery Needles

4. **Not using Hoop or embroidery frame:** In hurry many times, while using semi-automatic machines the embroider forgets or ignores the need of using a frame for doing a little portion of embroidery. This ignorance can lead to a blunder as the fabric will not stretch properly and there will be no tension in the fabric which can end in distortion of stitches or thread puckering. There are variety of hoops available in the market.



Fig.: 2.19 – Puckering of Embroidery due to improper or no framing

5. **Marking of design on fabric using a regular pen/pencil:** The stains of regular pen and pencil are difficult to erase, thus one should use water soluble fabric marking pen or chalk pencil or fabric pencil which can be washed out after the embroidery process is completed.



Fig.: 2.20 – Marking of design on fabric using a regular pen/pencil

6. **Not removing the hoop after completion:** Often after completion of embroidery, the embroiderer forgets to remove the hoop and leaves it as it is which results in creases, rusting stains and fabric distortion.
7. **Rushing in fixing a mistake:** Normally when any mistake is found, one should not just rush to fix it causing more damage sometime. In case of any thread related issue, one should not pull them or tug threads, instead it should be removed carefully and gently so that the base fabric is not damaged.

PROCEDURE TO SET STITCH TYPE ACCORDING TO THE EMBROIDERY STYLE ON AUTOMATIC EMBROIDERY MACHINES

The stitch, which is a line from one point to another is one of the building blocks of the embroidery design that needs to be created. The encounters of loops, knots etc. that take place during hand embroidery can be easily eliminated here with the use of technology. The embroidery machine helps in controlling the direction and the distance of the stitch with the movement of the needle. The machine gives the strength to create combinations using these

single stitches readily and quickly and repeating the same in a loop to form beautiful patterns.

Setting a stitch type in an automatic machine: The automatic machine used commercially and in the industry are a combination of sewing and embroidery machine consisting of a frame system that holds the fabric under the sewing needle and moves automatically to create the design. The design is programmed digitally and the stitches are set on the computer. There is a card that is punched and the settings are done on the software which further generates the embroidery on the fabric.

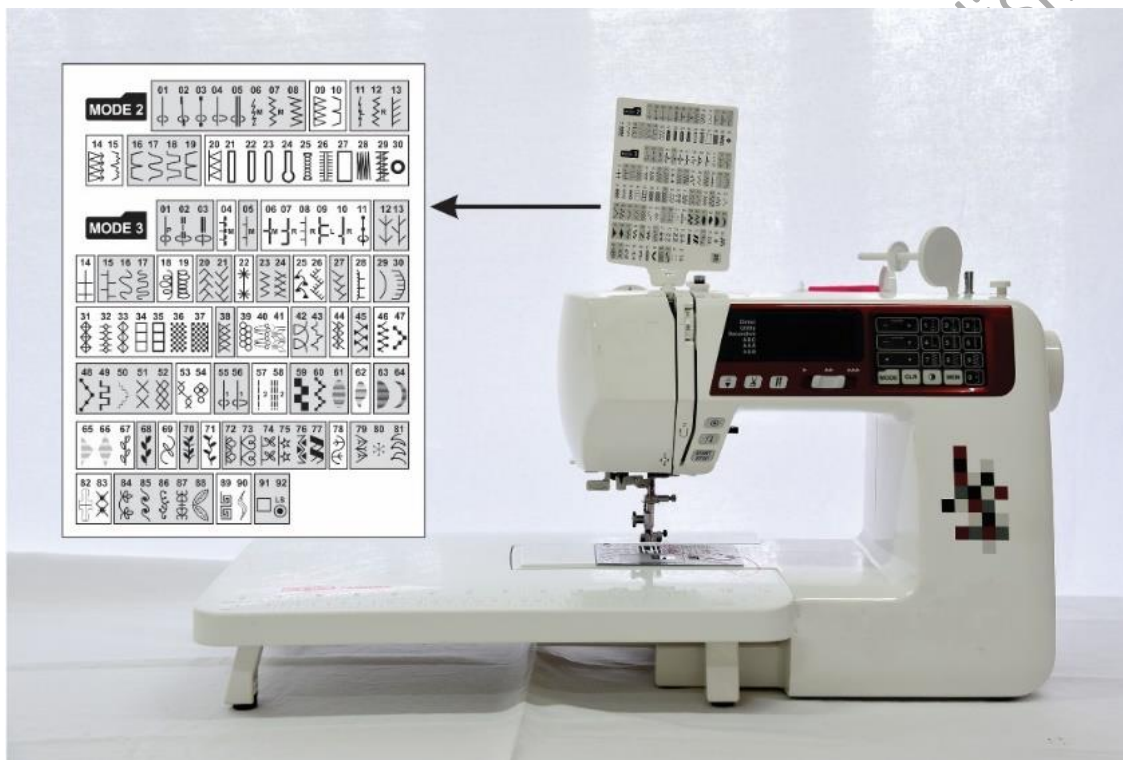


Fig.: 2.21 – Automatic embroidery machine

Setting a stitch type in a Semi-Automatic machine: The semi-automatic machines work on the presser foot and stitch type is selected using a particular presser foot.

1. The Presser Foot is raised and lifted and removed in the higher position.
2. The power of the machine needs to be turned off before changing the presser foot.
3. Raise the needle in its highest position and raise the presser foot.
4. Press the lever on the back foot holder and the presser foot will drop.

- To attach the presser foot, pin the foot under the groove, lower the foot holder and lock the foot.

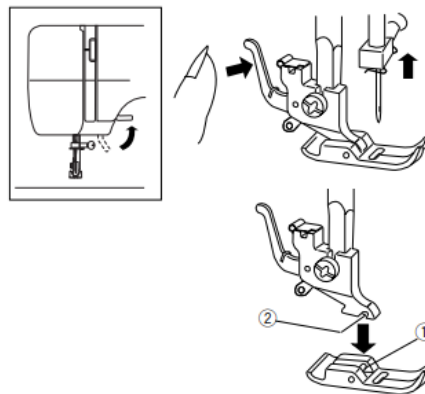


Fig.: 2.22 – Attachment of presser foot in semi-automatic machine

- Select the type of stitch, raise the needle and presser foot and select the dial for the type of stitch.

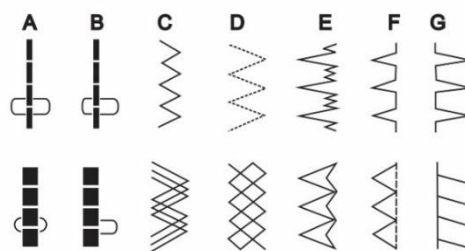
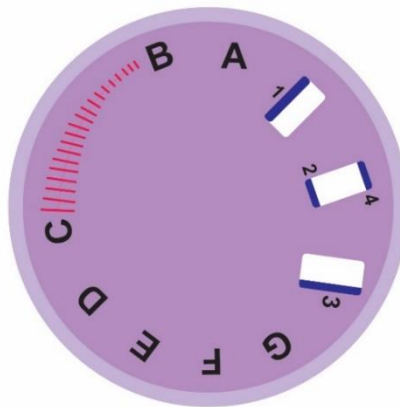


Fig.: 2.23 – Selection of Stitch Type in semi-automatic machine

Selecting a right stitch type and stitch length is one of the most important factors while handling embroidery machine. One needs to select the right attachment and length of the stitch to get desired results. A good embroidery cannot be achieved with only a right stitch or fabric or software. It is dependent on a number of factors. The embroider needs to ensure the right needle, fabric, machine, presser foot, bobbin tension, stabilizer to suit the density and stitch type, length and thickness of stitch and threads. All these

factors need to be kept in mind to create a perfect pattern. With the growth and development in the industry there are new fabrics and new machinery which are being developed leading to a pathway of creativity in the production process making it simpler and faster.

Activities

ACTIVITY 1:

Create a swatch file with a collection of different types of fabrics.

Materials Required:

1. A4 size white file or sheets
2. Writing material
3. Fabric scissors
4. Fabric samples

Procedure:

1. Visit nearby tailor shops/ boutique and collect the waste samples or left-over fabrics by them after stitching.
2. Segregate the samples and with the help of your faculty and identify the fabrics.
3. Cut these fabrics into 2X2 inches.
4. Mount these samples on the A4 size sheet and write the name of each sample under it.

Check Your Progress

A. Fill in the Blanks:

1. Felt is a non- woven fabric mostly made by using_____.
2. Knitting is a process of _____ of yarns.
3. _____ fabric has a fuzzy surface and it is very difficult to do embroidery on it.
4. Satin is an extremely_____fabric due to its constructional weave.

B. State whether the following statements are True/false:

1. Velvet is the most slippery fabric.
2. The hoop should be placed very carefully on satin fabric as it leaves a mark after it is removed.
3. A wrong selection of needle can cause holes, fuzz and unnecessary problem in the fabric.
4. A craft thread can be used instead of an embroidery thread in some designs.
5. A wrong thickness of thread can ruin the embroidery.

C. Short answer questions:

1. Explain the points to be kept in mind during the embroidery process.
2. Explain the process of setting the stitch type in a semi-automatic machine.
3. Explain natural and manmade fibres briefly. What are the problems that occur while handling synthetics during the embroidery process?

Module 3**Detecting Faults in Embroidery Machine and Inspection Process to Maintain Quality****Module Overview**

Every embroidery piece is unique and valuable due to the hard work, patience and workmanship behind it. Finest quality of embroidery can enhance the beauty of the overall garment and the wearer. Therefore, to develop high quality products on embroidery machines, all the machine faults should be dealt properly in time. In an industry the workflow is consistent only when the machines are in good condition. Timely check on these faults and repairing them can be very helpful. An embroidery machine operator should be aware of the correct ways to rectify these problems and follow the instructions given in the user manual of the machine. While working on a project, a lot of time can be saved if one is capable of dealing with the machine faults instantly. Similarly, after the completion of embroidery work, quality check and inspection are very significant. Buyer satisfaction should be the priority of every garment manufacturing industry. Good quality in products always adds to the goodwill of the firm and brings more work and fame. Hence, inspection at all levels while processing the embroidered products is necessary to avoid any wastage and work delay. Making proper checklist and following the inspections accordingly surely helps in maintaining the quality and deliver well finished products.

Learning Outcomes

After completing this module, you will be able to:

- To learn to Detect faults in machine
- Perform inspection of embroidered products
- Set up an efficient work station and quality checks

Module Structure

Session 1: Detecting faults in machines

Session 2: Inspecting embroidered products

Session 3: An efficient workstation and quality check system

Session:1 Detecting Faults in Machines

While doing machine embroidery, many problems may arise in the embroidery machines. As soon as the problem arises, one must refer to the manual of the machine as it has solutions for all the basic problems in the machine. If one has been working continuously for hours and hours, it's more likely that the machine will stop working all of a sudden. Just like human beings, even machines need break. The machine stops to save the motor from overheating. The machine should be turned off for at least 20 minutes and then one can use it again. In case the motor or light is not working, check if the power cord is plugged properly and make sure the power is turned on.

In automated embroidery machines, some problems can be rectified easily but if the machine breakdowns completely, it is difficult to rectify it by the user itself. The faults that can be rectified by the operator itself by following the instructions in the manual are known as **correctable faults**. Some problems could also happen due to the improper wiring in the outlet or incorrect machine installation, incorrect use of machine, that cannot be resolved by the operator and lead to complete breakdown of the machine, they are known as **non-correctable faults**. In case of non-correctable faults if one tries to resolve the problems, it may or may not happen and it has a greater risk of damage to the machine and it might also cause accidents. To check such faults only a professional technician must be called. Therefore, it is advisable to take the machine to the service centre or call a trained professional to mend it properly in such situations.

Some of the problems which can be rectified by the operator itself (Correctable faults) and their causes and remedies are as follows:

3. **Bobbin related problems-**

a) **Does not wind-**

- Make sure that thread is wrapped around the bobbin in correct direction.
- Bobbin should be placed properly in the winder.



Fig.: 3.1 – Bobbin related problems: Bobbin should be placed properly in the winder

b) Winds unevenly-

- Check if thread is inserted in the thread guide or not.
- Machine might be running very fast.
- Tension spring may need some adjustments.

4. Fabric related problems –**a) Layers feed unevenly**

- Incorrect attachment of presser foot.
- Stitch slowly.
- If fabric is of very light weight, use a tissue paper or newspaper under the fabric while sewing.

b) Fabric does not feed in a straight line

- Presser foot might be bent or loose, check it!
- Needle might be bent, change it!
- There may be a defect in machine feed.
- Do not push or pull the fabric while stitching.

c) Fabric puckering

- Some fabrics pucker in single layer, use a layer of paper below the fabric while sewing.
- Check stitch length as per the type of fabric.
- Regulate the thread tension as per the type of fabric.
- Needle may be coarse or thread might be thick or vice versa, check them.
- Bobbin thread might be uneven.
- Feed dog may be worn out, check and change it.
- Fabric is loose on the hoop and is not stretched properly.
- Tighten the screw on the hoop and stretch the fabric correctly.



Fig.: 3.2 – Fabric related problem: fabric puckering

d) Damaged fabric or holes around the stitches-

- Needle may be blunt or bent.
- Check the throat plate, presser foot and feed dog.
- Size of needle and fabric weight is not matching, correct it!

5. Machine related problems –

a) Motor not working

- Cord is unplugged, check the same!
- Power is off, check the same!
- Foot accelerator may be jammed or improperly attached to power source.

b) Motor runs but hand wheel does not turn

- Thread or lint may be caught or tangled in the bobbin case area.
- Needs oiling.

c) Motor runs, wheel turns but needle does not move

- Needle is loose and not fixed properly, fix it!
- Needle not tightened up in position or the belt may be slipping.

d) Stitch is not formed

- Thread may have come out of the needle.
- Needle might be fixed in the wrong direction, Check and change.
- Needle might be fixed and clamped too high.
- Incorrect needle size.
- Bobbin may be empty, check and fill it again.
- Bobbin may be inserted incorrectly.

- Incorrect threading.

e) Machine runs with noise

- Machine needs cleaning and oiling.
- Needle might be bent and hitting the throat plate.
- Bobbin area is having lint collected around it.

4. Needle related problems-

a) Needle Unthreads

- Thread in top spool pin may be finished.
- Insufficient thread may have been pulled through the needle before the seam was started.

b) Needles Bending or Breaking

Breaking of the needle is the most common problem with embroidery machines.

Causes can be-

- Presser foot and throat plate may be improperly fastened.
- Needle is bent and hitting the throat plate.
- Needle is incorrectly inserted.
- Needle size is incorrect for the thread and fabric type.

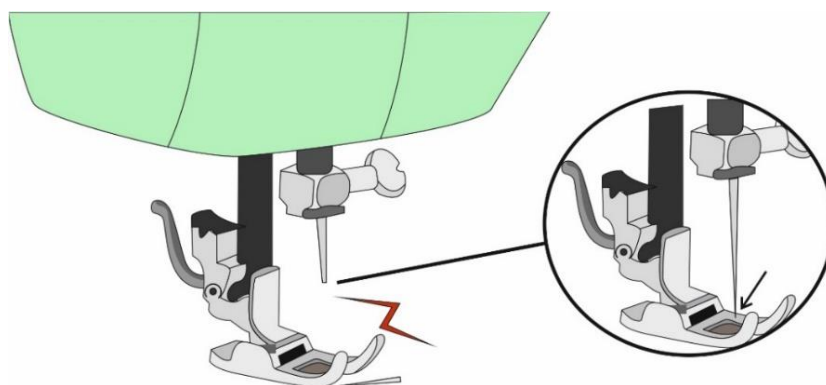


Fig.: 3.3 – Needle related Problems: Breaking of needle

Remedy-

- Ensure presser foot and throat plate is properly fastened.
- Ensure that the needle is not loose and is placed fully in the needle bar.
- Check if the bobbin is inserted correctly.
- Select correct needle size as per the fabric type.
- Before removing the needle, raise it out of fabric to prevent it from breaking.

- Use the right presser foot based on the fabric and the stitch type.

5. Stitches related problems

a) Uneven length of stitches

- The operator may be pulling or pushing the fabric too much.
- Incorrect presser foot as per the fabric type.
- Lint clogged between the teeth of feed dog.

b) Loops between stitches/Seam puckering

- Improper threading.
- Improper tension of thread, Check stitch on rough cloth.
- Bobbin may be wound un evenly.
- No stabilizer used, fabric not firm enough, use proper stabilizer.
- The fabric not stretched properly on the hoop.

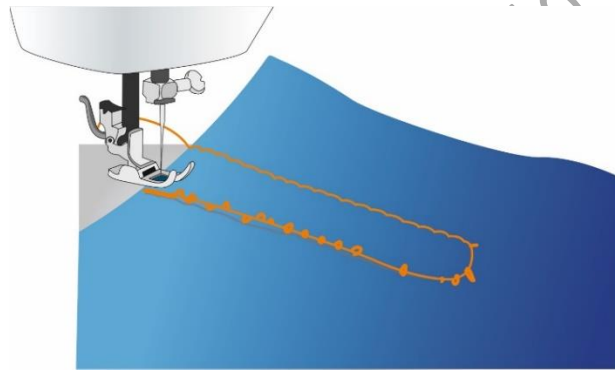


Fig.: 3.4 – Stitches related problems: Loops between stitches

c) Stitches form loop below the work

- Needle thread tension might be too loose, check the tension and stitch again.
- The needle is either too thick or fine for the thread and fabric.

d) Skipped stitches

Cause-

- Damaged, blunt or bent needle.
- Incorrect needle for fabric type.
- Needle not inserted properly.
- Throat plate may be inserted incorrectly.

Remedy-

- Insert a new needle.
- Use the right needle according to the fabric type.
- Do not pull the fabric while sewing.

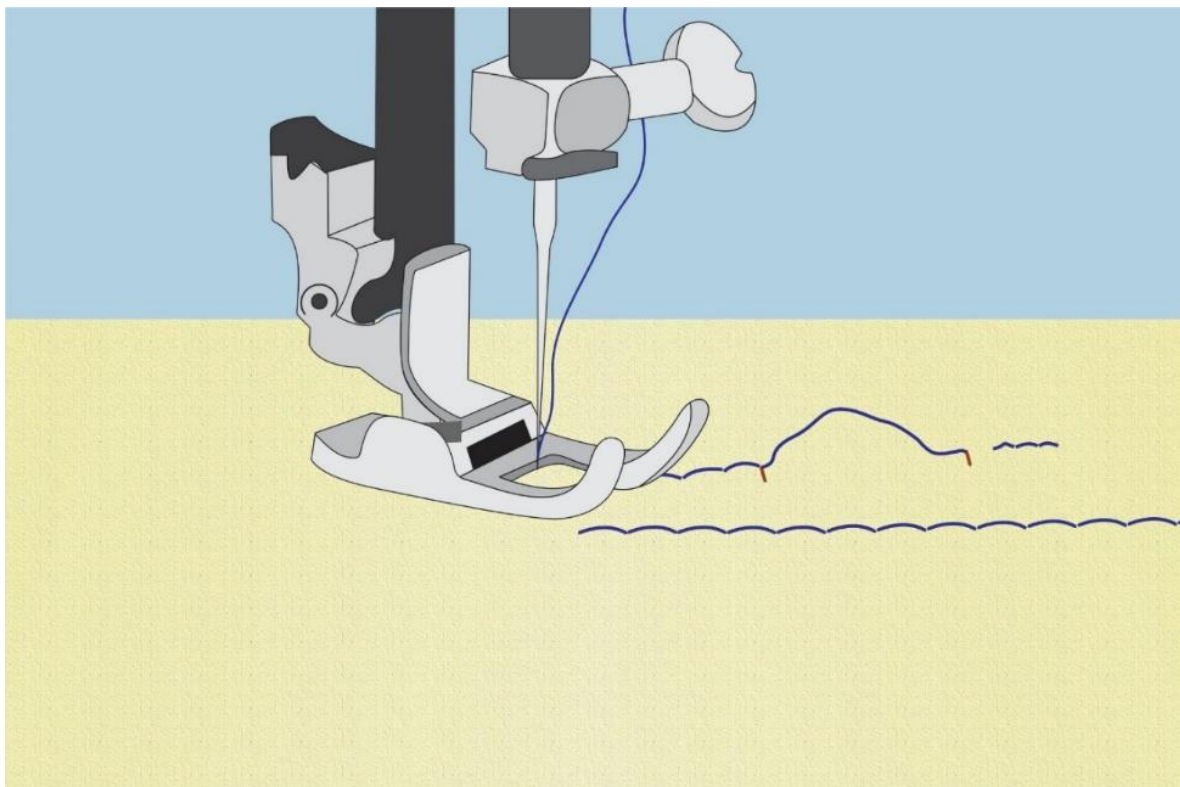


Fig.: 3.5 – Stitches related problems: Skipped stitches

1. Thread related problems

a) Thread slips out of the needle before beginning to sew

Cause-

- Take-up lever pulls the thread out as it lifts.
- Trimming thread too close to the needle.
- Remedy-
- Pull thread down and hold as the Take-up lever lifts for the first stitch.

b) Bobbin thread breaks constantly

Cause-

- Bobbin incorrectly wound or damaged.
- Bobbin is over filled.
- Bobbin tension is too tight.

Remedy-

- Rewind and insert a new bobbin.
- Replace bobbin case if damaged.

c) Needle thread breaks

Cause-

- Needle inserted improperly.
- Needle caught in spool pin.
- Needle is blunt or bent.
- Needle is not according to the type of thread and fabric.

Remedy-

- Change the needle frequently.
- Insert the needle properly not too high and not too low.
- Needle size should be as per fabric and thread type.

d) Bobbin thread cannot be raised through the hole in throat plate

Cause-

- Bobbin improperly threaded.
- Bobbin improperly inserted.

Remedy-

- Take out the bobbin and thread it again evenly
- Insert the bobbin correctly

Other than the above-mentioned faults which can be easily corrected by the operator itself, there can be some serious problems or **non-correctable faults** in the automatic and computerized embroidery machines. These cannot be rectified at operator/primary level and need professional help like-

- Damage of any internal part of the machine.
- Machine breakdown due to some electronic accident like shot circuits.
- Software of computerized machines becomes corrupted or outdated.
- Machine not working as it turns too old.
- Machine completely jammed due to not being in use for long time.

With regard to all these faults in embroidery machines, some suggestions that may be of good assistance while doing embroidery are as follows-

- Machines should be checked and serviced by a qualified mechanic at least once a year.
- Machines should be kept clean, needle should be changed often and use good quality thread.
- Dust cover should be used to protect the machine when not in use.
- When one feels that the machine is not working properly then make sure to get it repaired by a professional.

FAULTS ARISING WHILE WORKING ON THE ADVANCED EMBROIDERY STITCHES

Now-a-days, embroidery work is very mechanized. Some embroidery works may also include the use of fancy metal pieces, mirrors, cords, laces, etc. along with the colourful threads in the advanced stitches like cut- work, mirror work, quilting, lace work etc. With time and growing advancements in technology, many machine imperfections are reduced to a great extent. Before using a machine, one must necessarily go through all the instructions given in its user's manual which may help in avoiding unnecessary interruptions during the work.

Many Automatic and Computerised machines have a special LCD attached to it with technical software to embroider products by feeding information as required. These machines have diagnostic devices, software's to recognise any faults arising and warn the user immediately through pop-up menus on the display screen. These warning signs can easily be read and faults can be resolved instantly.

The operator is even informed through an email. These machines automatically recognise and display the diagnosed faults and ways to rectify them on the display screen. Only a trained technician or an embroidery machine operator can understand and interpret them and can work accordingly to prevent any delays/loss of time in work flow does not stops due to these problems. The system includes one or more programmes to test operation of machine components and generate specific error or status messages related to such components. Networking software can be enabled to allow this information to be viewed using a screen display and controlled from a location distant from the site of the embroidery machine. This displays information on the LCD screen regarding the following-

- Improper hooping
- Poor registration of design
- Poor digitization
- Incorrect setting of x and y-axis motor
- Improper Grabber motor setting
- Improper Thread trimmer and jump stitch motor setting
- Take up lever, colour change motor and thread detector setting issues
- Improper attachments used
- Incorrect needle and thread type used

In case of performing special stitches like cording, beading, quilting, mirror work, sequins work, etc., some faults may also arise like:

1. **Problems with metallic threads, thread kinks and twists back on itself**

Cause-

- Tension too tight through needle.
- Needle too small.
- Thread feeding incorrectly.
- Spool pin not covered with a cap.

Remedy-

- Adjust the needle tension.
- Use a needle with large eye.
- Use a metal thread guide.
- Use a thread net over the spool.
- Turn spool over and/or place spool on a different spool pin or cover it with a cap.

2. **Other Problems include:**

- Needle breakage due to improper attachment of the sequins, darning, beading or cording foot or while doing mirror work due to hitting on the mirror while working on it. It is good to stick the mirrors using fabric glue to keep them in place. Needle should be attached properly in the needle bar and should not be tilted.
- Thread breakage due to high-speed working of the machine or due to incorrect thread tension. To avoid it, one must adjust the thread tension and check the stitch on the rough fabric before doing the final stitching.
- Improper placement of patches in case of patch and applique work. It is advisable to fix the patches using fabric glue to keep them in place.
- Fabric damage in case of eyelet stitch, mirror and cut work as the needle is inserted more at the same place or very nearby points again and again. Proper practice of the stitch is necessary before doing the final work to avoid damaging the fabric.
- Improper attachment of *gota* pieces in *gota patti* work. It is advisable to fix them using fabric glue to keep them in place.
- Fabric puckering due to incorrect use of needle and thread as per the fabric; or not using the stabilizer or incorrect thread tension. An appropriate stabilizer should be used depending on the type of fabric to prevent puckering.

- Thick embroidery or skipped stitches due to faulty needle attachment or lack of training of the operator. To prevent this, needle attachments must be checked prior to embroidery and the operator must be properly trained.
- With reference to the above faults, the embroidery machine operator should follow the following tips-
 - Thread the machine properly and fix the attachments correctly.
 - Change the needle after every project and check the thread tension.
 - Select the thread and needle as per the type of fabric.
 - Properly stabilize the fabric before fixing it in the embroidery hoop.
 - Set the machine as per the instructions given in the user manual.
 - Use proper attachments as per the stitch to be done.
 - Trace the designs correctly for semi-automatic machine embroidery and digitize the design properly for automatic machines and test the stitch on rough fabric before doing the final work.
 - Regular servicing of the machine should be done for its proper upkeep.
 - Keep the machine covered to keep it dust free.

MAINTENANCE OF MACHINE EQUIPMENT AND SPECIAL ATTACHMENTS

Embroidery machines are very costly machines to be found in any household or industry. They are actually miracles of technology and far more complex mechanically than any other home appliance. The introduction of computerized machines has both simplified the operation and made them more reliable.

Preventative maintenance of machines, its tools and equipments are thus of prior importance. Just like a car, automatic embroidery machines have numerous moving parts. So, they need proper care and maintenance. To keep the machines in good shape, one needs a solid workstation, a clean and dry place which is free from insects and excess humidity. Machine must be kept/stored in a dust and heat free area to avoid any damage to LCD screen operated advanced embroidery machines.

Points to remember while taking care of embroidery machines-

- Inspect the machine at regular intervals for any problems.

- Keep it clean to keep it dust free.
- Clean needle plates and feed dog by taking them out.
- Clean any lint tangled in the bobbin area, feed dog and hook race with a brush.
- Change needle and bobbin when needed.
- Keep the embroidery machine tools like needle, thread and special attachments separately, size and colour wise to avoid wastage and damage.
- Clean the bobbin and inside of bobbin case and blow out any lint.
- Check thread tension before starting the final project on a piece of cloth.
- Remove broken thread near thread take up lever.
- Unplug the machine when not in use.
- Take care of any power surges and spikes which can destroy electronic devices.
- Mark the damaged machines with proper signage to avoid any accidents in work area.
- Train the embroidery machine operators well.
- Inspect the root cause of the problem in the machine and rectify it as soon as possible.
- Keep the machine well lubricated.
- Check the instruction manual for care and safety rules.

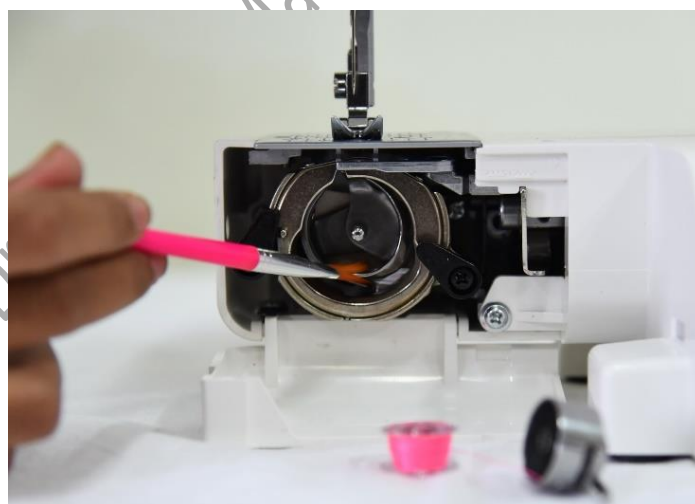


Fig.: 3.6 – Cleaning of machine to keep it dust free

CARE OF EMBROIDERY TOOLS

Embroidery tools and materials should be used and taken care to produce quality work. An embroidery machine operator should have a tool box containing a fine sand paper, machine oil, cleaning cloths, pin cushions, needles and scissors. To keep the embroidery tools in their best working

condition and make it last longer it is very important to take proper care of them.

Taking care of Needles

Needles are the most important tool in the embroidery kit. One should purchase good quality needles of different thickness and sharpness. Needles should be kept in the paper wrap or packet in which they come or in some needle case like needle storage tubes, size and number wise. Some cotton wool is kept in the needle case to prevent rust.

When the embroidery work is done, rub the needle lightly over a sandpaper. Now put a drop of machine oil on a piece of felt or soft cloth and wipe the needle. Use a clean cloth, wipe it off thoroughly to remove all traces of oil otherwise it will mark the fabric while embroidering. Over a period of time, needles become blunt, and their eyes can also wear thin. As soon as this happens, one should get rid of them and change them with new needles.



Fig.: 3.7 – Needle holder

Taking care of Embroidery Hoops

Embroidery hoops or frames are either wooden, metallic or of plastic. Care should be taken to keep them properly so that they do not break. Before using a hoop, one should lightly rub both parts over with a fine grade sandpaper. This will smoothen the wood and will prevent it to catch on any fabric or thread.

One can also dress up the hoop before use that means to wrap a cotton tape or strip of cotton cloth around the inner ring of the frame and fasten it with

fabric glue. This provides a better grip on the fabric. The other ring can also be dressed in the same way. Plastic hoops can be very slippery to work with.

Metal hoops used for machine embroidery should be rubbed with the sandpaper, to remove any burrs or rust. All types of hoops should be stored properly to prevent them from breaking and bending.

Taking care of Threads and other trims

Embroidery floss or threads and other trims used in embroidery work like mirrors, beads, sequins, laces, cords and Zari threads should be stored properly and kept in an organised way.

One can sort and store embroidery floss colour wise in various ways to prevent it from tangling. In a garment industry, large number of threads are used for different projects from time to time. So, for long term storage, threads can be sorted by type and colour and stored in various ways like in transparent drawers, bobbin boxes, project cards in a binder, thread organiser bars, thread drops on key ring, plastic bags by labelling the colour number on it or by wrapping the thread on small cloth pins and hanging the threads from a pegboard. In this way, one can easily and quickly use the required colour of thread. The threads should not be stored in direct light as colours might fade in light with time.



Fig.: 3.8 – Systematic arrangement of embroidery threads

Laces, ribbons, cords, sequins lace should be wrapped over cardboard pieces to avoid any tangling. Zari threads should be kept rolled over thick thread reels and locked well when not in use. Mirrors, *gota* leaves, beads should be

stored size and colour wise in separate transparent plastic boxes to keep them dust free, with a label stuck on them to avoid any breakage or wastage of these trims. Organised storage of materials helps to reduce wastage as one can use them for multiple projects if kept properly.

Taking care of Scissors

Scissors should be sharp enough to cut the threads and fabric. They can be sharpened at home using a sandpaper or can be professionally sharpened at least once a year by putting it apart and sharpening each blade, oiling and cleaning it. Then finally putting it back together. It should be cleaned well with a cotton cloth. Scissors should be kept carefully to avoid any accidents. When not in use, the tip of scissors should be covered with a strip of cotton cloth as it is very sharp.

Many scissors come with their leather tip cap for safety purposes.

By following these simple tips, the embroidery tools will work better and will remain in a good condition for a longer period of time.



Fig.: 3.9 – Using Scissor covers to protect blades

Taking care of Special attachments like darning, beading, cording and Sequins foot

These special attachments can be used as per the need of some special embroidery work and they can be attached to any machine to perform specific tasks. These tools are not a part of the machine but are attached to it whenever needed like beading foot is attached to machine by replacing the regular presser foot to attach beads in the embroidery motif. These tools help

to work speedily and obtain the desired result in the machine which only have some basic features.

All these special attachments should be kept in separate transparent plastic boxes which are well labelled so that one can access them quickly whenever required. They should be well oiled before and after use and then wiped with a clean cloth. It is always advisable to keep them covered with some cotton wool in the boxes to prevent dust and rust.

Consequences of incorrect machine settings and handling

Whether one is working at home or in an industry, incorrect setting and handling of machine can cause many problems. One must be very careful while working on an automatic embroidery machine as they run very fast. One who is not properly trained to use them should not work on them.

- a) These machines are quite expensive and hence very difficult to maintain in case of any breakdown. So proper setting of machine before starting the embroidery and its correct handling is of utmost importance. Before start working on a computerized and automatic embroidery machine, correct training is required and before doing the final work, one must test the machine on small samples. Proper attention should be paid to hooping methods, threading of machine, inserting the needle, using the correct type and size of thread of both needle and bobbin and the thread tension should be wisely checked.

Incorrect machine setting can lead to the following-

- Poor quality of final product
 - Damage to the machine and its parts
 - Accidents or injuries
 - Wastage of material
 - Effects the productivity
 - Delay in reaching the target due to wastage of time
- b) Another aspect is to handle the machine and embroidery tools and equipment properly while working with them. Picking up raw material of heavy weight can cause short term or long-term injuries. Cuts, bruises, sprains, wounds, small fractures, muscle strain, etc. Some issues in the organisation like conflicts, work pressure can also cause mental health issues. Incorrect machine handling can lead to the following-
- Postural problems like backaches, sprains

- Injuries
- Delays
- Loss of production

Training and education regarding safe working practices can help reduce workplace accidents specially while moving, handling, and storing of materials. Employees should recognise the potential hazards associated with the task to minimise the danger while moving materials both manually or mechanically.

Accidents are also caused due to falling objects, inappropriately stacked materials, and various types of equipment. Thus, proper precautions should be taken by embroidery machine operators by following correct lifting techniques and use all the personal protective tools like gloves for loads and sharp edges, eye protection, safety shoes or boots, ear guards, etc.

Actions to be taken when embroidery machine functions incorrectly

When embroidery machines do not work properly, there might be some faults in the parts of machine or its setting. Many correctable faults are already discussed in this session along with their remedies. Other than that, embroidery machines usually require basic maintenance of cleaning, oiling, and lubricating frequently. These procedures are given in the user manual of every machine. As a general thumb rule, most embroidery and sewing machines should be serviced after every 12-18 months. But if one notices a sudden change in the sound of the machine and if it working stiffly or some breakdown occurs, one can get the machine checked without any delay. The damaged parts of the machines can be repaired or changed instantly as worn-out parts can affect the overall working of the machine and also affect the quality of the work done on it. The machine should act as an asset to the organisation and not as a liability. Any faults in the machine should be immediately dealt with so that it does not affects the productivity and workflow speed in the industry. In case of a sudden problem in the machine, following steps should be taken-

1. Turn off the motor of embroidery machine.
2. Open the hook cover, and remove the bobbin case.
3. Rotate the handwheel (around 50 degrees) to move the race of the hook to a position in a way that it can easily be oiled.
4. Put a drop of oil onto the hook.

5. After oiling, insert the bobbin case into the hook, and then close the hook cover.
6. Turn the motor on and check the machine again but if still does not work, call for professional help like an embroidery machine mechanic or from the company itself.
7. Mark the machine with proper signage to avoid any accidents till it is repaired.

A systematic checklist of machine maintenance should be prepared and all the points mentioned in it should be analysed and evaluated at some intervals to prevent any sudden breakdown of machines. Points like seam appearance, seam quality and durability, morale and productivity of the operator, profits earned by the industry, consumer satisfaction, good will of the brand all should be considered. In case of any deviation and dissatisfaction, immediate actions should be taken.

Activities

Activity 1:

Visit an industry / design studio or Boutique and prepare a report on the common faults that occur in embroidery machines and how the operators rectify them.

Materials Required:

1. Writing material
2. Camera

Procedure:

1. Take an appointment with the HR of garment manufacturing industry in your area explaining your educational purpose.
2. Take permission from the HR for taking photographs.
3. Observe and click pictures of the activities of the embroidery department of the industry by visiting and observing thoroughly the tasks performed by the embroidery machine operator like setting the machine, rectifying faults, etc.
4. List all the steps taken and tools used by the operator.

5. Enlist the details and pictures. Prepare a final report.

Check Your Progress

A. Fill in the Blanks:

1. The faults that can be rectified by the operator itself by following the instructions in the manual are known as _____.
2. _____ are the most important tool in the embroidery kit.
3. Metal hoops used for machine embroidery should be rubbed with the sandpaper, to remove any burrs or _____.
4. _____ storage of embroidery materials helps to reduce wastage.
5. Incorrect machine handling can lead to postural problems like backaches, sprains and _____.
6. Machine Runs noisily due to lack of cleaning and _____.

B. Short answer questions:

1. Explain all the correctable faults, their causes and remedies in detail.
2. Explain the consequences of incorrect machine handling.
3. How can one take care and store threads, needle, and other trims used for machine embroidery?
4. How faults are diagnosed in advance in computerized embroidery machines?

Session 2: Inspecting Embroidered Products

Quality is the level of acceptance of a product or service. It is defined as the minimum level of performance and aesthetics that a garment or product is expected to reflect when it goes to the customer. Quality of a product is directly related to customer satisfaction which affects the sales of a product. Failure to maintain adequate quality can result in loss to the company and can become a barrier in achieving company goals. A number of factors determine the quality of an embroidered product or garment. These factors depend on the perceived image of the embroidered product that a manufacturer wants to offer to his customers.

Inspection of products or garments refers to visual analysis of a garment for different measures of quality. The main purpose of inspection is to make sure that the garment or product conforms to its predetermined specifications. To meet desired quality standards, an embroidered product must conform to the embroidery specifications.

There are various methods by which the quality of the embroidered fabrics is maintained by inspecting it at every stage. Defects if encountered while inspection are mended and rectified. Rejected fabrics or products are sent to designated locations for any mending or rectification if possible.

INSPECTION OF EMBROIDERED PRODUCTS AGAINST SPECIFICATIONS

Specifications are often contents of a document that serve as guidelines or requirements to be met while manufacturing a particular product. It is also known as technical standard set for raw materials to be used while manufacturing a particular product. There are three main contents of specification sheet namely, raw material, design or constructional detail and packing detail. Many a times, buyers have their own specifications with respect to embroidery for a specific collection.

These specifications can be very specific as it is held as the base while doing the final quality check of the consignment. The specification sheet has many directions already given in terms of color codes, materials to be used and their counter numbers. The buyer may specify the embroidery thread count, specific brand thread to be used, and the color number for the thread to be used. He/she may also specify the number of embroidery stitches to be taken in one square inch; this is to maintain the denseness of the embroidery. The

length of the stitch is also mentioned as it is helpful when a shade has to be developed using two or more colors of thread. Exact placement of the embroidery on the fabric to be embroidered is also mentioned along with the detail measurements in the specification sheet.

Once the fabric is embroidered according to the specification given by the buyer the bundle is sent to the Quality Control (QC) department. The quality control inspector notes down the points given by the buyer in the specification sheet and adds the same in the report. The QC inspection also makes a note of the bundle number, number of pieces of fabric in the bundle to be checked, date, time and who handed the bundle, in the daily report sheet. The QC inspector then starts the inspection of each embroidered piece to match to the specification given by the buyer. The inspector starts referring to the measurements given by the buyer.

Appropriate inspection methods that can be used for embroidered products

The three main categories in which the inspection can be carried out are listed as under:

Workmanship and Stitch Quality

Through the process of embroidering, fabric is converted into an embellished surface. Therefore, the stitching quality must be as per the standards given by the buyer. To check workmanship quality following things must be checked and inspected:

1. The workmanship of the artwork execution is as per the sample approved by the buyer.
2. Check for jump stitch throughout the embroidery.
3. No undesired puckering in the fabric due to thread tension.
4. In case different fabrics are used in the case of cut and sew details and topped with embroidery, check fabric quality and color combination.
5. Check whether correct thread size and thread color are used for embroidery or not.
6. Cross-check the measurements of the dimension of the artwork.
7. Check the exact colour shade as mentioned in spec-sheet.
8. Number of colours used (to make sure no more or less colour of threads are used).
9. Even ness of the stitch length throughout the artwork.

10. Neatness of the stitch on the face side and reverse side of the fabric.
11. Uniformity of the artwork given as standard sample.
12. Keeping a check that no white thread used in bobbin is showing on the fabric surface.
13. Inspecting the fabric from the reverse side: to check the tension of the thread.
14. Trimming of the extra fusing/backing/canvas used to give a grip and body to the embroidery.

Visual Inspection

Embroidery must be visually inspected for following things:

1. Check if the embroidered fabric is balanced and embroidered on the grain of the fabric, or else it will not be dimensionally stable.
2. There is must not be any kind of twist in the embroidery patch due to the fabric or due to the thread tension.
3. Placement of the embroidery is balanced visually.
4. No undesired stain, oil mark, chalk mark, pressing mark, and soiling is there on the fabric (invisible zones).

Fabric and raw material quality report

Embroidered fabric must be inspected for following things to ensure quality:

1. All the fabric, lining, and material used in the product are as per approved design
2. The trim card should be used to compare all trims details. Trims can be like beads, rhinestones, sequins or any other raw materials.
3. Check the fabric quality test report (FPT-Fabric Package Test and GPT-Garment Package Test) for the order that needs inspection. Consider parameters like - fabric GSM, fabric weight, fabric shrinkage, seam slippage, button pulling strength, color fastness properties dimensional stability, user limit (whichever is applicable for the shipment).
4. If visually one finds shade difference between the products, check with the approved shade band and compare that all shades are within the approved fabric shade bands.
5. Do visual inspections for any kind of defects in the embroidery like pucker, miss stitch or holes due to needle sizes.

6. The product is also run through a metal scanner to detect if any needle pieces are stuck with the embroidery thread. This step is utmost necessary as some times; the needle breaks due to various reasons while embroidery and the needle gets stuck with the embroidery thread on to the fabric, with the help of metal detector these tiny pieces of needle metal can be identified and removed before final packing of the fabric or product.

QUALITY SYSTEM AND MACHINE EMBROIDERY PROCESSES PRACTICED IN THE ORGANIZATION

The quality system followed to keep a quality check on the products during the production process is very important as any faults or defects that the inspector comes across can be rectified well in time. The process of keeping a quality check may vary from company to company but there are some points that are covered in almost every system. A few of them are discussed in this section.

A quality system is a method where by using various tools, the company can keep a check and assure smooth functioning of processes to provide high quality products to their clients. These tools can be prepared in various forms of reports that are filled in the real time observation done by the machine operator and supervisor. These reports make their way to department heads for analyzing the production process. The reports are filled in daily, based on the shift if the company is shift timings. The machine operator in order to keep a record of small movement of the production line has to maintain all records. This data is also helpful to achieve the delivery targets given by the buyer. The contents of the report may vary from company to company but some points are common for all.

These are as follows:

1. Details of the person in charge during a particular shift time.
2. The details of the bundle given to the machine operator to embroider.
3. Filling in the details of the order number, lot number/batch number.
4. The name of the buyer to differentiate with other lots. This is important as the fabric ordered by two buyers may be same but the embroidery designs will be different hence it is important.
5. Time taken by the machine to finish one design unit.

6. In case of any technical issue, machine stops working, what part of machine caused the technical error and who rectified it in how much time, must be recorded to keep track of daily targets.
7. The attendance of the operator between lunch and tea time
8. The embroidery machines need oiling in the bobbin every two hours, the operator has to keep a record of the oil feed or it may jam the machine working and target may suffer.
9. The bobbin case of each embroidery machine must be changed every four to five hours daily, as due to high friction it may cause various thread tensions ultimately compromising the quality of the stitch of embroidery.
10. The daily performance of 'H Test' is done by the machine operator to be sure if the thread tensions of the machine are appropriate according to the thickness of the fabric and the thickness of the thread. As the base material thickness changes the machines need to be re set for smooth functioning.

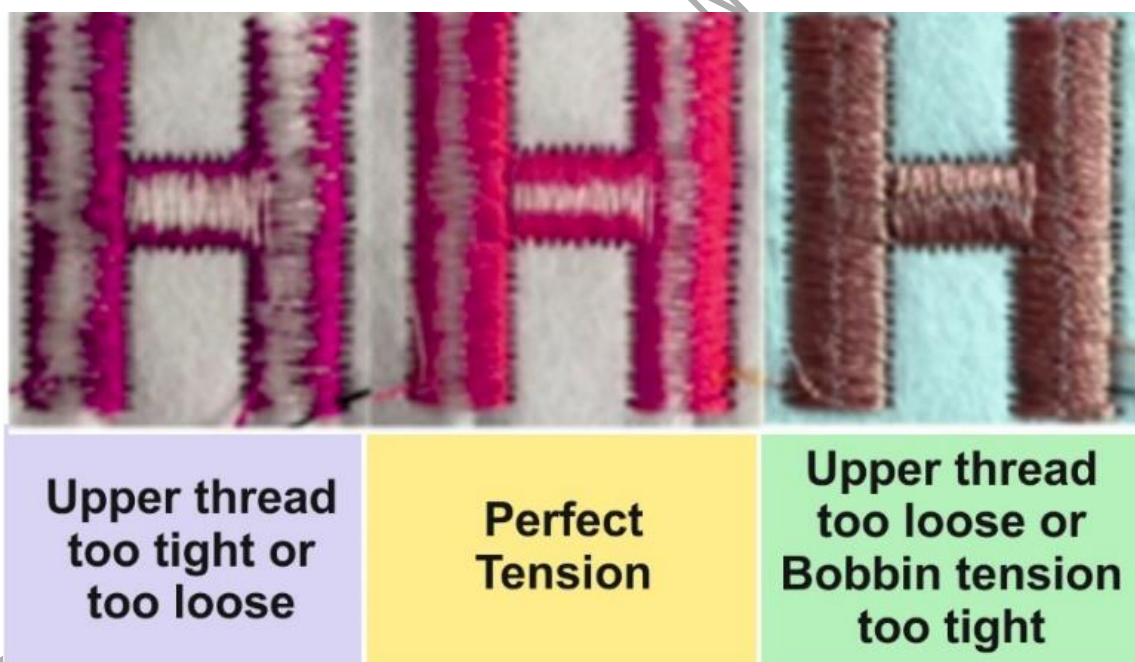


Fig.: 3.10 – H Test for machine embroidery

1. The cleaning of machine for any dust or oil spill should also be recorded.
2. The needle plate must be opened and cleaned in every shift to keep the bobbin case attachments free from any fiber linters or dust caused due to high speed of machine needle running through fabric.
3. Embroidery QC (Quality control):

4. In the embroidery section, the supervisor ensures that machines setup is done accurately by testing the stitches on rough fabric. The Quality checker inspects all the embroidered pieces for any defects.

MACHINE EMBROIDERY PROCESSES PRACTICED IN ORGANISATION

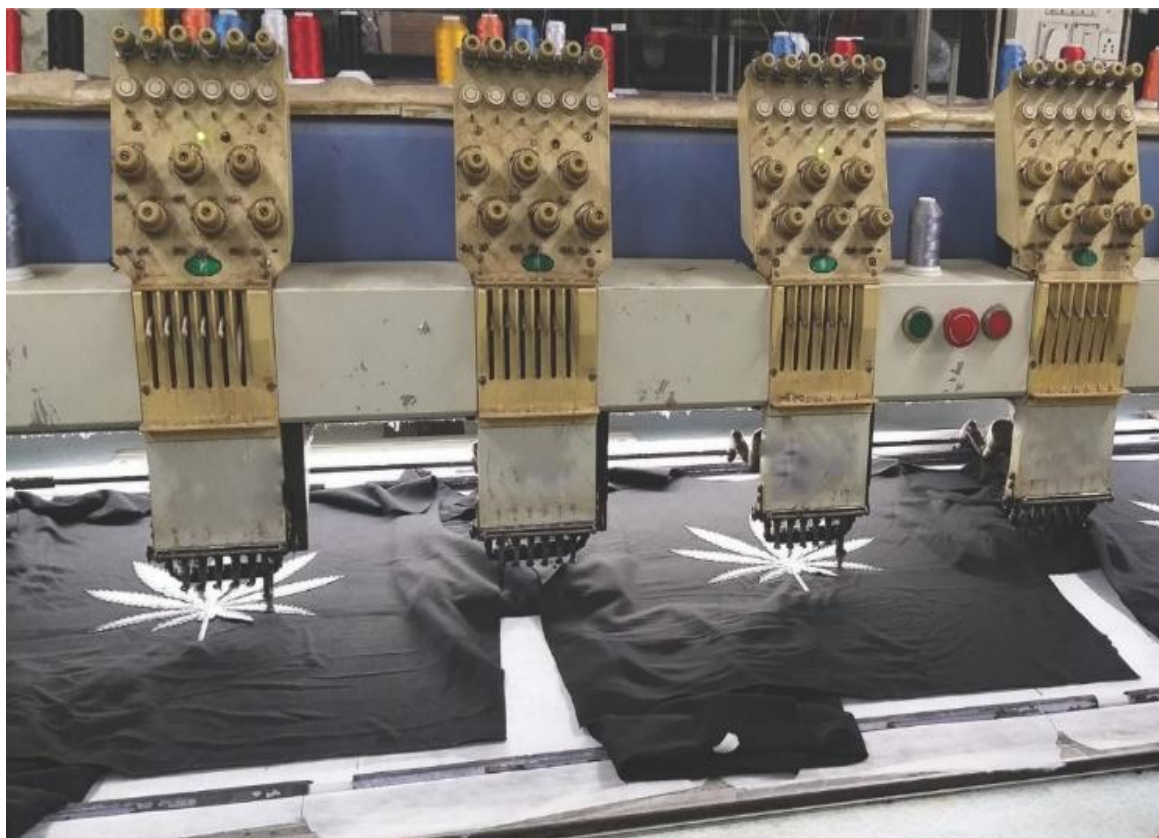


Fig.: 3.11 – Embroidery Machine

Embroidery is a decorative stitch or a combination of various decorative stitches that is placed on the fabric surface to enhance its visual appearance. Some fabrics need an engineered embroidery placement like on the pocket, front of a garment, or on sleeve.

Multi-head embroidery machines have different attachments and different discs for different materials and designs.

The operator adjusts the machine speed so that it is suitable for the different fabric and embroidery types. The variation of speed may have direct effect on the thread flow. If the speed of the machine is high in comparison to the fabric type, there will be frequent thread breakage, and it may result in poor finishing of the design.

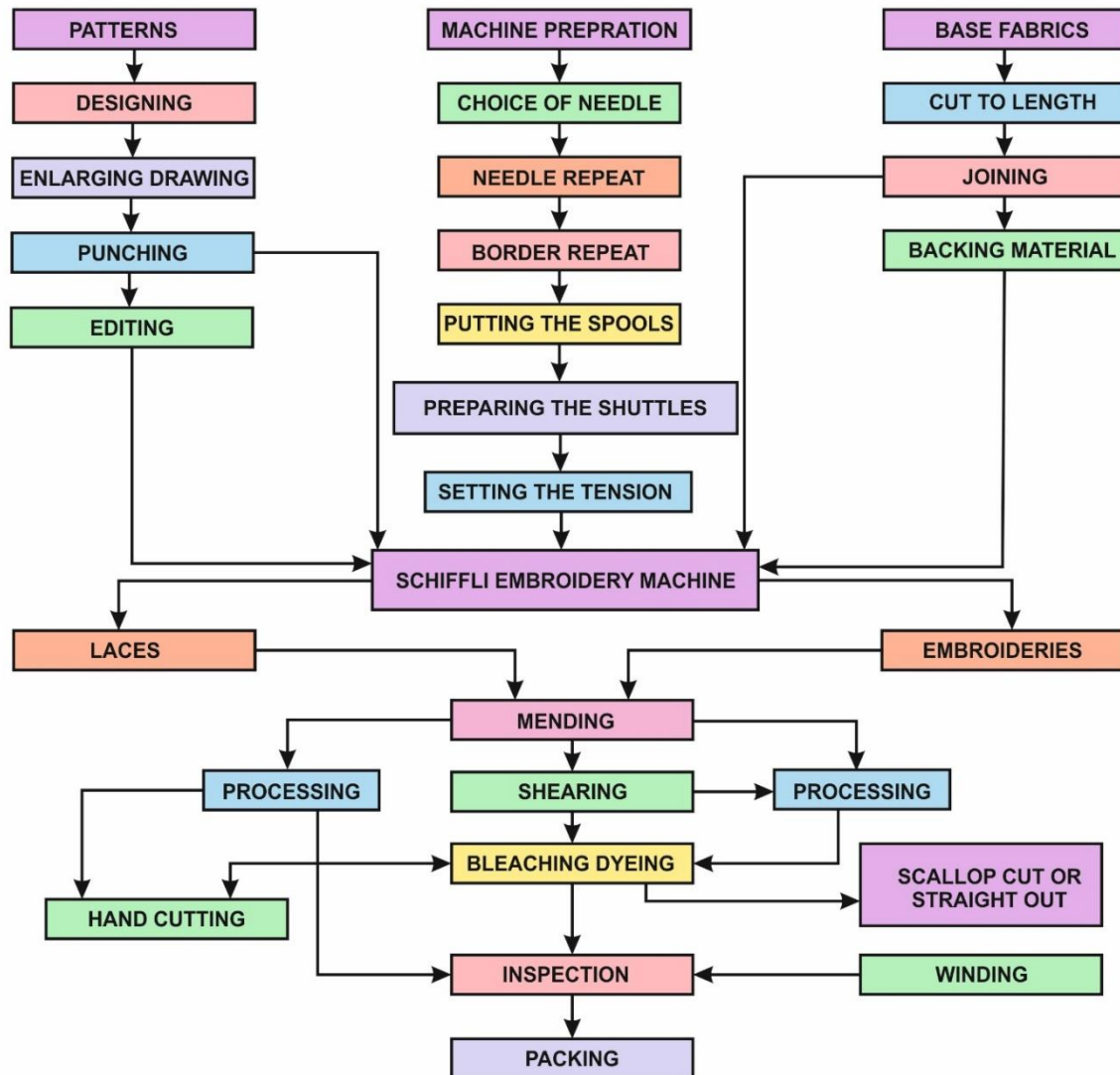


Fig.: 3.12 – Machine Embroidery Process

The approved standard sample is hung with the machine and must be followed according to design. It helps the operator to keep a check on the stitch length and stitch numbers in the design. Also mixing of colour shades can be observed visually with ease if one has a reference in front of them.

Embroidered pieces are first checked using a needle detector machine and then sent to the cutting department. Finally cutting section includes all the parts together, if it is a part of garment it will be delivered to the sewing line. If it is a fabric it goes to the fabric inspection department. The cutting quality inspector must check each lot received from embroidery, 100% for its quality and quantity as per buyer's specification or as per manufacturers set standard.

Cutting in-charge keeps recording all in a report sheet provided and he/she has to follow the bundled chart and ensure the entire cut lot received is as per its Quantity and number sequence.

IDENTIFY, MARK AND PLACE REJECTED FABRIC/ GARMENT /PRODUCT IN DESIGNATED LOCATIONS

Once the embroidered pieces are inspected for defects, any embroidered panel if found with defects or any kind of faults must be marked with a placement sticker and must be returned in the embroidery section. A report for correcting the faults should be attached with it ensuring that each corrected piece is sent back in their respective bundle. The report submitted with this defective



Fig.: 3.13 – Identification and marking of embroidery defects

piece will be helpful to track the bundle and piece number of the defected piece so that once the defect is rectified it can be combined or replaced in the original bundle.

Before sewing the product, each bundle is checked by passing it through a metal detector machine for any pieces of broken needles.

ACCEPTABLE SOLUTIONS FOR PARTICULAR FAULTS

Before knowing what are acceptable solutions for the faults occurred in embroidery, one must know what are the various factors, that may affect the quality or finish of embroidery. A good digitizer would not select a design that does not work well. If the operator has an acceptable sample sew-out from the digitizer then the problem may not be in the digitizing. Before reporting the problem to the digitizer, check the following:

Improper machine setup:

- Improper setting of needle and bobbin thread tensions are the most common reasons.
- Tension may result in problems like loops in the top stitch, bobbin thread gathering up on the top along with the embroidery thread, bobbin thread not visible on the back on satin stitch columns, and very tiny running stitches.
- Registration problems of the thread in the needle are magnified by tight tensions like stitches pulled more than required, exposing fabric between bounded areas as well as between rows of stitches in fills. This may result in puckering of the fabric and too tight and dense embroidery.
- Thread breaks and even needle breaks both are related to tension problems. Proper tensions are very crucial, and understanding how to set them in best possible match is important.
- In addition to the machine's tension settings, there are other factors also that might affect thread tension like the amount of thread on the spool or bobbin and thread thickness. Dirt particles and thread lint buildup along the thread path can also impact tension.
- Fabric thickness can affect thread tensions. Thick fabric and tight tensions may result in very stiff embroidery patches that may hinder the flow and stability of the fabric or garment altogether.
- Operator needs to improve the effect of thread delivery by adjusting the thread tension, especially while working on designs for thick fabrics which are not properly digitized. According to the fabric to be embroidered the digitizer needs to develop a design, keeping in mind the area to be covered with stitches.
- Make sure that the hoop moves smoothly without any difficulties. Small pins can also hinder the free movement of hoop and cause registration problems. Even large, bulky fabrics can obstruct the correct hoop movement. Thick trims can break the needle while stitching. The presser foot and trimmer mechanism can also hamper up on thick items and prevent smooth hoop movement.

Needle:

There is no surprise in understanding that something as small as needle can affect the quality of the fabric. The needle that does all the work, carries the embroidery thread from the top tension and interloop it with the bobbin thread therefore the smooth functioning of the needle is vital. To achieve the most precise stitch placement, use of the finest, sharpest embroidery needle that can carry the thread through the fabric without damage is essential.

Improper stabilization

- Proper stabilization is the fundamental to quality sewing. Stabilization is affected by hoop, hoop tension, backing, topping, and use of any adhesives.
- The hoop is used to support the fabric during sewing. A smallest hoop should be selected to accommodate the design in it. Enough space for the presser foot movement is a must. The bigger the hoop, lesser the support for fabric; and more the fabric has the chance to loosen and shift from its position and result in flagging causing poor registration of the design.
- When the digitizer tests the sample design they do it in the smallest hoop and hence high quality design sample is achieved. If one wants to create multiple designs of the same pattern and uses a large hoop instead of many small hoops it will also increase the chances of poor registration problems by many folds.
- The tension of the hoop also plays a crucial role in maintaining the quality of the fabric. The tension of the fabric must be kept as balanced and as neutral as possible. If the fabric is fixed too tight in the embroidery hoop/frame it will come back to its original position after the hoop is released and it will cause puckering in the embroidered design resulting in poor quality. When fixing the hoop, the inner hoop should go in with some even pressure; it should not drop right in smoothly nor should be so tight that one has to bounce on the hoop to get it seated. Tightening the screw of the frame/hoop should be done properly neither too loose nor too tight as it can also cause uneven hoop tension on the fabric and break the hoop also. The hooped fabric should be ironed smooth and must be wrinkle free. Loose fabric can also result in puckering, as while embroidering the fabric will be pulled with the needle and thread.

- It is important to take extra care when hooping knits and nets to avoid non-required stretching. Stable backing should be used while working on stretchable fabrics, woven or knits. To overcome poor hooping and shifting of material while sewing, backing is temporarily fused with the fabric using embroidery spray adhesive or heat fusible product.
- Selecting the appropriate backing and hooping it properly is vital for quality results. Backing has many purposes, one of which is to provide firmness to the item being sewn. In this capacity it minimizes the chances of fabric shifting and hoop slippage due to the forces of sewing. In smooth and soft fabrics like silk, net, organza a backing helps to hold the fabric in even pressure throughout. Backing should be large enough to be entirely gripped by the hoop. Partly hooped backing will result in uneven support and will not deliver its purpose of using.
- The selection of the backing is completely based on the amount of stability the fabric needs to withstand with the amount of stress that will apply while embroidering the design. A detailed design that needs richness in terms of multiple layers of thread or denseness of the embroidery will have more chances of distortion as compared to small or airy designs. Cutaways are sturdier and withstand to needle penetrations and thus provide more support during and after sewing than a tear away defect. Stabilizers (backing and topping) surely reduce fabric slippage, but it may still pierce holes in the fabric during sewing. Heavy and stiff backings, as well as adhesives, can contribute to embroidery thickness and thread breaks as the speed of needle, the size of needle and the size of thread, if not set according to the fabric surface after the backing has been applied. It will create more thread breaks and will result in poor quality of embroidery. Thus, proper stabilizers should be selected as per the type of the fabric for best results.

Thread and fabric selection

- The most commonly used thread for embroidery is the polyester thread; with the main reason being given as reduced thread breaks. Polyester thread is stronger than rayon and will stretch further before breaking. While that stretching phase, stitches are sewn more tightly into the fabric. As the required amount of thread is not provided for the embroidery and therefore the stretched thread covers the area to be embroidered, it results in puckering of the fabric. When the fabric/product is removed from the hoop, the stretched threads relax to its outstretched state and pull up the embroidery, causing puckering. If the thread is stretched throughout the design due to improper machine

tensions, or bobbin tensions puckering and poor registration can result in a poor quality of embroidered fabric.

- For special designs in which some special threads are being used, specific digitization is needed to work smoothly. Such threads may cause even more issues while threading and while setting the tension, even while choosing the correct size of needle for the specialty thread. Bobbin thread is also equally important. Use of thread made for embroidery is most expected to deliver a clean and finished reverse side of embroidered fabric.

Design resizing

- Whenever the digitizer alters a design by sizing it up or down, or by skewing it, and or even by rotating it so that it sews on the bias, the design have been changed from the way it was originally digitized and tested. In this case, the embroiderer may run the risk of an unsatisfactory result. Due to the vast range of sizing software in the market, nowadays, there is no method where a digitizer can foresee how a specific programme will modify the design.
- Some resizers change the stitch effects themselves without any change being made. One must be aware that resizing a design is changing the proportions of the design, which may affect its registration. Stitch length, especially in satin stitch, can be destructively affected. If the digitizer alters or modifies a design, be sure to work only on a copy file and not an original file, it is always good to go back on original design if in between the design gets messed up. Also, it needs to get tested it thoroughly before putting it to test or on the main fabric.

Testing designs

All designs must be tested before it is sent in for production. Custom made designs should be tested under the settings for which they were digitized. If you will be sewing a design by changing the base fabric, one needs to test the same design separately for each fabric. Keep the hooping procedure same each time, insert a new needle after completing a project, use the proper type and size of the thread and needle and check the machine tension carefully.

THE CONSEQUENCES OF NOT RECTIFYING PROBLEMS

There are a number of consequences of not rectifying the problems of setting up of embroidery software, machine, needle, thread or fabric. Many of these consequences have been discussed in the factors affecting the quality of the embroidered design. If the problems are not rectified in the sampling stage the mass production will suffer heavily. The quality of the complete lot will not be as per the requirement of the buyer. The easiest method of rectifying a problem is to note where the machine stopped functioning while working on a design. Note the point and check the design in software to see if problem occurred due to the prepared digital design, if yes inform the digitizer to help, correcting it out. If there is the problem in the thread tension, each thread tension of each colour of the embroidery thread used must be checked. This can be done by using the 'H-test for each colour'. The quality of the thread also needs to be checked in the testing stage. Any problems faced during the testing of the design must be corrected before putting the design for mass production, or rejection of the consignment will lead to heavy losses to the embroidery unit. It is also the duty of the embroidery machine operator to set up the machine each time for a smooth production. If the setup of the machine is not done correctly it may result in delay of the production.

Activities

ACTIVITY:

Visit an embroidery unit with the subject instructor and whole class, note down the working process and prepare report on your visit experience.

Materials required:

1. Coloured pens or sketch pens
2. Writing material

Procedure:

1. Visit an embroidery unit.
2. Observe the process and working of the unit.
3. Based on your observations, draw the flowchart of machine embroidery process practiced in the organization and prepare a report on the same.
4. Submit the report in your class.

Check Your Progress**A. Fill in the Blanks:**

1. Most designs are digitized for _____ weight thread.
2. The most commonly used thread for embroidery is _____ thread.
3. Fabric surfaces like _____ cloth, use a more permanent topping.
4. _____ provides firmness to the item being sewn or embroidered.
5. The embroidery machine operator will get the _____ before the bulk production.

B. Short answer questions:

1. Why is it important to test designs?
2. What will happen if the machine is not stabilized properly?
3. Why is quality report important?

Session-3: An Efficient Workstation and Quality Check System

Setting up an efficient workstation in any department of the textile industry is essential. An efficient workstation is where the operator can put all his concentration in achieving every day's target effectively, while maintaining the quality without making any error in his/her performance.

SETTING UP AN EFFICIENT WORKSTATION WITH PROPER PLACEMENT OF EQUIPMENT

A work station is a place engaged by an operator while executing a job. The place may be one employed all the time or may be one of some places where work is designed. An example of a workstation is the area covered by an embroidery machine, a chair, racks with machine parts, raw materials and finished pieces and the adjoining spaces in which the workers move and work.

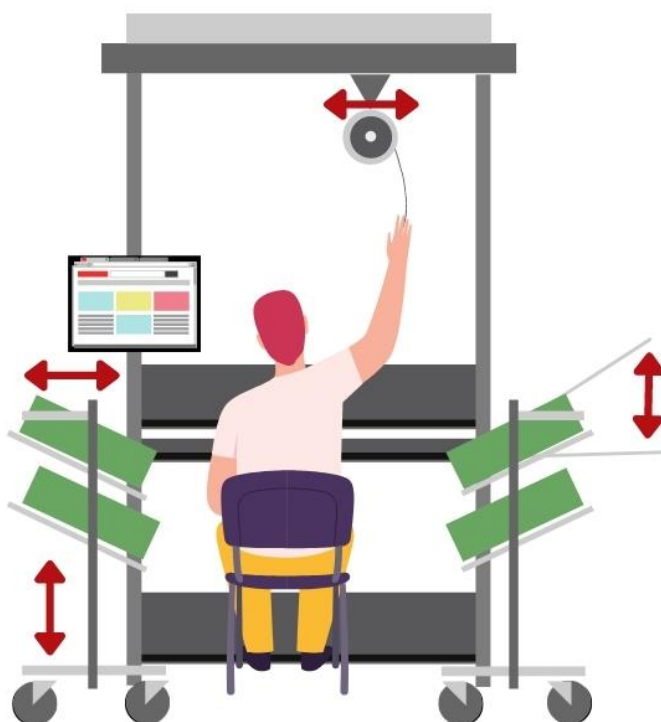


Fig.: 3.14 – Efficient work station

A good working station is a set-up that is ergonomically designed for the operator to comfortably perform his/her duties. The placement of the machine, and required tools must be at comfortable distance so that they are easily accessible to the operator. In most cases the essential tools rack arrangement has to be in such place so as that the operator can approach to

these racks instantly without wasting any extra energy in reaching them or with making any extra adjustments.

Some ergonomically effective ways by which an operator can setup an effective workstation are discussed below:

1. **Normal and extended reach areas at table top height for the machine operator:** Factors such as reappearance, energy, position and vibration are associated with higher rates of injury. Therefore, in order to reduce these injuries, there should be a good design of the work place station that helps the workers to work efficiently and effectively to manufacture good

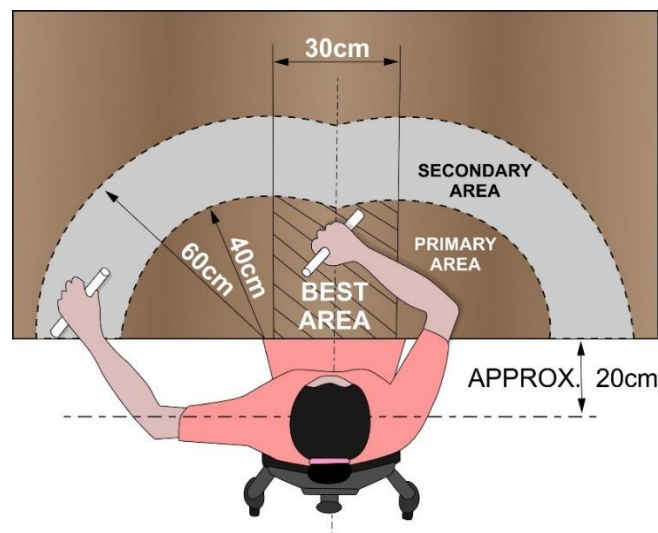


Fig.: 3.15 – Proper reach area on working table

quality embroidered textiles or garments with increased productivity. A well-organised workplace minimizes material handling, improves efficiency and reduces operator's fatigue.

Time required in searching and selecting items can be saved by placing the materials, tools and equipments or controls within easy reach of the worker. Long reaches require additional time and effort of the worker. Hence, the more a particular tool is used, the closer it should be.

The space that can be reached easily without bending, leaning or stretching forward is quite small. Any object that is recurrently grabbed or used should be located approximately between 15 cm to 40 cm from the front of the working surface. Fixed locations of often used tools and equipment assist the operator to develop good working habits, thus distinctively reducing the search and select time required to grasp an object to achieve improved efficiency and productivity.

2. **Body posture of the worker:** Stropy bodily positions can rapidly lead to tiredness and possible injury. For example, tasks requiring raised arms for longer duration leads to exhaustion and tire the shoulder muscles and may lead to a possible injury. Tasks executed while bending forward or flexing the body can easily cause back strain. As a concern, the time required to complete a job increases and the worker becomes more likely to have mishap or damage goods.



Fig.: 3.16 – Incorrect body posture

There should be a facility for a stable work surface where frequently required tools can be firmly placed. Resources, supplies and controls can be easily reached without leaning or twisting the body posture. Platforms must be used for workers with short height to be at proper work height and firm chairs with right seat height and a well-made backrest must be made available.

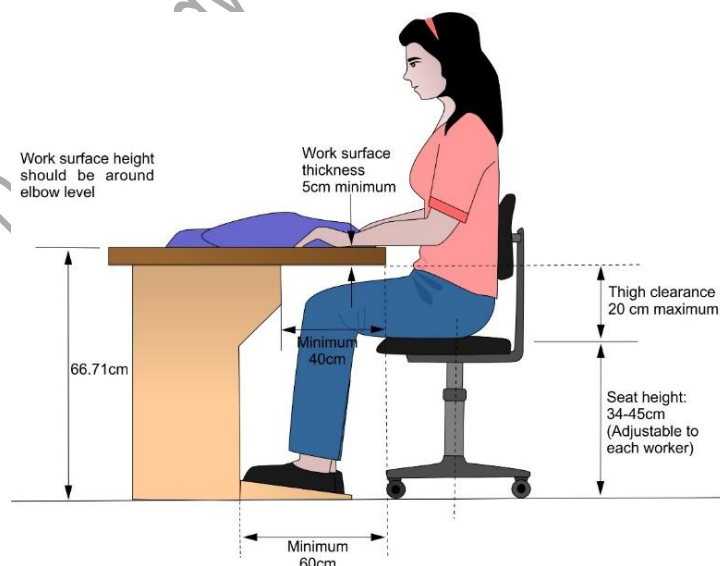


Fig.: 3.17 – Correct body posture

There should be enough space for easy movement and an arrangement for footrest to change and relax the strain on leg muscles, particularly for seated

workers. By providing all these enhancements efficiency and quality of the goods can be upgraded.

Workstations can often be restructured to reduce the number of monotonous motions that must be performed.

To avoid any ergonomic injuries workers should rotate job duties or take regular, short breaks to stretch and relax muscles.

Manufacturing tools and machinery should include features of ergonomic designing principles. Some jobs can be automated or restructured to eradicate tiresome monotonous movements and musculoskeletal damages.

These basic interventions made in the industry units can help to expand the progress and work environment of the textile and garment manufacturing units. The industries should also seek certifications under international standards.

EQUIPMENTS AND ITS TESTING

The basic and most commonly used equipment also need most care and maintenance to help it give its best performance without hindering the process of embroidering in any way. These frequently used tools and equipment are:

Hoops: Embroidery hoops and frames must have smooth edges and must be of an even shape. It may happen that while using a certain frame for a long time the edges may get rough or may get cracks; such hoops must be immediately replaced as it will affect the tension of the fabric. The use of different fabrics with different thickness in the same hoop may also cause improper tension situations while embroidery, hence, the operator needs to keep in mind all these points to avoid any quality issues. We have discussed in earlier sessions about the importance of the hoop in maintaining the quality of the embroidery hence, the hoops must be taken care for their smooth surface and even edges and shape.

Needles: The use of different needle sizes for different fabrics is also very important. As discussed in earlier session something as small as needle can cause bigger damages if not considered well while setting of the embroidery machine. Therefore, checking the tip of needles in every two hours is must as, due to the high-speed movement the needle may tend to lose its sharp tip resulting in damaged fabric surface or broken embroidery threads. Placement of the needle in correct direction is also important as the groove made in needle helps to guide the thread in a certain direction. If the direction of the

needle is not set properly the groove will not be able to guide the smooth flow of the thread resulting in frequent thread breakage.

Spools: The spools are important tools to be taken care while threading the embroidery machine. Each spool is attached with a tube-like structure which helps the smooth flow of thread and doesn't allow the thread to tangle with other threads. The tubes sometime are also fixed with air flow to maintain the easy flow of the embroidery threads.

Bobbin case: Another most important tool is bobbin case. The only attachment in the lower part of the machine which helps the embroidery threads to inter-loop and get attached to the surface of the fabric. The testing of the bobbin's tension is done by using a drop test method.

1. In this case the bobbin case is threaded with bobbin wound with a white thread the thread is marked with a marker at its point that is threaded through the tail loop in bobbin case.
2. Hold the thread in hand approximately 20cms away from the bobbin case, which is hanging towards the ground
3. Keep elbow parallel to the ground and keep the weight of the bobbin case as steady as possible.
4. Move your hand in 90-degree motion very smoothly. This will allow some thread from the bobbin case to unwind by the weight of the bobbin case.
5. Check the distance of the marked point to the new point with scale.
6. The distance between two points should be less than two inches. This will indicate the thread tension of the bobbin case to be accurate.
7. If the distance is more than 2 inches the small screw on the bobbin case is tightened a bit and the drop test is performed again.

Presser foots: Presser foots are essential as they help the fabric to maintain its position while the needle and thread does all the work. The pressure of the presser foot should not be too tight that it can hinder the movement of the fabric or it also should not be too loose. The presser foot screw needs to be checked in every two hours to maintain its constant pressure through the production process.

External attachments: The embroidery machine have a lot of external attachments which are used while embroidering with different materials like rhinestones, sequins, cords, beads etc. These also should be kept handy and

well clean so that there is no dirt or dust or oil stains when these are required for the embroidery.

Scissors: Some machines have an auto thread cutting system and some require manual thread cutting. Scissors are also used to cut any extra threads on the surface of the fabric after it has been un-mounted from the machine. These needs to be clean and free from any rust, dust or oil drops.

PLAN AND MANAGE WORK ROUTINE BASED ON COMPANY PROCEDURE

Every company has their own ways and methods to maintain their efficient work routine. Following are some important points to be kept in mind while planning the work routine to deliver best results every time:

- a. Make a list of all of the tasks that one needs to complete, and proper breakup plan of every single day has to be made. The operator can list down the consignments to be embroidered and delivered first. The list of tasks should be in order.
- b. Prioritizing the list. After listing the tasks for the day, one need to now start prioritizing the important tasks. If needed, break large tasks down into small ones. Fig. out what requirements to be done at the moment, what needs to be done before the end of the day and what can be completed another day.
- c. Schedule the day according to the consignment priorities. If certain project needs to be finished easily, set aside enough time at the beginning of your day to complete that task. Schedule less prioritized projects after lunch or at the end of the day.
- d. Take work conducts into account. Prioritizing and scheduling is one thing, but executing that work within ones setup is a completely different matter. All the complicated tasks should be completed before lunch.
- e. Noting down anything that did not get completed during a set day, should be made a priority for next day's list of tasks. Enter the same in the report so as to make it in priority for the next day. Make sure it does not goes on to further next day as it will just keep carrying forward. Prioritize to finish the previous day's unfinished tasks before starting a new project, otherwise one can forget to finish the previous work.

OWNER'S RESPONSIBILITY AT WORK DURING PRODUCTION

The responsibility of the owner is to overlook the production process. Every process undergoing in the unit, including receiving the order from a new buyer

or keeping a check on existing orders and their status all comes under the owner's responsibility. Each industry has their own way of preparing and maintaining the reporting systems, these reports submitted by the employees working as in-charge at various levels in various departments are submitted to the owner. The owner goes through the reports submitted by the operator or the supervisor to check where are improvements needed and which tasks are running smoothly. The owner also keeps a check on the performance of the employees. It is the duty of the employee to be sincere and show dedication in completing the assigned task or duty. The owner's job is also to keep a check on the maintenance of the machinery and its timely routine check for ensuring the smooth flow of the production process. Quality check of the products before its packing is also one of the main tasks of the owner. He/she has to take information of from the designated quality control officer. As keeping the quality up to mark to match the specification of products given by the buyer is also crucial. The owner's duty also is to keep a note of the completed consignment or the consignment under production process as delivering the orders on time is the foremost priority for the industry. Keeping a close eye on the industries basic facilities and amenities for the workers to get proper working conditions is also the responsibility of the owner.

Activities

Activity 1:

Create an ergonomic arrangement of classroom supplies which are utmost necessary for the teacher to deliver the class in effective way.

Materials Required:

1. Classroom essentials like teacher's table with necessary drawers to store chalk and duster and some other stationery supplies like scale, pencil and eraser or colour pens.
2. Teacher's sitting chair, blackboard or white board, a storage cupboard for teaching material.
3. Flannel board for putting up notices or students assignments and table chair or benches for students.
4. Projector and screen placement, a computer system to connect with projector.

Procedure:

1. Arrange the classroom essentials like, teacher's table and chair, chalk, duster, board, pins for board, in such a way that it will help the class or teacher to move through the class smoothly.
2. Discuss the points where there are no possibilities of shifting or re-arranging and discuss the possible solutions for the same.

Check Your Progress**A. State whether the following statements are True/False:**

1. Making a list of things to do in a day is not important.
2. A small space will help the operator to work efficiently.
3. The operator can switch on the automated embroidery machine and also can multitask with daily reporting.
4. Since embroidery machine has a height where a person needs to stand, even a stool in the room will help the operator to relax.
5. Room with no natural light but good amount of artificial light will also help the operator to work efficiently.

B. Short answer questions:

1. How does working environment help to improve working efficiency?
2. List and explain any five Equipments used with the embroidery machine.
3. Give five main reasons why an ergonomically designed space is important?

Module 4**Maintain a Clean and Hazard Free Working Area****Module Overview**

A clean workplace means more than just having a fresh surrounding area. Clean workplace encompasses various elements:

- Walking surfaces
- Light Fixtures
- Air quality

A clean and hazard free workplace ensures the safety and health of the employees and visitors. Clean walking surfaces, suitable footwear, and appropriate speed of walking are important to preventing falling accidentally. Stairways and aisles that are clean and dry are also vital in reducing accidents and ensuring a safe workplace. Clean light fixtures improve lighting efficiency in the workplace. Good air quality greatly influences work environment as well as the health of the employees.

The negative effects of the unclean environment are as follows:

- A build-up of dust, lint, and grease can create breathing problems for everyone in the working area, resulting in asthma attacks, stuffy noses that may lead to serious health issues.
- A dirty work environment is breeding ground for various germs and allergens.
- Workstations, tools and equipment, machinery, materials, and the progressive bundling system of production systems are all poorly constructed, increasing the risk of musculoskeletal injury and stress-related disorders.
- Fire dangers are typically caused by overcrowding and incorrect storage of flammable goods.
- The significant health and safety risks are caused by bad sanitation and a lack of effective maintenance procedures.
- Two most common ways to tackle it are:
- Use of disinfectants to prevent the spread of germs and microbes.

- Proper disposal of waste and recyclable materials keeps work areas clutter-free.

Therefore, the major health and safety concerns of the apparel industry are related to general conditions of the work environment.

Proper maintenance procedures are a must to ensure a clean and safe working environment.

Learning Outcomes
After completing this module, you will be able to: <ul style="list-style-type: none"> • Identify Importance of routine maintenance and its procedures • Explain how to Maintain cleanliness • Analyze handling of machinery, equipment and tools safely and correctly • Describe Effective oral and written communication at workplace
Module Structure
Session 1: Importance of routine maintenance and its procedures
Session 2: Maintaining cleanliness
Session 3: Operation of machinery, equipment and tools safely and correctly
Session 4: Effective oral and written communication at workplace

Session 1: Importance of Routine Maintenance and It's Procedures

MAINTENANCE PROCEDURES

Maintenance is defined as the group of systematic activities carried out to keep the machines or equipment in proper running condition.

Proper working condition of machines is a must to produce good quality products in time. Therefore, there is a need to establish a maintenance department in every factory to ensure timely production. Moreover, it is required to document the process and procedures for assistance of auditor.

Good maintenance includes the regular upkeep of material, equipment, machinery and good housekeeping, e.g. trolleys are used extensively throughout the industry and play a major part in reducing manual handling. Systematic cleaning and maintenance of wheels ensure that risks of injury are minimized. Clean floors benefit by ensuring ease of movement

THE IMPORTANCE OF RUNNING MAINTENANCE

Running maintenance means routine maintenance, inspection and servicing of machines and systems to ensure smooth functioning and efficient production. Running maintenance also means routine maintenance irrespective of presence of problem in any of the machines or systems.

The major reasons for running maintenance are as follows:

1. To increase the life and productivity of machinery, equipment and tools.
2. To avoid delays in production due to malfunctioning of machines
3. To ensure better or superior quality for the product.
4. To control and reduce the wastage.

Effective maintenance program plays an important role in the manufacturing processes. The importance of running maintenance can be understood from following points:

- It effectively reduces waste and run an efficient and continuous manufacturing / service operation.
- The cost of routine maintenance is very less than the cost of repair of a major breakdown.
- Daily inspections, cleaning, lubrication and minor adjustments can be detected and corrected before they become a major problem and may result in complete shut-down of a production line.

The running maintenance is one of the three maintenance systems present in apparel industry. The maintenance systems are as follows:

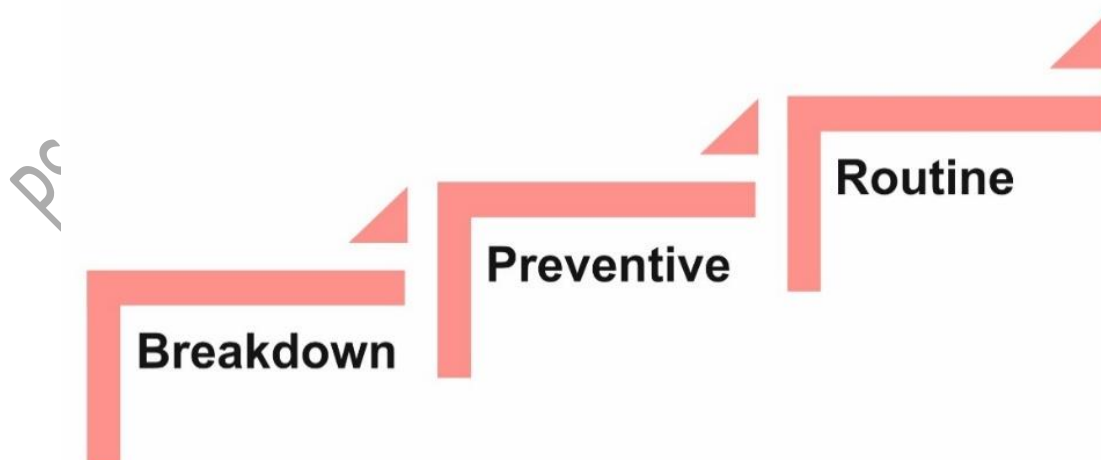


Fig.: 4.1 - Types of Maintenance Systems

a. Breakdown Maintenance: Breakdown Maintenance is the repair process carried out after the equipment stops functioning.

Machine breakdown time should be recorded and tracked to see mechanic performance. It is carried out only when evident problems occur. These are unpredictable type of maintenance and difficult to schedule. The equipment is either repaired or replaced. They are important because machine breakdown time is considered as loss time in garments manufacturing. .

b. Preventive Maintenance: Preventive maintenance is periodical and timely inspection which includes daily, weekly, monthly based cleaning, inspection, equipment condition diagnosis, oiling and alignment, and servicing activities. Maintenance team carries out preventive maintenance as per their maintenance schedule.

c. Routine Maintenance: Routine maintenance consists of periodical and timely inspection, servicing, lubrication and cleaning of the equipments. It might also involve replacing certain parts to prevent sudden failure and avoid problems to ensure un-interrupted working condition of all machines.

SAFETY PRACTICES

The maintenance systems are inadequate to ensure safe and clean working environment until they are complemented by the various safety practices. Presence of hot steamers, electrical equipment, and sharp tools and devices combined with the busy schedule make it important to work carefully and pay constant attention to safety practices. The various safety practices are as follows:

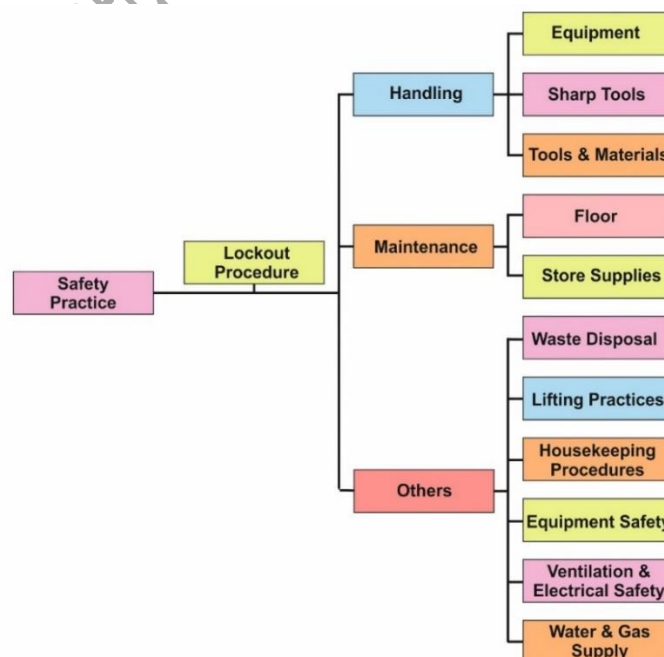


Fig.: 4.2 Safety Practices

1. Lock-out procedures

Locking out a machine means disconnection of the power feeding the machine.

The designated person carrying out the maintenance or repair is in charge of the key to the lock of power supply. Before turning the power off, this person ensures the work on the machine has been completed.

The person in charge reports early before the shift timings and removes the power lock of all the machines. This allows the power supply to make machine functional again. It is the duty of the person in charge to lock the machines during the lunch and tea breaks.

To safeguard the key, lock-out poster or signage must be posted near the equipment, so that no one can accidentally restore power without the person in charge's knowledge.

The steps listed below must be followed before repairs or maintenance is carried out.

Steps of Lockout Procedure:

1. Notify all workers on duty about the lockout and the reason for it.
2. If the equipment is operating, switch it off.
3. The power cables must be unplugged. Grounding, repositioning, blocking, and bleeding down must all be used to dissipate or release stored energy in capacitors, springs, raised machine members, revolving fly wheels, hydraulic systems, and air, gas, steam, or water pressure.
4. Operate the push button or other usual working controls to guarantee that the equipment is not functional after ensuring that no workers are exposed and that the energy sources have been disconnected.
5. The equipment is now locked out.

Restoring Equipment to Service:

1. When the repair / maintenance job is completed and the equipment is ready for testing or normal service, a check of the equipment area is carried out to ensure that no one is exposed.
2. When equipment area is clear, all locks are removed. Power cables can be then reconnected.

2. Equipment handling

The points to be kept in mind while handling the equipment are as follows:

1. Do not use any machine if not trained to use.
2. Ensure the machine is switched off before cleaning or adjusting any machine.
3. Ensure fingers, hands, tools, etc., are away from moving parts. Please wait until machine fully stops.
4. Care must be taken while cleaning the cloth cutting and drilling machines. The steps followed are as follows:
 - i. Pull the plug from switch board.
 - ii. Do not touch the edge of the blade.
 - iii. Clean the blade moving from the Centre towards the outer edge.
 - iv. Clean the inside edge of the blade with a stick that has a cloth wrapped around one end.
5. Do not start a machine until the parts are locked in place and the attachments are securely fastened.
6. Use a wooden plunger (rather than hands) or other metallic tools to clean the machine.
7. Ensure awareness of the lock-out procedures that are to be followed before repairing or cleaning any machine.
8. Do not wear rings, large size wristwatch, bangles, or a tie while operating electrical power equipment.

3. Sharp tools Handling

The points to be kept in mind are as follows:

1. Use the right cutter or knife for the job.
2. Avoid close proximity to falling cutters or scissors. When a knife starts to fall, jump backward to get out of the way.
3. Always carry a cutters or scissors with the tip pointing downward, with the cutting edge turned away from the body.
4. Never talk while holding a cutters or scissors in the hand.
5. While cutting with any cutters or scissors, always cut away from the body.
6. Place cutters or scissors in drawers or in racks for proper storage.
7. Always use a sharp knife; it is much safer than a dull one.
8. Take a firm grip on a knife handle and always make sure that the handle is free of grease or any other slippery substance.



Fig.: 4.3 - Sharp tools

4. Tools & Materials handling:

The points to be kept in mind are as follows:

1. Use dry towels while handling hot openers, steamer covers/doors as wet cloth conducts heat more readily than dry cloth.
2. Avoid splashing grease on top of the range. Grease will ignite quickly, causing a fire. Do not throw water on a grease or fat fire. Use a foam based extinguisher or a wet towel.
3. Remove the lids of iron steamer or washers slowly. Lift the side of the lid that is away from operator so the steam does not rush out too quickly, causing burns to the hands or face.
4. One should know the location of fire extinguishers; know how and when to operate them.

5. Floor Maintenance

The points to be kept in mind are as follows:

1. Wet floors are dangerous. Keep them dry.
2. Wipe out any spilled water or other similar liquids immediately.
3. Walk. Do not run or slide across the floor.
5. Never leave tools and rags on the floor.
6. Keep all path areas clear of boxes, garbage cans, portable equipment, mops and brooms, etc.
7. Using rubber mats behind the range is a good practice. Mats must be kept in good condition by daily cleaning.

6. Store supplies Safety and Maintenance

The points to be kept in mind are as follows:

1. Always store heavy materials on bottom shelves, medium-weight materials next and light-weight items on top shelves.
2. Clean all dirt, grease, and trash daily to reduce fire hazards and to eliminate breeding places for rats and cockroaches.
3. Use ladders, not boxes or chairs, to get things from high shelves.

7. Waste Disposal

The points to be kept in mind are as follows:

1. Place cloth and other scraps in proper containers.
2. Do not allow containers to overflow. Empty them before they are completely full.
3. Report broken or defective containers.
4. Wear gloves while disposing off expired washing chemicals or similar liquid trash.
5. Wash and sanitize hands properly.
6. Push garbage down using a tamper or other tool. Do not push it down with hand or foot.

8. Lifting Practices

The points to be kept in mind are as follows:

1. Keep back straight, but not necessarily vertical. Have a firm grip on the object.
2. Keep the object close to the body.
3. Bend the knees before lifting.
4. Lift the object by pushing weights on legs.
5. Call for help to lift or move heavy boxes or containers.
6. Use of trolley is advisable for heavy objects.

9. Good housekeeping procedures

The points to be kept in mind are as follows:

1. Do not block exits.
2. Maintain a clean, dry, and grease-free work environment.
3. Maintain the condition of your steps and ladders.

4. Keep emergency equipment clean and unobstructed.
5. Ensure that all warning signs and labels are in good working order and are easily visible.

10. Equipment Safety

Extreme care should be taken while operating equipment. Before operating any tool or piece of equipment, one must be fully trained. Make sure that all guards are in place and function properly and that all electrical connections are properly made. Precautions taken while using equipment are

1. Understand the correct operating procedures and safety precautions before operating the equipment.
2. Ensure that all guards are in place and functioning before any machine is started.
3. Report defective or unsafe equipment to a responsible individual to prevent serious injury.
4. Keep edge-cutting tools properly sharpened. Store the same in safety covers.
5. Use tools only for their intended use and make sure the size of the tool is right for the job.
6. Lock the machines before lubricating.
7. Do not wear loose clothing, jewellery, or keep long hair open may around machines which increase the risk of being caught in the machinery.
8. Approach the supervisor for any queries about a machine safety.

11. Ventilation systems

The environment in which the workers work should be free from smoke, fumes and steam. Industries should have ventilation equipment with suppression systems to release fresh air.

Many industries use emergency shutdown systems or “panic buttons.” These are installed so that a single switch can be used to turn off the power to a large number of pieces of equipment.

These devices are intended to be employed in the situation in which a person is electrocuted or becomes caught in a piece of machinery. In these conditions, quick action is required. The points to be kept in mind are:

1. Hit the panic button.
2. Locate and learn how to use the emergency shutdown.

12. Electrical safety

The points to be kept in mind are as follows:

1. As human body is sensitive to relatively small values of current, worker can receive a shock or burn from any common electrical circuit.
2. Worker should be made aware of the location of the main panel or sub-panels being used, and learn how to shut them off in case of an emergency. Notify the supervisor right away.
3. Obtain permission from the electrician before using a new service.
4. Electrical extension cords, if they need to be used, should be orderly and not allowed to become tangled. Such cords should be taped to the floor whenever possible as this will reduce the chance of someone tripping over them.

13. Water supply

If a pipe breaks or bursts, the water may damage material, tools, and equipment or work already done. In addition, water may create an electrical hazard if it comes in contact with electrical panels or outlets. Locate water shut off point of the industry, shut the water off and notify supervisor at once.

14. Gas supply

Escaping gas can cause an explosion that could injure anybody or cause severe damage. When the valve handle is running parallel with the gas line, the supply of gas is flowing and on. Locate the gas shutoff in the industry, shut the gas off and notify supervisor immediately.

CARRY OUT RUNNING MAINTENANCE WITHIN AGREED SCHEDULES

Maintenance is the action to retain, fix or restore an item in a state where it can perform its required function by the combination of all technical administrative, managerial and supervision actions.

The maintenance strategy has a significant impact on the industry's bottom line, but many maintenance managers have trouble selecting an appropriate strategy or overlook their approach altogether. Benefits of optimizing maintenance strategy include extending asset life, reducing asset failures and downtime, minimizing repair costs, and improving health and safety.

It's important to follow agreed schedules to maintain the assets properly and ensure that they remain in working order. Cutting, sewing, washing, ironing, folding, packing and finishing machines are important for the production of

garments. So it is necessary to keep them in the best operating condition at economical cost.

1. Maintenance department activities in garment industry

The maintenance department is mainly responsible to look after the machines and other production equipment in proper working condition and take corrective action against any environmental pollution.

a. Functions of Maintenance Department

1. Inspection of all machines and other machinery in the industry, repairing and up gradation.
2. Maintaining and ensuring continuous power supply in the factory.
3. Maintaining the water plant, compressors, air conditioning systems, Generators and boiler.
4. Planning, design and implement any kind of expansion of the industry.
5. Purchase of new machinery.
6. Issuing of different spare parts and accessories according to the production requirement.
7. Housekeeping.

2. Responsibilities of machine mechanic

a. Daily basis work of machine mechanic

1. Check machine setting correct or not
2. Check oil level and oil leaks of the machine
3. Check un-usual noise of the machine
5. Check safety equipment
6. Check machine allocation
7. Check production plan
8. Check for any loose nuts or bolts.

b. Monthly basis work of machine mechanic

1. Cleaning of whole machine by opening parts
2. Check back/ front cover
3. Check Oil lubrication, Oil level/ oil filter condition
4. Check functioning of machine
5. Check condition of Machine table
6. Cleaning and blowing
7. Check Power on/ off switch

8. Check Motor and control box condition
9. Observe abnormal sound Connections

3. Machinery maintenance schedule and procedure

a. Daily maintenance

If a machine breaks down during its operation, floor mechanics are called in to repair it. If this is not achievable in a reasonable amount of time, the machine is relocated to the maintenance room and replaced by another machine, with the appropriate steps done to repair it. The daily record of maintenance work is kept in a systematic format. Following are few of the maintenance work which are conducted daily.

Activities carried out daily:

1. Check speed and working of the machine.
2. Complete cleaning of the machine.
3. Check un-usual noise of the machine.

Activities carried out every four hours:

- Check for oil leaks.
- Clean machine parts.

b. Monthly maintenance

It is a preventive maintenance to reduce machinery problem and increase machine life, execute as per predetermined schedule fixed at the starting of the year by regular basis. This maintenance program covers total servicing of the all machine, oil change, oil filter change, or change of any defective parts. Records of monthly maintenance works must be kept in specified format.

HAZARDS LIKELY TO BE ENCOUNTERED WHEN CONDUCTING ROUTINE MAINTENANCE

Regular maintenance is essential to keep equipment, machines and the work environment safe and reliable. Maintenance workers are more likely to be exposed to various hazards.

Potential hazards could be:

- A. Dangerous substances,
- B. Confined spaces,
- C. Working at height,

- D. Awkward positions,
- E. Plant under pressure,
- F. Moving parts of machinery,
- G. Unexpected start-ups,
- H. Chemical substances or dust in the air, etc.

Insufficient maintenance can result in unsafe circumstances, accidents, and health issues. Working alongside a running operation and in close proximity to machinery makes maintenance a high-risk activity with distinct dangers and risks.

In contrast to regular operation, direct contact between the worker and the machine cannot be decreased significantly in maintenance activities, where workers must be in close proximity to the processes.

Maintenance activities are critical for the health and safety of maintenance staff. They may also be critical for others, in particular, for the equipment users or the production operators.

According to the relationships between maintenance and production, some accidents can be traced back to maintenance failures, such as insufficient, inappropriate, or late maintenance. For example, if maintenance is not performed on a regular basis, the equipment or installation can become dangerous to maintenance and production personnel. Other accidents may result from the co-activity of the two types of operators for example repair without interrupting operation.

Maintenance operations include both disassembly and reassembly, often involving complicated machinery and working at height. These can be associated with a greater risk of human error, increasing the accident risk.

Maintenance often involves unusual work, non-routine tasks and it is often performed in exceptional conditions, such as working in confined spaces. Working in confined spaces may expose workers to risks, which are:

1. Exposure to harmful gas, fumes, vapours or lack of oxygen
2. Risk of drowning in water or free-flowing solids
3. Risk of getting injured due to fire or explosion.
4. Risk of getting burned by high temperature machines

The hazards are commonly grouped as physical, chemical, biological and psychosocial. The hazards may vary significantly between planned, preventive and repair or corrective maintenance tasks.

- Type of hazards are as follows:



Fig.: 4.4 – Types of Hazards

1. Physical Hazard

- a. Mechanical movement - rotating elements e.g. flywheels, compressed springs, unexpected start-ups e.g. blockages cleared, trapped air in lines operating valves, restoration of power, computerized auto-start, failure of sub-standard parts and sewing machines
- b. Electrical - capacitors; high voltage; static
- c. Hydraulics - high pressure fluids
- d. Pneumatic - high pressure steam, gases, vapors
- e. Engulfment - oxygen deficient atmospheres
- f. Fire/explosion - extreme heat/cold, noise, vibration
- g. Work at Height – visibility, loading, unloading, etc.

2. Chemical Hazards

- a. Dusts and fibres e.g. heavily starched fabric materials, accumulated polluted air within production line, fibre/fabric dust and tiny fabric rags.
- b. Dangerous substances e.g. chlorine, oxygen, hydrogen
- c. Toxic, oxidizing, explosive, flammable, corrosive
- d. Hydraulic fluids, oils, acids, alkalis, organic solvents

3. Biological Hazards

- a. Pathogenic bacteria, viruses, parasites, insects, moulds and fungi.

4. Psychosocial Hazards

- a. Time pressure, long hours, shift work
- b. Poor work organisation, unsocial working hours

Activities**ACTIVITY:**

Visit a Garment manufacturing firm, discuss with maintenance team and prepare a report on various types of maintenance conducted by them.

Materials Required:

1. Writing material
2. Ruler

3. Adhesive

Procedure:

- 1.
2. Make a group of 4 students each.
3. Visit a garment manufacturing firm
4. Enquire about its maintenance activities.
5. Prepare a report of your observation with pictures.
6. Submit the report to the teacher for evaluation and feedback.

Check Your Progress

1. Fill in the Blanks:

1. A clean and hazard free workplace ensures the _____ and health of the employees and visitors.
2. Overcrowding, together with improper storage of flammable materials, frequently creates serious _____ hazards.
3. _____ maintenance means routine maintenance, inspection and servicing of machines and systems to ensure smooth functioning and efficient production.
4. Locking out a machine means _____ of the power feeding the machine.
5. The environment in which the workers work should be free from _____ and steam.

1. Write short answers for the following:

1. What is maintenance? Briefly explain running maintenance.
2. What are hazards? Enlist different types of hazards.

2. Write long answers for the following:

1. Briefly explain activities of maintenance department.
2. What are the types of running maintenance?

Session 2: Maintaining Cleanliness

Maintaining clean and organized premises is one of the biggest struggles of the job. Keeping the machines in the production line clean and in perfect working order and the aisles of work area free of debris with the minimum of effort is very essential. It requires a bit of effort and forward planning which can pay back several times with increased productivity.

The benefits of maintaining cleanliness

Working environment that is clean, safe, and efficient, motivates employees to take pleasure in their work. A place when clean also helps to make place look more organised and contributes to worker's efficiency.

COMPLIANCE WITH HEALTH AND SAFETY REGULATIONS /GUIDELINES

Section 11 of The Factories Act, 1948 suggests “Every factory shall be kept clean and free from effluvia arising from any drain, privy or other nuisance.” Whereas Section 12 advise that effective provisions should be established in every factory for the treatment of wastes and effluents resulting from the industrial process carried out therein, so that they can be rendered harmless and disposed of.

Section 13 specifies that effective and acceptable provisions should be provided in every factory for securing and maintaining enough ventilation via the circulation of fresh air, as well as such a temperature as will provide reasonable conditions of comfort to workers and prevent danger to health.

Section 14 suggest how dust and fumes to be handled in a factory as- Every factory where, as a result of the manufacturing process, dust, fumes, or other contaminants of such a nature and to such an amount as to be hurtful or objectionable to the employees employed within are released.

CLEANING PRACTICES

The types of work perform in the industry premises will determine how frequently it needs to be cleaned, but one should perform two kinds of cleaning schedule- deep and regular cleaning.

1. **Deep cleaning:** Over time, the floor of industry gets dirty; dust and grunge also gets accumulated on equipment, which can affect productivity. In this case machinery needs to be cleaned deeply. Time required in cleaning depends on what kind of work is performed, and may be different for each section of the production processes.
Deep cleaning of working area takes several hours to clean surface, tools and machines, using heavy duty cleaning equipment.
To perform the deep clean, each cleaning / housekeeping staff should be assigned an area of the premises, in order to ensure accountability. Each housekeeping staff should then be provided with the equipment and supplies they need to thoroughly clean everything in their designated area. They should be provided training to use any special cleaning equipment if they require. One should schedule the deep clean during a slow production period or a non-working day, so that there won't be any loss of productive work hours.
2. **Regular cleaning:** A messy work environment doesn't reflect well on the business and may have an impact on work quality and production speed.
Frequency of performing regular cleaning depends majorly on two factors, which are:
 - a. Type of work performed in the industry
 - b. ii. Frequency of visit of clients and suppliers in the working area.

Following are the suggestion for Regular cleaning activities:

1. Employees should be instructed to clean up any spills, debris, rubbish, etc. as they appear to prevent them from causing any sort of health / safety hazards.
2. Providing employees with a buffer time of around 5 minutes, at the end of every shift, to get their workspace clean and tidy so the next person can use it straight away.
3. Providing employees with the suitable cleaning equipment and supplies like cloth, dustpan, brush, paper towels, etc. to clean up any spills and messes on their own.
4. Management should ensure the presence of waste and recycling bins at each work station. Management should also encourage the staff to dispose of waste as soon as it appears rather than leaving it to build up. They should also set up a rotation for emptying the waste bins so they don't overflow and become a hazard themselves.

5. Equipment not used regularly, should be kept covered and cleaned once a week, to prevent dust accumulation which may potentially affect its performance.
6. Management should invest in cleaning equipment because it helps in making regular cleaning routines easier, faster and efficient as possible.
7. Make an inventory of every item that needs to be cleaned in the industry that could help the staff to clean it more efficiently.
8. A regular cleaning routine chart can also be maintained by the management to keep a track of cleaning schedules.

DIFFERENT TYPES OF CLEANING EQUIPMENT, SUBSTANCES AND THEIR USE

A variety of necessary and vital cleaning equipment and substances are designed and available in various colours, materials, mechanisms, shapes, sizes and styles to meet a cleaning need. They are used to clean easily, effectively and efficiently.

Types and uses of cleaning equipment:

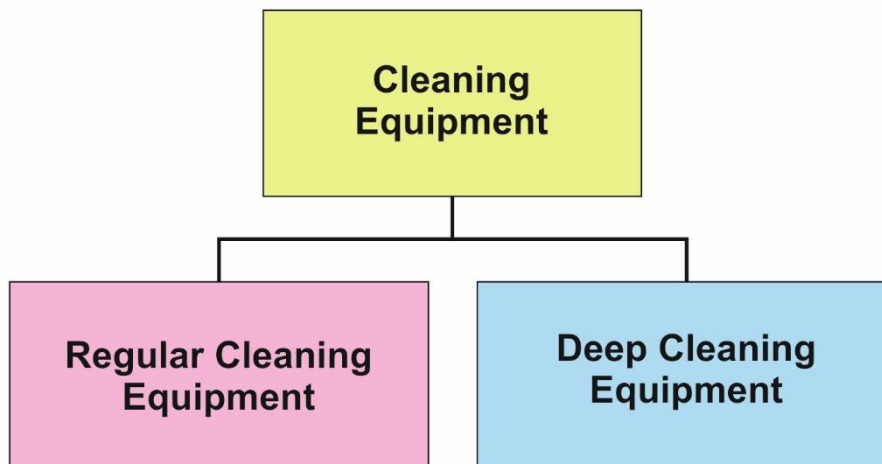


Fig.: 4.5 - Types of Cleaning Equipment

1. Regular Cleaning Equipments

1. **Broom** – It is a cleaning equipment made of bundle of straws or twigs attached to a long handle used to sweep the floor area.
2. **Dustpan-** A cleaning tool used to scoop the dirt and wastes from the floor.
3. **Water Hoses** – It is used to supply the water in washing, toilets and other cleaning units.

4. **Bucket and mug** - To carry water or any other cleaning substances within the premises area and to clean the work areas.
5. **Scrubber** - A scrubber is a type of wide brush with a long shaft used for cleaning hard floors or surfaces. At the end of shaft attached soft bristles to sweep dirt away and hard bristles for brushing. It may be used wet, with water or cleaning fluids. There may also be a detachable mechanism to fix mop cloth, either soaked in water for cleaning or dry for wiping dry surfaces.
6. **Dust cloth** – Dust cloth is used to clean all fine dust build up on any surface.
7. **Sponge** - A sponge is a soft, porous cleaning device that is used to clean impermeable surfaces. Sponges excel in absorbing water and other water-based solutions.
9. **Tissue paper**- Tissue is a type of absorbent and disposable paper. They can be used for the same things as regular towels: drying hands, wiping windows and other surfaces, dusting, and cleaning up spills. They're commonly found in public restrooms, where paper towels are thought to be more hygienic than hot-air hand dryers.

2. Deep Cleaning Equipments

1. **Spray cum vacuum suctioning cleaner**– Cleaning is done automatically. It is used in professional cleaning to apply a pressured, diluted cleaning solution to filthy or contaminated surfaces, followed by vacuum suctioning to remove the applied liquid, as well as the suspended solids and dissolved pollutants.
2. **A floor scrubber** – It is a floor cleaning device that cleans bigger areas by injecting water with cleaning solution, scraping, and removing the residue off the floor as a floor mop or floor brush.
3. **Auto floor scrubber** – Auto floor scrubbers are used to scrub a floor, clean of light debris, dust, oil, grease or other marks on floor. These machines have an automated system for dispensing cleaning solution and then vacuuming it up.
4. **Washing machine** - For bulk washing, the industry uses a high-capacity washing machine. For washing a smaller number of garments and sample pieces, the domestic washing machine is used for removing dirt of soiled mop clothes and other materials.
5. **Vacuum washer** - A wash-head of a vacuum washer sprays water without detergent and quickly suctions it out, generating a swirl of water. The drying time is substantially reduced by instantly reabsorbing the wash water. This cleaning approach is appropriate for both

intermediate and basic cleaning. The technique works on all water-resistant surfaces, such as carpet, upholstered furniture, wooden floors, stone, plastics, and so on.

6. **Vacuum cleaner** - Both scrap and dust vacuum cleaners are used to clean all production line floors to remove the scraps and dust quickly to keep the working area clean and tidy.

3. Cleaning substances

Cleaning substances are hard-surface cleaners available in the form of liquids, powders, sprays, or granules and are used to remove dirt, including dust, stains, bad smells and clutter on surfaces. Purposes of cleaning agents include health, beauty, removing offensive odor and avoiding the spread of dirt and contaminants of work areas.

Disinfectants are cleaning agents that can kill bacteria or other microbes on surface of commonly used items like door handles, working tables etc. Other cleaning substance is degreaser which contain organic solvents and help to dissolve oils and fats.

a. Types of cleaning substances are:

1. Detergents:

Detergents contain significant quantities of a group of chemicals known as 'Surfactants' They are similar to soap but are more soluble in hard water. It works by breaking up dirt or soil, making it easy to wash it away. Detergents are commonly available as powders or concentrated solutions. Detergents are also foaming agents of varying degrees.

2. Degreasers

Degreaser is used to remove grease from surface such as machine tops, counters and grill backsplashes. Methylated spirits or white spirit is commonly used for degreasing. It usually consists of strong alkalis, which can dissolve proteins and disperse grease or similar substances. It is generally based on caustic soda or sodium metasilicate. Sodium carbonate is also used as stain remover and for clearing blocked drains, cleaning all types of washers and other industrial equipment.

3. Abrasives

Abrasives are chemicals used to clean dirt from hard surfaces. In commercial industries abrasives are used to clean floors, pots and pans. The cleaning action of abrasives depends on the presence of fine particles which when

rubbed over a soiled hard surface, dislodges the soil, remove tarnishing and surface scratches.

The various types of Abrasives are as follows:

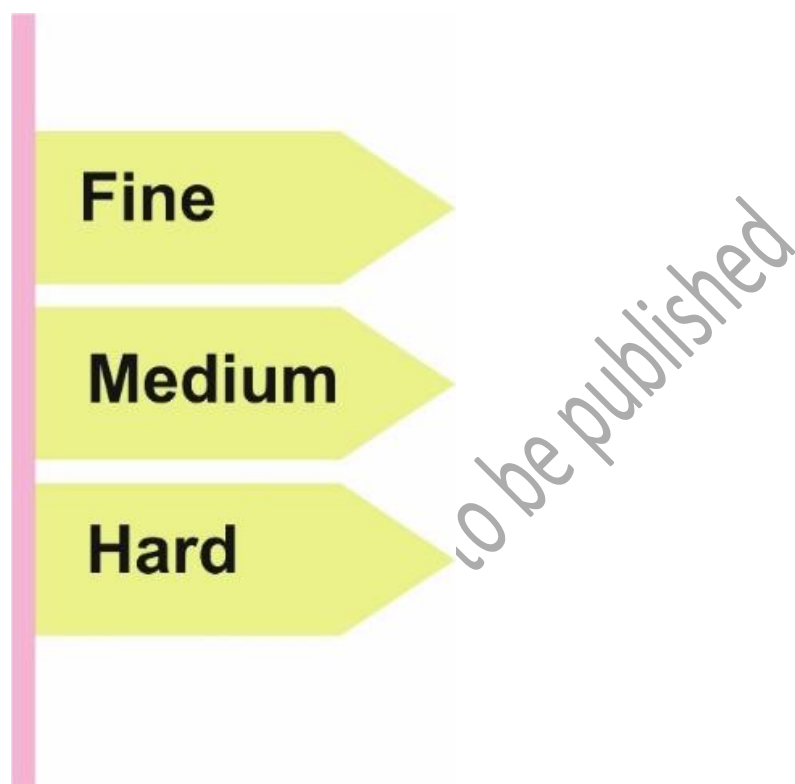


Fig.: 4.6 - Types Of Abrasives

Fine abrasives are preferred over coarser ones. For example nylon pads, powdered pumice, feldspar, fine ash, filtered chalk, etc. are available in liquid, paste or powdered form.

Examples of Medium abrasives include rottenstone, salt, scouring powder and scouring paste. Scouring powders are made up of fine particles of pumice mixed with soap/ detergent, alkali and bleach.

Examples of Hard /coarse abrasives include bath bricks, sandpaper, powdered pumice, steel wool and emery paper. Abrasives are used along with other substances such as bleaches, anionic surfactants, alkaline builders and perfumes.

4. Acids

Acid cleaners are used to remove mineral deposits and for descaling or removing rust from any surfaces. Often, surfactants and corrosion inhibitors are also added to the acid. Acids dissolve metals and are thus used to remove metal stains, stains from deposits around taps, and tarnish on copper and brass, among other things.

Vinegar can also be used to clean hard surfaces and remove Calcium deposits.

- a. Acidic drain cleaners use sulphuric acid to unblock clogged pipes by dissolving greases, proteins and even carbohydrate-containing substances such as toilet tissue.
 - b. Hydrochloric acid (HCL) is a common mineral acid. Stubborn hard- water deposits are removed by concentrated HCL. Dilute HCL is used for removing stubborn scales and deposits from sanitary ware.
 - c. To remove tarnish and stains from metals such as copper and brass, acetic acid is used.
 - d. Toilet cleansers use their acid content to clean and sanitise the W/C pan while also removing metal stains. They come in a variety of forms, including crystalline, powdered, and liquid.
- Powder toilet cleaners are in the form of solid salts, such as Sodium Hydrogen Sulphate.
 - Liquid toilet cleaners contain other acids like dilute hydrochloric, phosphoric or formic acid.

These acids can convert the calcium carbonate into salts that are soluble in water and can easily be rinsed away. The toilet brush is used to scrub the toilet, remove stubborn stains and biological debris.

5. Alkalis

These are used in the form of liquid and powders. Many alkalis have bleaching properties. Alkaline cleaning chemicals include bleach and ammonia. These are dispersants that keep dissolved dirt and rust from resettling.

Caustic alkalis are very strong alkalis. Cleaning products based on caustic soda are used to unclog drains and clean industrial equipment. Fats, such as grease, oils, and protein-based compounds, can be dissolved by alkaline cleaners. Strong bases, such as sodium hydroxide or potassium hydroxide, are found in cleaning products.

6. Neutral

Non-ionic surfactants are used in neutral washing products to disperse various types of dirt. Water is the most popular cleaning agent that, even when used alone, can dissolve some type of dirt. It becomes more effective when combined with additional cleaning agents, such as a detergent.

Water is used to carry the cleaning materials to the soil, suspend the soil, remove the suspended soil from the cleaning site and rinse the detergent solution from the surface.

7. Organic Solvents

These are substances that dissolve fats, oils, grease, wax, and other similar substances. Methylated spirit, white spirit (turpentine replacement), carbon tetrachloride, and other kinds of alcohol such as isopropyl alcohol and rubbing alcohol are all examples of organic solvents. The first two are extremely flammable, whereas carbon tetrachloride is toxic if inhaled and should never be used in a confined space. Many of them are commonly used to remove stains. They are irritating to the skin and might cause fires.

8. Other Cleansing Agents

1. Polishes

They smooth out the unevenness of the article's surface by applying a thin coating of wax on it. On the surface, it also serves as a protective layer.

a. Metal polishes: They come in the form of a liquid or a paste. Plate powder, mentholated spirit, and Ammonia are examples of fine abrasives waxed with grease solvent and occasionally with an acid. When abrasive is rubbed on the metal's surface, friction is created, which removes tarnish and produces a shine.

b. Floor polishes: Spirit-based polishes, which come in paste or liquid form, may contain Silicon. It is suitable for wood, cork, linoleum, and magnesite floors. Water-based polishes are emulsions made up of fine natural and synthetic wax particles mixed in water. They can be used on thermoplastic, rubber, PVC, asphalt, and combination floors, as well as wood, cork, magnesite, and linoleum that has been sealed.

2. Floor Seals

These are placed as a semi-permanent finish to flooring surfaces to act as a protective barrier against dirt, germs, fluids, grease, stains, and bacteria. They protect the surface from scratches and make it easy to clean.

3. Bleaches

Bleaches are alkaline stabilised sodium hypochlorite solutions that are excellent for cleaning stained sinks, W/C pans, and other surfaces. They contain germicidal and whitening effects. With oxidation, bleaches can break down the tough stains. Sodium perborate is a common ingredient in detergents for washing fabrics.

4. Disinfectants and De-odorants

Disinfectants, antiseptics, and deodorants are not cleaning agents, but they are frequently used in cleaning operations. With their fragrance characteristics, these help to keep rooms free of infections and fresh.

a. Air sanitizer – It is a disinfectant/sanitizer that is used to disinfect or sanitise inanimate surfaces in the institutional and/or commercial environment by limiting or moderating the growth or development of microbiological organisms such as bacteria, fungi, or viruses. Some glycol vapours, such as tri-ethylene glycol, can operate as an air sanitizer.

b. Deodorants – It can hide unpleasant odours by interacting chemically with the particle that causes the odour or by having its own scent dominate. Restrooms, guestrooms, guest bathrooms, store rooms, and public areas such as lobbies all use them. Aerosol sprays, liquids, powders, and crystalline blocks are the most common forms.

c. Carbolic soap – It is also known as red soap, and is a mildly antiseptic soap that contains carbolic acid and/or cresylic acid, both of which are phenols and is derived from coal tar or petroleum. Carbolic acid is a skin irritant that is utilised in a wide range of industrial and consumer products.

5. Glass Cleaners

Glass cleaner comes in sprays or liquid form and is made up of water-miscible solvents. It's frequently used with isopropyl alcohol, as well as modest amounts of surfactants and alkali, to boost the cleanser's polishing effect. It can be sprayed directly onto windows, mirrors, and other glass surfaces, or it can be applied with a soft cloth and then rubbed off with a soft, lint-free glass cloth.

6. Metal cleaners

Metal cleansers contain chelating agents, abrasives, and surfactants for cleaning stainless steel sinks, faucets, metal trim, silverware, and other ferrous metals. These agents include citric and phosphoric acids, which are nonaggressive. Stainless steel, nickel and chromium cleaners contain lactic, citric or phosphoric acid.

Nonferrous metal cleaners contain ammonia, ammonium oleate, stearate and chelating agents like ammonium citrate and oxalate.

7. Absorbents

They carry out the action by absorbing the stain or grease. They are used only when the quantity of stain is too much. e.g. starch powder, fuller's earth, bran, French chalk powder, etc.

8. Anti-mildew agent

The chemical which protect the fabric material and garments from mould and mildew namely zinc chloride. It is used in textile / garments store and industries.

9. All-purpose cleaners

All-purpose cleaners are usually concentrated solutions of surfactants and water softeners, which enhance the behaviour of surfactant when used with hard water. Common examples could be alkyl benzene sulfonates, anionic detergent and modified fatty alcohols.

SAFE WORKING PRACTICES FOR CLEANING AND THE METHOD OF CARRYING THEM OUT

Safe work practices are steps that guide a worker to perform a task with minimum risk to people, equipment, materials, environment and processes.

Safe working practices for cleaning are:

1. Understand the risks and hazards of the workplace during cleaning hours and take necessary steps to reduce risk of work-related injury.
2. Measures must be taken to ensure that cleaning operations can be carried out safely.
3. Use mechanical aids for cleaning, wherever possible.
4. Use ergonomically designed cleaning equipment, and re-arrange the work area so that everything is within easy reach.
5. Use necessary tools and personal protective equipment to carry out safe cleaning and maintenance
6. Wear protective equipment to suit the cleaning tasks. Gloves, full-face mask and apron can reduce risk of injury from concentrated cleaning substances and sharp equipment. Respirators may be used while cleaning filters.



Fig.: 4.7 – Personal Protective Equipments

7. Surrounding windows must have curtains or blinds which workers can adjust to prevent reflected glare during cleaning of production floors and machineries.

8. Humidity- It is important to maintain ventilation and humidity at a level which keeps the cleaner comfortable.

Methods for cleaning

It is the best practice to use a two or three-bucket system for mopping. This can be facilitated by using a cleaning cart or on a separate trolley, if a full cleaning cart is not available. The various methods and tools used in the cleaning process are as follows:

- 1) Two-bucket system – It is used for routine cleaning with one bucket containing a detergent or cleaning solution and the other with rinse water.
- 2) Three-bucket system- It is used to for disinfection. The detergent or cleaning solution is in one bucket, the rinse water is in another and the disinfection or disinfecting solution is in the third.
- 3) The rinse water bucket is used to rinse and wring out the mop before re-dipping it into the prepared solution. This extends the solution's useful life, saving both time and money.

The points to be kept in mind along to ensure proper cleaning are as follows:

1. Cleaning staff should be trained on appropriate use, application and removal of PPE for all environmental cleaning procedures and tasks for which they are responsible.
2. Put on all parts of PPE before entering a working area and remove it (for disposal or reprocessing, if reusable) before leaving that area.
3. Include required PPE for specific tasks in standard operating procedures and other visual job aids.
4. All PPE parts (reusable and disposable) should be available in sufficient quantity, well maintained (good quality, appropriately stored stocks) and clean before use.
5. Reprocess (i.e. clean and disinfect) all reusable PPE, at least once a day
6. Use reusable rubber gloves for cleaning.
7. To avoid interfering with gloves or affecting hand hygiene, keep sleeves at or above the elbow.
8. Wear rubber-soled closed toe shoes or boots (but not sandals), to prevent accidental injury.
9. Regularly reprocess all reusable items (i.e. thoroughly clean, disinfect, and dry).

10. Whenever a solution is changed, thoroughly clean, disinfect, and rinse equipment such as buckets and containers. To allow full drying, store them upside down.
11. Launder mop heads, floor cloths and soiled cleaning cloths at least once a day (e.g. at the end of the day) and allow them to fully dry before storage and reuse.
12. As directed by the manufacturer, reprocess all reusable materials and equipment in a separate area that is not used for other purposes.
13. Cleaning aids and products should be disinfected by thoroughly immersing them in boiling water or a disinfectant solution for the required contact time, then rinsing with clean water to eliminate any residue.
14. All reusable supplies and equipment should be kept clean and in good operating condition at all times. All reusable equipment should be evaluated on a regular basis and replaced or repaired as needed.

CARRYING OUT CLEANING ACCORDING TO SCHEDULES AND LIMITS OF RESPONSIBILITY

During the whole Garment production process, management should ensure that maintenance is coordinated, scheduled and performed correctly as per plan, and that the equipment or workplace is left in a safe condition for continued operation.

Environmental Cleaning guidelines deal with cleaning of the physical environment as it relates to the prevention and control of infections. Administrators, supervisors of housekeeping departments, infection prevention and control experts, construction/maintenance project supervisors, and public health officers are among those who fall into this category.

Cleaning according to schedule and responsibility

1. Written procedures for cleaning and disinfection of working areas and equipment should be followed.
 - Defined responsibility for specific items and areas
 - Clearly defined lines of accountability
 - Procedures for daily and terminal cleaning
 - Procedures for outbreak management
 - Cleaning and disinfection standards
 - Frequency of cleaning and disinfection.
2. Regular cleaning is necessary to maintain a standard of cleanliness.

3. Thorough and timely cleaning.
4. Monitoring of environmental cleanliness.
5. Ongoing review of cleaning procedures.
6. Cleaning schedules should be revised and developed, depending on:
 - Surfaces of high-touch or low-touch items / equipment,
 - The type of activity taking place in the area and the infection risk associated with it,
 - The vulnerability of the cleaning staff working in the area.
7. Each health care facility should have written rules and procedures for proper cleaning that clearly identify the frequency and amount of cleaning, as well as the cleaning authority.
8. Institutions should have in place systems with regard to frequency of cleaning. They should periodically conduct audits to ensure a clean environment during working hours.
9. Cleaning audit results should be evaluated and analysed, and cleaning employees should be given feedback.
10. To detect and solve cleaning issues, an action plan should be developed.
11. Knowledge of Personal Protective Equipment (PPE), hand hygiene and safe work practices is required for every cleaning staff.
12. All chemical cleaners and disinfectants should be properly labelled and kept to reduce the danger of contamination, inhalation, skin contact, or bodily damage.
13. Develop a facility-level monitoring and maintenance schedule that clearly describes the items, inspection frequency, and responsible personnel. Certain equipment, such as floor cleaners, may require regular maintenance checks by qualified personnel, as directed by the manufacturer.
14. Prepare and keep a service record, and make it available to the cleaning programme manager for examination.

Storage of cleaning substances

Cleaning agents with a longer shelf life are bought in bulk because of the reduced costs.

Points to be considered for storage of cleaning substances are:

- a) Storage racks should be strong enough to carry the weight of the items. Heavier containers must be kept on the bottom shelf.
- b) The store-room should always be well lit, well ventilated and clean.
- c) Ensure that the lids of the containers are tightly fitted.
- d) While issuing cleaning substances, use appropriate dispensers and measuring apparatus.
- e) Ensure that no residual deposits of the cleaning substance is left around the rims of the containers.
- f) Spillage should be avoided. And if spill occurs, it should be cleaned immediately.
- g) A systematic procedure should be followed for rotating stocks.
- h) Organic solvents, strong reagents and polishes should be kept away from heat sources.
- i) Stock check should be conducted at regular intervals.
- j) Store should be locked when not in use.

Activities

ACTIVITY 1

Prepare a geographical poster on PPE kit for safety.

Materials Required:

1. Writing material
2. Ruler
3. Adhesive

Procedure:

1. Based on your understanding, prepare a graphical and interactive poster on PPE kit for safety.
2. Display the same in your class.

Check Your Progress**A. Fill in the Blanks:**

1. Working environment that is clean, safe, and efficient, _____ employees to take pleasure in their work.
2. _____ cleaning of working area takes several hours to clean surface, tools and machines, using heavy duty cleaning equipment.
3. _____ are cleaning agents that can kill bacteria or other microbes on surface of commonly used items like door handles, working tables etc.
4. _____ is used to remove grease from surface such as machine tops, counters and grill backsplashes.
5. _____ cleaning is necessary to maintain a standard of cleanliness.

B. Write short answers for the following:

1. What are the benefits of maintaining cleanliness in apparel industry?
2. Describe various cleaning practices.

C. Write long answers for the following:

1. Briefly explain different types of cleaning substances.

Session-3: Operation of Machinery, Equipment and Tools Safely and Correctly

The most important concept to remember is that - one is responsible for one's own safety and the safety of others. Most safety practices are though very common, unfortunately can be forgotten or overlooked unless one makes safe practices a habit or an instinct.

GENERAL SAFETY

By following the right procedures, workers will commit themselves to safety on the job and with that everyone will be benefited. Accidents may occur in many ways but most often can be based on ignorance or carelessness.

Safety precautions to be followed in work area are as follows:

- Walk instead of running - People who rush around in the work area tend to increase the likelihood of an accident.
- Concentrate on work - Stay completely alert on the job. Lack of interest, personal problems, and distraction by others can all lead to serious accidents in the working area.
- Understand all the rules for operating equipments. Never operate the equipment until trained
- Never work under the influence of drugs or alcohol.
- Pay attention to moving objects, such as equipment, cloth cutter and driller, trolleys etc.
- Avoid back strain by lifting the materials in proper position.

Accidents are caused due to overlooking of situations involved with risk. They are the result of not knowing the proper way to do a task, carelessly performing an operation or job, or not being consciously aware during the performance of a task.

The most common accidents in the working area are as follows:

a. Cuts

Cuts are too common in the industry because cutter, needle and other cutting equipment and tools are constantly in use. These cuts, as well as the severity of the cuts, can be avoided by following the right safety standards and following proper cutting methods.

Accidental cuts can be prevented if the expertise of using a cutter has been mastered. If they do occur, however, they should be treated safely and promptly. If infection sets in, it can result in more serious consequences.

b. Burns

Two types of burns occur in the working area-

- Minor
- Major

Minor burns occur when an exposed body part comes into contact with a hot surface, such as a steamer, a hot air oven, or concentrated chemical compounds.

When grease and chemicals are spilled, steam is discharged too quickly, or gas is released unintentionally, major burns occur.

Burns are more painful and take longer to heal than cuts. If a blister forms as a result of the burn, it should be treated as soon as possible by skilled medical staff.

c. Falls

Falls can cause some of the most serious injuries in the commercial industry. They may disable or incapacitate a person for life.

Falls are caused by extreme carelessness, wet floors and aisles, spilled materials, rags, grease, and by torn mats or spread rags and floor boards.

d. Strains

Strains are very painful and can cost you a lot of time at work. They are caused by carrying excessively heavy loads and using inappropriate lifting techniques. The majority of strains do not require medical attention, but they do necessitate time and care in order to heal properly.

HANDLING MATERIALS, MACHINERY, EQUIPMENT AND TOOLS SAFELY AND CORRECTLY

Employers are legally required to ensure that all equipment and materials supplied and used for work purposes are safe and does not pose a long-term hazard or risk to employee's health. Employees must have sufficient knowledge and training to handle materials, machinery, equipment and tools safely.

Safe practices to handle machinery, equipment and tools are:

1. Worker should possess the required know how of machinery, equipment and tools used for the job.

2. Routine maintenance must be carried out for all machines, equipment and tools.
3. Inspection at regular intervals to avoid wear and tear that might compromise safety.
4. Proper inspection of machines before use if the equipment's safety depends on installation
5. Noise and vibration levels should be checked and should not affect the operator and others.
6. Use hand-held tools safely- Anyone who uses a hand-held tool might be at risk of injury.
7. Band knives can cause serious wounds unless effectively protected. The circular knife of portable cutting machines should also be similarly protected.
8. If power presses are used, adequate machinery guarding, preferably fixed, is necessary to keep hands out of the danger area. Guards which prevent the pressure head from coming in close contact (most importantly, the hand) comes within the area are to be used. All presses, with their steam and pneumatic supplies, must be frequently inspected.
9. The drive motors and the needle are the two most dangerous parts of a sewing machine. Long lines of machines are still driven by under bench shafting in several places. When workers bend under benches to grab goods or fix belts, many entanglement mishaps might occur, so it's vital that this shafting is effectively protected by enclosure or close railing. Several different types of needle guard, which keep fingers out of the area of risk, should be used.
10. Handling old equipment - Ensure that it is safely and properly handled, stored, transported and recovered or disposed-off. If the equipment contains hazardous components, follow additional requirements under hazardous waste legislation.
11. Personal Protective equipment -Workers in many activities may require special protective equipment at work like helmets, bump caps or hair nets for the head crash and climbing. Hearing protection should be worn if exposed to high noise levels. Safety glasses, goggles and face shields can also be used to prevent eye hazards. As a standard, everyone should wear safety spectacles, goggles and face shields while using hand or power tools. Other PPE types likes Safety boots or shoes, gloves, gauntlets, mitts, cuffs, armllets or elbow protectors, overalls, boiler suits, high visibility clothing, leggings and gaiters for different activities in production line are required. Cutting machine operators must wear a protective glove, preferably of metal mesh.
12. Amputation and Caught-in Hazards – Machine guards are mounted on machines to protect employees from moving parts. Every day, equipment should be checked carefully to confirm that all guards are in place.

13. Chemical Hazards – Chemical-processing equipment can be a source of a variety of risks. Leaks can result in slipping dangers and chemical exposure. Chemical-leaking hoses could cause respiratory problems for workers working nearby. As a result, caution must be given when using such devices.
14. Sharp Edges – Walking very close to machinery area, may be hazardous if sharp edges are not guarded. Hence equipment mounting brackets, signages and control boxes should be checked regularly to see if sharp edges are present.
15. Ensure that all equipment are well maintained and checked regularly. All equipment should be removed from the platform, at the end of the working day, and all power supplies should also be switched off.
16. Risks caused by workplace equipment - Cutting equipment, forklift trucks, equipment using heat or bright light, can cause risks not just during the normal operation of the equipment but also during installation, maintenance, repairs, breakdowns and servicing. Hence, use of appropriate warning signs is advisable.

Tool safety

Workers should be taught how to use tools in a safe manner. When tools are misplaced or handled incorrectly by workers, they can be dangerous.

Following are some suggestions for safe handling of tools are:

- a. Tools should never be tossed but should be properly passed from one employee to the next. Pointed tools should be passed with the handles facing the receiver or in their carrier.
- b. Workers carrying large tools or equipment on their shoulders should pay particular attention to the workspace clearances.
- c. Cutter and screwdrivers should never be carried in a worker's pocket. In a toolbox, pointed down in a tool belt / pocket tool bag, or in the hand with the tip always held away from the body are all acceptable ways to carry them.
- d. Tools should always be put away, when not in use. Leaving tools on an elevated structure such as a scaffold, poses a significant risk to workers working below the elevated structure.
- e. Fabric cutting tools - Cutting tool guard must be correctly set in order to give the necessary protection to the hand positioning the material, otherwise it may have a risk of accidental cuts. Supporting and

maneuvering a cutting machine, while stretching across the cutting table, can present a risk of neck, upper-extremity and back disorders.

- f. Handling rolls of fabric, which can weigh up to 32 kg and must be lifted above the head onto a rack for spreading, also poses muscular hazards. Proper material-handling equipment can eliminate or reduce these risks.
- g. Sewing machine operators who operate in a seated position at poorly built workstations, executing the same operation throughout the workday with highly repetitive, time-pressured work are at a significant risk of acquiring musculoskeletal disorders. It is necessary to take proper precautions.
- h. Adjustable seats and worktables have the ability to reduce the dangers connected with using a sewing machine.
- i. Finishing workers, such as pressers, are frequently required to work standing and in static positions. Many of these occupations can benefit from the addition of chairs, stools, or sit-stand chairs. With a slanted mechanism, table tops may be adjusted to the correct height for the operator, allowing them to work in a more comfortable position. Hands, wrists, and arms can be relieved of some stress by padded table edges and appropriately made and sized equipment.
- j. Burns and ergonomic dangers can occur when using presses and irons. The majority of the presses are constructed with two-handed controls, which eliminates the risk of a hand becoming stuck in the press. Working on a pressing machine also puts you at risk for shoulder, neck, and back injuries due to repeated overhead reaching and standing while using the foot pedals. By properly situating the worker at the machine make this task safer and minimise the excessive stress.
- k. Ticketers who use manual ticketing guns to place tags on finished garments, are at risk of hand and wrist injury with highly repetitive operations. Automatic ticketing guns can decrease the force required to perform the operation, hence reducing stress and strain on the operator's fingers and hands.
- l. Many injuries in warehouse activities, such as lifting and overhead work, are caused by manual material handling. Mechanical material handling equipment such as forklifts and hoists, can reduce injuries caused by lifting heavy lifts. This can also be reduced by designing the distribution workplace with adequate material handling, such as positioning of conveyors and worktables at appropriate heights.
- m. Chemical exposure - Workers at every stage of apparel production may be exposed to the chemicals used in fabric finishing, the most common is formaldehyde. Formaldehyde releases into the air from fabric in the form of a gas. Workers may also have skin exposure to formaldehyde as they handle the fabric. Exposure to formaldehyde can be prevented by allowing

the fabric to blow off-gas in a well-ventilated area before it is handled. Workers must wear gloves or apply protective cream.

Instruction for Safety at work place are as follows:

1. Keep the work area clean, tidy, well swept/washed and well lit. Floor should be level and must have a non-slippery surface.
2. Do not remove any guarding device; before operating, the operator must ensure that guarding devices are in position and good working condition.
3. Before measuring, cleaning, maintaining, or adjusting the machinery, follow the lock-out procedures.
4. Check and adjust all safety devices before operation.
5. Wear appropriate personal protective gear as prescribed, including CSA-approved safety glasses with side shields.
6. Ensure that all cutting tools and blades are clean, sharp and rust free and should be able to cut freely without extra effort.
7. Ensure there is enough space around the machine for operator, maintenance team and cleaning staff to do their job freely.
8. Ensure that all stationary equipment /machines are anchored securely to the floor.
9. Maintain distance with the cutting head and all moving parts of the machine, to avoid any accident.
10. Avoid awkward positions and postures as sudden slips could cause the hand getting harmed by the cutting tool or blade.
11. Do not leave machines unattended: turn OFF the power, when not in use.
12. Avoid distracting the operator; horseplay can lead to hazard and injuries.
13. Wearing loose-fitting clothing, gloves, neckties, rings, bracelets, or other jewellery that could get tangled in moving parts is not a good idea. Long hair should be kept out of the way, and rags should not be used near the machine's moving parts.
14. Return all portable tools to their proper storage place after use.
15. Clean all tools after use.
16. Use a vacuum cleaner or a brush to remove any rag cuttings.
17. Do not use compressed air, to blow debris from machines or from worker's clothes.

18. Keep the tools out of the aisles and out of the way of other workers. Knives and scissors must be sharp; dull equipment pose a greater risk than sharp ones. Cracked saw blades must be removed from service immediately; else, an accident may occur.
19. In the presence of combustible substances, iron or steel hand tools may produce sparks, which could lead to an ignition. Spark-resistant instruments made of nonferrous materials should be used near flammable gases, highly volatile liquids, and other explosive chemicals wherever this hazard exists.
20. Because power tools can be exceedingly dangerous if handled incorrectly, they must be equipped with guards and safety switches. Electric, pneumatic, liquid fuel based, hydraulic, and powder-actuated power tools are classified according to their power source.

USE CORRECT LIFTING AND HANDLING PROCEDURES

Musculoskeletal problems often emerge from poor work place or job design. Among the most common risky activities are as follows:

- Heavy loads
- Difficulty in gripping
- Excessive use of force
- Repetition
- Twisting and other awkward postures.

Some of these problems can be prevented in following ways:

1. **Manual handling of fabric rolls often close to machinery**, e.g. lifting to and from store room, in storage and dispatch areas, shelves, racks, trolleys and stillage, in quality control areas, reduces the risk of hazard.



Fig.: 4.8 - Manual Handling of Fabric Rolls

- a. Mechanical methods of handling the rolls, for e.g. on a conveyor and mounting on roller tracks.
- b. Organize rolls according to weight, so that heavier rolls are stored at a convenient height for handling. Stackers with adjustable widths are ideal for lifting and lowering rolls in storage facilities. A roller track attached to the top of two support arms allows rolls to be passed easily to and from storage racks. The height of the trolley, which is supported by wheels, may be simply modified using a foot pump. The trolley is especially designed for transporting and moving rolls in the confined spaces of cutting section.
- c. Rolls exceeding a specific weight can be routed to a truck pick-up point for loading, while lighter rolls are diverted to a manual pick-up station, where personnel can pick up the roll before bringing it to the vehicle.

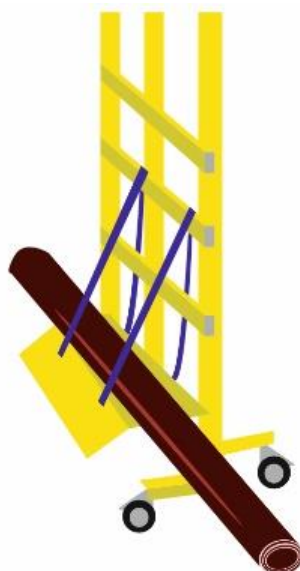


Fig.: 4.9 – Mechanical handling of fabric rolls

2. Handling loosely folded cloth at intermediate stages of the production process, e.g. moving cloth to or from machines, inspection and quality control areas, including lifting to or from weighing scales.

A lightweight 'stretcher-board' can be utilised to reduce the distance through which the load is lifted as well as increase its stability and give a more uniform distribution of weight between two lifters. It also helps with grip and the ability to implement the proper force during the lift.

3. Handling boxes –It happens mainly in delivery and storage areas, loading and unloading from vehicles. Suspended overhead rail system allows the load to move freely within the storage area. Pneumatic grippers grasp the box securely and scales built into a roller conveyor to compensate for the weight

of the load, allowing it to be moved with minimal effort. The device can be adapted to suit a range of different items and containers. Use of mechanized procedures reduces the risks.

4. **Lifting to and from bins, stillage, trolleys and machinery**- Trolley fitted with a self-leveling base can be used. As the material is removed, the suspended base rises, maintaining a constant height from which to lift an inner lining thereby preventing material from being caught in the springs.

5. **Working around machinery**- Use a mechanical handling device suspended from an overhead support or rail that grabs the package's centre and assists with lifting and manoeuvring by balancing and supporting the load.

6. Maintenance tasks can lead to some of the most hazardous handling operations. Flexible multi-purpose handling devices like tool-box trolley can be more practical during machine installation to minimize repetitive lifting of heavy loads at work place.

7. Do not attempt to lift by bending forward. Bend your hips and knees to squat down to load, keep it close to the body and straighten the legs to lift.

8. Any heavy object should never be lifted above shoulder level.

9. Avoid turning or twisting of body, while lifting or holding a heavy object.

10. **Work safely at height or in a confined space** - Plan work to be carried out at height. Plan steps to reduce the risks of all falls liable to cause personal injury or to anyone on the premises / site, e.g. employees, visitors and contractors. Make sure roofs, working platforms and walkways are safe.

MAINTENANCE OF TOOLS AND EQUIPMENT

A competent employee must regularly inspect, test and maintain the machine's guards and safety control system with reference to manufacturer's instructions. This will ensure the reliability and integrity of the safety system. Maintenance and repair program should specify –

1. Where, how much, what type of and how often servicing is required?
2. Responsible worker for conducting the repair and maintenance program.
3. What standards to be used for performance testing and evaluation?

4. Program should be reviewed regularly to ensure their effectiveness. Develop, implement and maintain an accurate record of maintenance.

Following are the suggestions for Maintenance of machinery and tools

1. Carry out cleaning according to schedules and limits of responsibility.
2. Workers should take all practical steps to make sure all hazardous machineries are switched-off, before any cleaning or maintenance is done and whether it is safe to clean, maintain and repair. Standard procedures must be followed by trained workers for these activities to be performed safely.
3. Establish and follow a safe work system.
4. The machine should run at the slowest practical operating speed for cleaning, loading and setting up.
5. Restrict access and control of danger areas to one person only.
6. Emergency stop controls can be set within immediate reach.
7. Employers should maintain and keep machinery in sound operating condition at all times. They can manage the maintenance using:
 - a. Preventive maintenance schedules.
 - b. Regular inspections.
 - c. Unsafe condition reports and feedback.
8. Carry out running maintenance within agreed schedules.
9. Carry out maintenance and cleaning within one's responsibility.
10. Report unsafe equipment and other dangerous occurrences.
11. Ensure that the machine guards are in proper place.
12. Use correct lifting and handling procedures for the tools and equipment.
13. Store cleaning equipment and tools safely after use.

Activities

ACTIVITY 1

Visit a Garment manufacturing firm, discuss with the safety officer / team and prepare a report on safety measures adopted by them.

Materials Required:

1. Writing material
2. Ruler
3. Adhesive
4. Camera for clicking pictures

Procedure:

1. Make a group of 4 students each.
2. Visit a garment manufacturing firm
3. Enquire about its safety measures.
4. Prepare a report of your observation with pictures.
5. Submit the report to the teacher for evaluation and feedback.

Check Your Progress**A. Write TRUE/FALSE the following:**

1. People who rush around in the work area tend to decrease the likelihood of an accident.
2. Accidental cuts can be prevented if the expertise of using a cutter has been mastered.
3. Equipment mounting brackets, signages and control boxes can not be checked regularly to see if sharp edges are present.
4. Mechanical material handling equipment such as forklifts and hoists, can reduce injuries caused by lifting heavy lifts.
5. Workers should take all practical steps to make sure all hazardous machineries are switched-off, before any cleaning or maintenance is done and whether it is safe to clean, maintain and repair.

A. Write short answers for the following:

1. Enlist precautions which are taken while handling sharp objects.
2. What is safety? Why is safety important while working with machines?

Session 4: Effective Oral and Written Communication at Workplace

Effective Oral and Written Communication not only helps in communicating one's thoughts clearly and concisely, but also to create focus, energy, and passion. Clear messages help to build trust and integrity between the writer and the reader. Well-written communication helps to define goals, identify problems and arrive at solutions. Employees must clearly write and talk so that other staff understand the situation without confusion.

Effective writing allows the reader to thoroughly understand everything that one is not able to say. Listening, reading, writing and talking are collectively known as effective communication skills. Good communicators have a wide range of skills and are able to adjust their communication style in response to the many variables they face at a given time.

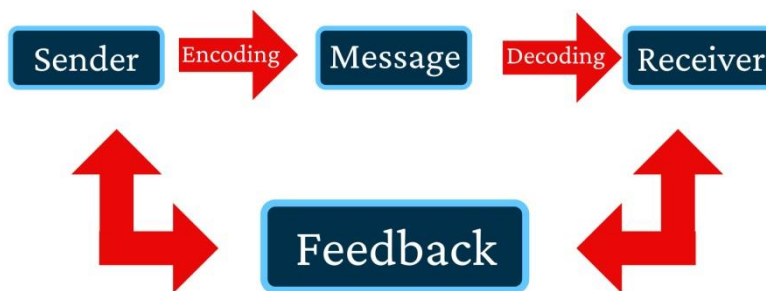


Fig : 4.10 – Communication Process

The Communication Process includes the following:

1. Sender

The sender bears the responsibility for ensuring that the message is understood and that the expectations for deliverables are clear. The sender should also consider any obstacles that may prevent the recipients from understanding the message. Languages, ethnic cultural beliefs, degree of education, and/or experience are all barriers.

2. Message

Verbal, non-verbal and written communications are affected by the sender's tone and method of communication. While sending a written message, the sender must be sure that it is professional, precise, clear and in simple language. Written communications are open to interpretation by receiver. Proof the written communication for typographical errors, grammar,

punctuation and sentence structure to reduce the chances of miscommunication.

3. Method and Environment

Messages are conveyed through channels. These channels are affected by the method and environment which is chosen to communicate. All written communications are one-way communication, as there is no opportunity for people to ask questions, provide feedback, express concern or gain clarification during or immediately after communication.

4. Receiver

Messages are delivered to the concerned receivers. Receiver enters into the communication process with ideas and feelings that influence his understanding of the message and send their response.

One of the indicators of a high-performance culture is open communication in the workplace. Workplace communication is the process of exchanging information and ideas within a company. Effective communication, on the other hand, occurs when a message is sent and received correctly.

a. Effective communication at workplace is center of all business goals. Its benefits are :-

- It avoids confusion
- It provides purpose
- It builds a positive company culture
- It creates accountability

b. Skills that employers mostly seek are:

- Oral communication
- Listening
- Written communication
- Public speaking
- Adaptability

c. The importance of good communication at workplace

At all levels of an organisation, effective communication is critical to attain productivity and maintaining healthy relationships. Employers who devote time and effort to establish open lines of communication will quickly gain employee trust, resulting in increased productivity, output, and morale. Employees should be able to effectively communicate with their co-workers, managers, and customers. The message is the outcome of the encoding, which takes the form of verbal, nonverbal, or written language.

THE LINES OF COMMUNICATION, AUTHORITY AND REPORTING PROCEDURES AT WORK PLACE

Lines of communication can include a chain-of-command that requires employees to communicate only with their direct superior. Workplace communication is the process of exchanging information and ideas, both verbal and non-verbal, between one person/group and another person/group within an organisation. To establish and manage, various lines of communication within a business is essential so that all workers and managers can contact the communicator, for example a manager communicating to an employee and an employee to a customer. Protocol is a set of guidelines regarding the chain of command for how various members of an organisation must communicate with each other.

1) Owner to Manager

The company owner provides directions to manager as well as any update or news he wants to give employees through manager.

2) Manager to Employee

Managers must delegate specific duties to workers and provide directions about work projects. A manager commonly communicates through regular meetings with the entire department. Manager may also schedule yearly employee review sessions with individual workers to discuss performance and productivity.

For example a flow chart of reporting and conducting maintenance in an industrial set-up is given as below:

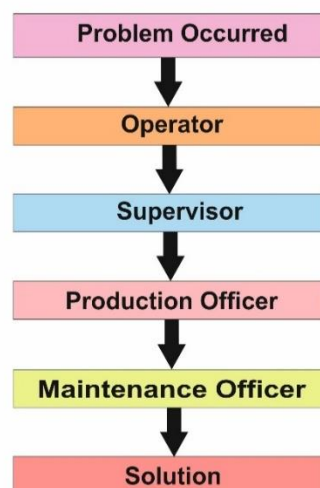


Fig.: 4.11 - Flow Chart of Maintenance

3) Employee

A line of communication is also established between employees / managers and outside business contacts. Certain employees of a manufacturing unit

may have to communicate directly with representatives of companies to supply raw materials, submit orders or request information.

4) Communication with Customers

Possibly the most important line of communication at a business is between the employees of a business and its customers. In some cases, certain employees are authorized to speak to clients for business contacts.

Reporting procedures at work place

Effective communication in the workplace is imperative in a leadership role. Having effective communication skills is the key to good leadership. In turn line of communication begins in descending order, i.e. reporting procedure begin from customers to employee, employee to supervisor, supervisor to manager and from manager to industry owner.

Ways of reporting procedures for effective communication at workplace are as follows:-

1. Open Meeting

It is easier to communicate in the work place situation via open meetings. In this kind of forum, workers will hear, see and feel it. This oral communication is one of the best approaches to communicate effectively with a team.

2. Emails

In official settings, written communication via email remains potent. It will enable to pass messages to the members of the team without pulling them out of their workstations.

3. One to One

Workers understand better when we talk to them on a one-to-one basis. Ensure to maintain eye contact with them to enable the message to sink in.

4. Create a Receptive Atmosphere

To effectively communicate with the team, one must create an interesting atmosphere which is open for communication.

5. Display Confidence and Seriousness

Ensure that one must display confidence and seriousness because if team members notice any uncertainty and lack of seriousness while communicating with them, they are likely to treat the information with disregard.

6. Use Simple Words

To be effective in the communications with the team members, use words that are easily understood.

7. Use Visuals

Place visuals at strategic positions around the work place of the team. Delivering messages both through sight and sound gives room for better comprehension.

8. Listen to the Team Members

Encourage team members to open up so that the leader can be well informed while communicating with them.

9. Use Body Language

The message will be conveyed much more quickly and effectively through body language. When communicating with your team, master the skill of utilizing body language. Smiles, handshakes, and eye contact should all be used.

10. Use the Appropriate Tone of Voice

Use the appropriate tone of voice to communicate the message to the team so that the message is not misunderstood and discourage / frighten the receivers. Voice modulation in such scenarios help to be beneficial.

11. Be clear

Being clear to communicate to the team members makes it easier for them to understand the message. Make a message to the point for better comprehension. Keep the focus of point to be conveyed straight forward.

12. Encourage Feedback

Do not just talk and walk away, give room for feedback so that one can measure the effectiveness of the style of communication. It will also afford the privilege of knowing if the message was well understood.

13. Gesticulate

Use the hands to demonstrate the message. Make hand motions and signals to establish the seriousness of the subject matter while communicating with the team members.

14. Be Appreciative

Always remember to thank the listeners for their time after each communication session. Working hard on these communication strategies and establishing ground rules to keep everyone up to date will ensure a smooth project conclusion. Lines of communication make it easier to not only

express the information effectively, but also to respond quickly in order to avoid missed opportunities or late work delivery.

THE IMPORTANCE OF COMPLYING WITH WRITTEN INSTRUCTIONS

A written communication is always put into writing form and used when the audience is at a distance or when record is required or where its preservation is essential and required as an evidence. It is in the form of instruction, orders, rules and regulations, policies, procedures, posters, memos, reports and information bulletins.

The importance of written instructions is mentioned as below:

1. It keeps evidence of what has occurred or what was stated.
2. It keeps permanent record for future use.
3. It reduces the chances for misinterpretation and distortion of information.
4. It is more reliable when transmitting lengthy information on financial, production or other important data.
5. It provides an opportunity to put up their grievance in writing and get it supported by facts.
6. Comply with industries written instructions
7. Carry out work functions in regulatory and accordance with legislation and organisational regulations, guidelines and procedures.
8. Seek and obtain clarifications on policies and procedures, from the authorized person.
9. Apply and follow the policies and procedures within work practices.
10. Provide support to the supervisor and team members in enforcing these considerations.
11. Comply with health and safety and security related instructions applicable at workplace.
12. Use and maintain personal protective equipment as per protocol
13. Carry out own activities in line with approved guidelines and procedures.
14. Writing Care Instructions

Care instructions should be written in the form of notices or signages to help employees remind of care or caution to be followed with regard to machinery or wet floor or any hazardous situations.

Equipment operating procedures/manufacturer's instructions

The manufacturer of machines, as well as the operator, both should take all technical and organisational measures, in order to ensure the safety of machine operators. It includes the general rules for approaching safety issues that should be taken into account by machinery designers in the design process e.g. inherently safe design, safeguarding and protective measures, information for use, mode of application, conformity assessment procedures etc. Use of machine operating manuals should be encouraged to employee designated to use particular machine.

Implementation of safety measures by the manufacturer

The manufacturer of machinery should eliminate hazards or reduce risks associated with these hazards by applying safety measures in the following order:

1. Inherently safe design

Hazard can be eliminated through the right choice of the machine design and features and minimizing personal exposure to hazards, through reduction of the number of un-necessary interventions within the danger zones. All accessible parts of the machine should have no sharp edges, sharp corners, rough surfaces, protruding parts, etc. Many hazards of the machine can be eliminated by means of choosing proper shapes and employing proper arrangement of mechanical parts.

2. Safeguarding

The hazards that cannot be eliminated using the inherently safe design approach should be reduced by means of the application of guards or protective devices. Covers, doors, fences, etc. also perform guarding functions. Guards should be difficult to remove or switch off, situated at a proper distance from the danger zone and allow performance of required operations like installation, tool changing or maintenance, guard locking, providing only limited access to the area where the operations are to be performed and without the necessity for removal.

3. Protective device

Protective devices that do not create actual physical barriers perform their protective functions by means of generating a signal that stops a dangerous motion of a given machine element. When it is impossible to apply guards, sensitive protective devices are used to reduce risk. There are several types of these devices. Optoelectronic protective devices such as light curtains,

scanning devices like laser scanners and pressure-sensitive devices, mats, trip bars, trip wires etc. are often used.

4. Functional safety of machinery control system

If failure of a control function performed by a control system can result in an immediate increase in risk, then this function is named a “safety function”. Generally, safety functions can be implemented for the reduction of risk associated with the improper machine operation, failure of technological processes and mechanical hazards.

The safety functions included in manufacturer’s instructions are:

- a. Safety-related stop function initiated by a safeguard
- b. Manual reset function
- c. Start/restart function
- d. Local control function
- e. Muting function
- f. Monitoring of safety-related input values
- g. Response time
- h. Monitoring of safety-related parameters such as speed, temperature or pressure
- i. Reaction to fluctuations, loss and restoration of power sources.
- j. Common cause failure factor
- k. Components and elements to achieve emergency stop function
- l. Measures for escape and rescue of trapped persons
- m. Measures for isolation and energy dissipation
- n. Provisions for easy and safe handling of machines and parts
- o. Measures for safe access to machinery.

3. Information for use

Despite the adoption of measures for inherent safe design, safeguarding and protection, the user is informed about machine design and their parts, running and maintenance of machine.

- a. The information may be in the form of accompanying documents and instruction manual, on the machine itself, on the packaging and by other means, such as signals and warnings outside the machine. Information and warnings on machinery is provided in the form of readily understandable

symbols or pictograms. The operator must have facilities to check the operation of the warning devices all the time.

b. Visual signals, such as flashing lights and audible signals such as sirens may be used to warn of an impending hazardous event, such as machine start-up or over-speed.

c. All the necessary markings on machine itself

- For unambiguous identification,
- In order to indicate compliance with mandatory requirements,
- For safe use.

d. The instruction handbook or other written instructions includes all information for safe commissioning, operating, adjusting and maintenance of the machine.

e. Implementation of safety measures by the user of machinery and work equipment. Work equipment should be properly adapted to the work without impairment to their safety or health.

6. Additional safeguarding

The employer should ensure that work equipment is installed, located and used in a way ensuring that the risks to the operators and other workers have been reduced. In particular, sufficient space between moving parts of work equipment and fixed or moving parts should be allowed with movable guards or protective devices.

7. Use of personal protective equipment

Technical safety measures comprise personal protective equipment. These are devices or equipment designed to protect worker against single or multiple risks that may affect health or safety at work.

Personal protective equipment also comprises

1. A unit constituted by several devices or appliances which have been integrally combined by the manufacturer for the protection of an individual against one or more simultaneous risks, e.g. a helmet coupled with a visor and/or hearing protection.
2. A protective device or appliance combined or separately, with personal non-protective equipment worn or held by an individual for the execution of a specific activity e.g. clothing or knee protectors included in trousers used for performing work while kneeling.

3. Personal protective equipment should include the items such as:
- 1) Clothing - Well-fitted pants and jackets with all buttons fastened. Sleeves should be close fitting, hair nets and Aprons made of non-combustible and flame-resistant materials.
 - 2) Footwear – Approved and sturdy footwear with non-slip sole and a closed toe and closed back.
 - 3) Hand protection - Natural rubber latex gloves, synthetic rubber gloves, and vinyl gloves or thick plastic gloves.
 - 4) Eye protection - Safety goggles or masks
 - 5) Respirators - Properly fitted to provide the best protection from inhaling harmful fumes or vapours.

8. Work organisation and procedures

Proper work organisation is important in ensuring safe operation of the work equipment. All operations should be performed according to established safe working procedures. The employer should take necessary measures to ensure that the use of work equipment is restricted solely to persons given the task of using it. Written permission for conducting high risk works should be issued namely, repairs, modifications, maintenance or servicing.

SUGGESTIVE STANDARD OPERATING PROCEDURES OR INSTRUCTIONS

a. SOP for machine inventory including spares, tools and tackles.

- Receipt of material against packing list/indent.
- Machine taken for installation as per requirement.
- After installation machine is numbered. Record is to be maintained in Asset register / computer excel sheet.
- Machine is not issued to production until the numbering is complete.

b. SOP for machine installation

- Arrange the related person from agencies to install the machine.
- After installation arrange to train production from company technician.
- Hand over the bobbin/bobbin case or related material use to run machine to production department.

c. SOP for maintenance of utilities - air/water/steam related

- Making indent for materials for installation.
- After receiving of materials from vendors, installation from vender.
- Looking After the maintenance of Steam Generator and Air compressor.

- Operating of steam generator and air compressor in shift timing.

d. SOP for machine's preventive maintenance

- Preventive maintenance schedule is prepared.
- As per schedule, preventive maintenance is done and record is maintained
- All weighing scales shall be calibrated once a year and certificate is obtained.
- Maintenance department shall inform the purchase department regarding renewal of AMC (Annual Maintenance Contract) at least 1 month prior to its expiry.

e. SOP for machine breakdown maintenance

- Breakdown intimation is received from concerned department.
- Breakdown maintenance is done considering type of fault.
- Record of breakdown maintenance is maintained in the breakdown maintenance register.
- Electrician repairs all electrical faults and maintains a register for electrical repair and breakdowns.
- A machine history record shall be maintained for all machines.

f. SOP for calibration of measuring instrument & Light Illuminations record

- Any machine having measuring instrument should be calibrated yearly.
- The calibration check list shall be maintained for all such instruments.
- The maintenance in charge shall keep the certificates of calibration in a file.
- Actual date of calibration shall be maintained in the machine history sheet.
- Monthly light illumination shall be recorded in all working area on the production floor.
- At least once in 6 months, illumination checking is done and record is maintained

Activities

Activity 1:

Prepare a graphical poster on SOP instructions.

Materials Required:

1. Writing material
2. Ruler
3. Adhesive
4. Camera for clicking pictures

Procedure:

1. Based on your understanding, prepare a graphical and interactive poster on SOP instructions.
2. Display the same in your class.

Check Your Progress**A. Fill in the Blanks:**

1. Well-written _____ helps to define goals, identify problems and arrive at solutions.
2. Verbal, non-verbal and written communications are affected by the sender's _____ and _____ of communication.
3. Use of _____ manuals should be encouraged to employee designated to use particular machine.
4. When it is impossible to apply guards, _____ devices are used to reduce risk.
5. Written permission for conducting high risk works should be issued namely, _____ or servicing.

B. Write short answers for the following:

1. Which are the ways to create effective communication at workplace?
2. What are SOPs? Briefly enlist SOP for maintenance of a needle detector machine.

Module 5**Health, Safety and Security at Workplace****Module Overview**

Health, safety and security are one of the most important aspects of human concern at the workplace.

Therefore, we should aim at building a working environment which provides and maintains highest degree of physical, mental and social well-being for workers in all occupations.

Industries and organisations should focus on health and safety related practices at workplace and should ensure availability of all the basic facilities like safe and clean drinking water, clean rest rooms, proper ventilation and lighting facilities etc.

With the advent of technical advancements in the form of imported machineries and others services in the apparel industry, we should give more emphasis on the principles of ergonomics and occupational psychosocial factors.

Thus, the benefit of maintaining occupational health, safety and security are:

- i. Reduced work related injuries
- ii. Make the working conditions healthy and safe in the interest of workers, employers, as well as the public/society at large
- iii. Reduce the risk of potential accidents and emergencies
- iv. Preparedness with suitable responses to accidents and hazards
Hence, workers should be trained to identify and report to seniors/supervisors or any other authorized personnel in case of any malfunctions in machinery and equipments, emergencies and take necessary corrective actions for the same.

Learning Outcomes
After completing this module, you will be able to: <ul style="list-style-type: none"> • Analyze Compliance to health, safety and security requirements at workplace • Explain Potential safety risks and emergencies • Identify and report malfunctions in machinery and equipment or any other hazard at workplace • Explain reporting emergency situations
Module Structure
Session 1: Compliance to health, safety and security requirements at workplace
Session 2: Potential safety risks and emergencies
Session 3: Identifying and reporting malfunctions in machinery and equipment or any other hazard at workplace
Session 4: Reporting emergency situations

Session 1: Compliance to Health, Safety and Security Requirements at Workplace

Safety and security of the workplace greatly depends on the enforcement of safety policies and rules of the industry which also ensures compliance with health and safety standards. Compliance is obtained through specific efforts made to reduce the risk of potential hazards and accidents at the workplace. It is increasingly observed that the health, safety and security of workers are subject to a variety of risks. Inculcation of safety culture in the working environment along with strict guidelines on safe work procedures significantly reduces the risk of potential hazards/accidents.

HEALTH AND SAFETY RELATED PRACTICES APPLICABLE AT WORKPLACE

Apparel industry is a labour oriented industry. Workers are the main resources and all companies must follow certain practices applicable at workplace for maintaining health and security of their workforce.

Following points must be taken care–

- Ensuring availability of fully stocked first aid boxes at every designated location according to the floor plan/layout.
- Fire extinguishers should be placed at clearly marked areas at regular intervals



Fig.: 5.1 (a & b) - Health and safety related practices

- It is advisable to maintain an accident register. This helps in record keeping of various accidents, their causes and the damages. The information in accident registers can be useful in prevention of accidents in future.
- Factories should ensure proper positioning of emergency lights on work floor leading the pathway to exit.
- It is essential to ensure that all fire-fighting equipment such as extinguishers are regularly inspected and kept in good working order.
- Exit signs should be clearly marked and displayed.

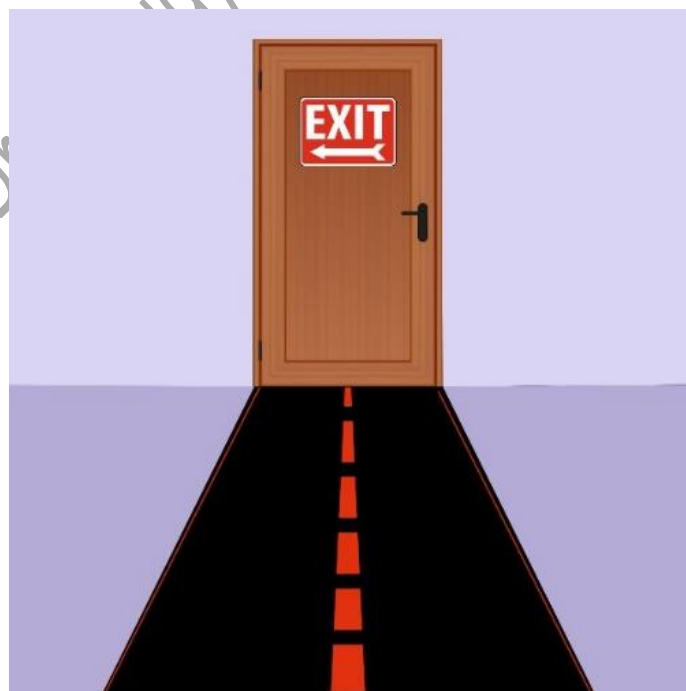


Fig.: 5.2 - Exit Sign

- Yellow lines should be marked on the factory floor to demarcate the pedestrian pathway from the space allocated for machines.



Fig.: 5.3 – Yellow Demarcation for Pedestrian Pathway

- Aisles should be designed wide enough and should not have any obstruction in between to prevent any accidents during movement of men and material.
- Cables /Wires should never be left loose or visible hanging at the floor.
- Proper lighting with well-distributed artificial light to ensure effective use of available daylight should be arranged.
- Good general ventilation plus local exhaust ventilation to remove air contaminants at the source should be ensured.
- A clean lunch room commonly called as canteen area for employees to have their meals should be allocated.
- Oily floors are a common cause of accidents and fire hazard. Splash guards and drip pans should be installed wherever oil spills or drips may occur. Prevent accidents by keeping oil and grease off the floor.
- Adequate supply of clean and pure drinking water must be ensured for all workers.
- Workers should be encouraged to use mask and gloves wherever required.
- Provision must be made for clean washrooms/restrooms for workers and staff members
- Mock drills must be performed with the workers at regular intervals for them to be prepared in case of any spills, fire, and explosion.
- It is advisable to carry out the regular maintenance of the factory if something gets broken or damaged. It must be ensured that same be replaced or immediately corrected/fixed, for example - defective ladders, broken handrails, steps, etc.
- Factories should have a provision of regular maintenance programmes like inspection, lubrication, upkeep and repair of tools, equipment, machines and processes.

Compliance to health, safety and security requirements at workplace will help in eliminating risk related to potential accidents and hazards caused by unfavourable conditions and thus, will lead to efficient, smooth and uninterrupted production cycle and safe and secure work environment.

ACCESS TO CLEAN DRINKING WATER AND SANITARY FACILITIES

Welfare facilities like access to clean drinking water, hygienic and well ventilated wash rooms or rest rooms are a vital part of good working conditions in an industry.

Clean Drinking Water –

Provision of safe and clean drinking water, beverages or an adequate meal is mandatory for a healthy workforce.

Availability of clean drinking water is indispensable for all workers. Mostly in hot weather conditions a lot of water is lost from the body in the form of sweat or evaporation. If appropriate arrangements are not provided then the workers might have to make the arrangements by themselves or leave the workplace often in search of clean and safe drinking water.

In case of impure or contaminated water being made available for the workers, it can be a cause of frequent transmission of diseases among them. If the workers get dehydrated, they can be tired, exhausted or fatigued and will be less productive in their outcome. Thus, provision of clean and pure drinking water should be made near the workstations. Preferably, cool drinking water must be provided specially in hot weather conditions. For example - Arrangements of water coolers or water dispenser with clean and cold drinking water can be done at regular intervals near the workstations.

Sanitary Facility –

All industries must ensure appropriate sanitary facilities for workers within the working premises. Hygienic and disinfected toilets/restrooms are very important. It is also requisite to equip adequate number of washrooms as per the number of workers/staff working in an industry and ensure their maintenance and cleanliness.

To ensure mental and physical well-being of workers and to prevent spread of any diseases within the working premises, it is vital to have proper sanitary facilities. These facilities also helps in improving rate of production as healthy workers are more efficient in their working and it simultaneously leads to lower rates of absenteeism within the workforce.

Therefore, developments in sanitary facilities should be undertaken and materials incorporated should be durable, easy to clean and quick drying likes tiles. Frequent cleaning and maintenance of toilets is also recommended.

The following points must be considered-

- i. Sanitary facility must be within easy access from the work site.
- ii. These facilities must be well enclosed, well lit and adequately ventilated.
- iii. Proper supply of toilet paper and other hygiene supplies must be ensured.
- iv. It must be equipped with a covered garbage bin.
- v. Hand claning facility like a wash basin along with soap and a sanitary way to dry hands must be installed in every single toilet facility.

Activities

ACTIVITY 1

Prepare a report on various types of health and safety related practices applicable at a work place. Place it a file and submit the same.

Materials Required:

1. Writing material
2. Adhesive
3. Ruler

Procedure:

1. Visit an apparel industry, learn and understand about the health and safety related practices being followed.
2. Make a report on the same.
3. Submit the report in your class.

Check Your Progress

A. Fill in the Blanks:

1. _____, safety and _____ are one of the most important aspects of human concern at the workplace.
2. _____ should be placed at clearly marked areas at regular intervals.

3. Factories should ensure proper positioning of _____ lights on work floor leading the pathway to exit.
4. _____ floors are a common cause of accidents and fire hazard.
5. _____ leads to lower rates of absenteeism within the workforce.

B. Write short answers for the following –

1. Mention points that must be taken care for maintaining health and safety related practices at workplace. (Any Five)
2. Write about the importance of having access to clean drinking water and sanitary facilities at the workplace.

Session: 2 Potential Safety Risks and Emergencies

Safety risks are chances of any detrimental or unfavourable result/outcome or anticipated losses (For example – Deaths or injuries caused due to malfunction of a machine in a factory) caused due to natural or human induced causes.

Emergency is an unforeseen and unexpected incident demanding instant/immediate response. It may be caused due to natural, technological or human causes/forces.

Preparedness against any potential safety risk or emergency is essential to protect the workers against any damage of life and property. The impact of any emergency crisis can be substantially reduced by active participation of employees and employers in safety related practices at workplace.

RESPONSE TO POTENTIAL ACCIDENTS AND EMERGENCIES

Ergonomically designed work areas have several benefits like:

- Increased human comfort
- Reduced stress and fatigue
- Increased workers rate of production
- Reduced risks of potential accidents/hazards.

Some of the factors that must be considered to be prepared are as follows –

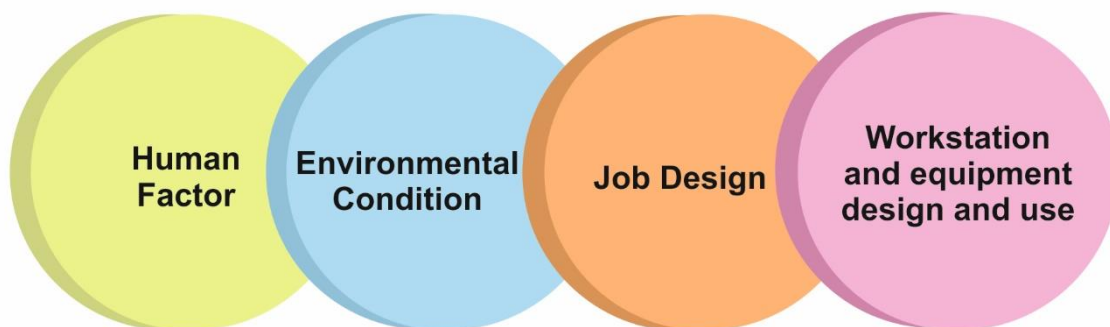


Fig.: 5.4 – Factors Responsible for Potential Accidents

- **Human factors**

Major human factors that affect are:

- Physiological
- Psychological
- Physical
- Cognitive

Human factors mostly include all physiological and psychological factors. Workers dimensions like reach, posture and strength must be considered while considering the human factors. Physical injury can cause a negative impact on employee's work performance and lead to increase cases of absenteeism. Cognitive factors equally affect the job performance. For Example – Lack of proper guidance and feedback from supervisors or lack of autonomy can often cause stress and result in lack of motivation among workers to perform well.

- **Environmental conditions**

Environmental Conditions in particular like proper lighting facilities, sound & vibrations, extreme temperature, humidity and poor air quality may affect the workers performance. Undesirable and unpleasant levels of a fore mentioned condition can be detrimental to workers health and safety.

- **Job Design**

A job must be designed keeping in mind the anthropometric characteristics such as age, gender, height, weight and ethnic differences. Proper use of ergonomics is advised as tasks can be either static or dynamic. Static tasks need a sustained position which can cause stress and pain in the lower back, neck and shoulder areas. Whereas, dynamic tasks require continuous body movements, very fast movements can cause fatigue, pain, weakness and sometimes lead to injury if performed with excessive force. Poor job designs and lack of proper training to workers can often be cited as an underlying cause of injuries among workers.

- **Workstation & Equipment Design and Use**

A workstation should be designed keeping in mind factors such as workable heights, placement, reach, requirements and postures. Adjustable equipments make it possible to adapt it in accordance to individual requirements. Tools and equipments must also have flexibility of usage and it should not force the workers to use an unnatural body posture or motion while using it. All equipments and workstation should work together in a well-coordinated system to ensure a smooth flow of production and safety of workers.

The following points are mostly the main sources of accidents at the workplace

- Spills
- Slippery surfaces
- Obstructions (Unclear Pathways)
- Broken equipments/tools.

- Machineries which are not regularly checked/maintained and kept unrepaired.
- Areas lacking safety signages (Fire and Emergency Exits)

Therefore, workers and employers must take collective active measures to adhere to an accident prevention plan. The following points must be considered to strengthen the safety practices at work and be prepared with response to any emergency situation –

1. Regular programmes and training sessions must be conducted on safety related practices at workplace for workers. It can be held in the form of mock drills for evacuation during fire hazards or any chemical spills, quick response training during accidents/emergencies etc.
2. Ensuring installation of proper lighting system, to have a well-lit and clear visible job site/ workstation, to avoid any potential risk associated with darkness around the workplace.

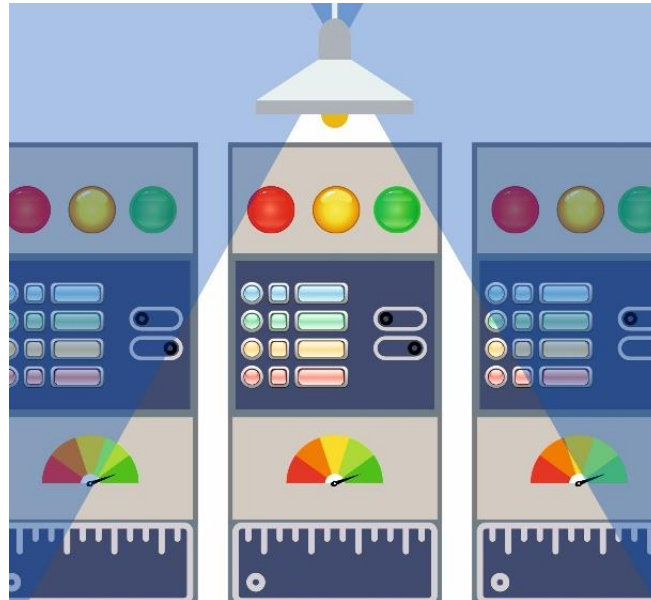


Fig.: 5.5 – Proper Lighting System

3. Clearly visible and demarcated safety signs must be placed/ installed wherever necessary, which will help in clear identification of hazardous areas and associated risk like obstacles in pathway, toxic chemicals being stored, slippery floor, emergency exit doors etc.
4. In case of a chemical or any hazardous spill, ensure to always suppress and hold the spill and always keep the cleaning equipment at an easily accessible location.
5. Ensure to conduct routine audits and checks for all potential safety hazards and emergencies to prevent any actual loss.
6. In case of an emergency/ accident, evacuate the premises and helps fellow workers in need.

7. Proper ventilation facilities must be ensured throughout the working place to avoid inhalation of any toxic chemical or foreign particles by the employees at the time of any chemical leak.

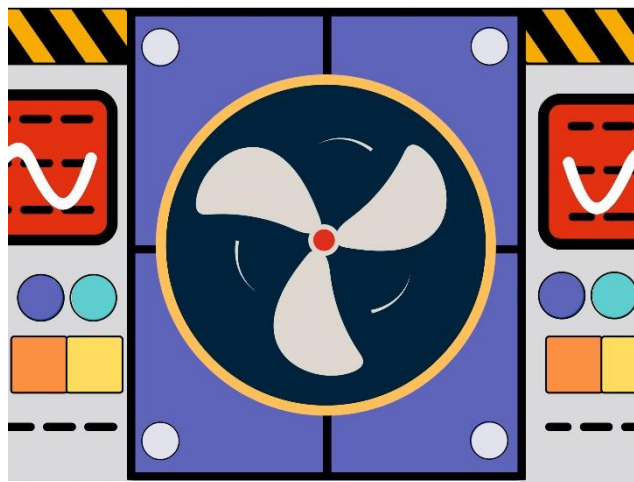


Fig.: 5.6 – Proper Ventilation System

8. Workers must be instructed to follow all the rules with regards to the attire/uniform permitted for their job role. For example- Workers working in the dyeing unit must wear slippage resistant shoes to prevent any fall or trips which can lead to injury.
9. Employees in an apparel or home furnishing industry need to spend long hours in the sitting posture which can cause soreness in back and reduced circulation in legs. Therefore, to avoid any pain or injury, adjustable chairs must be provided to ensure easily adjustable heights, seat tilt and backrest positions.
10. Chairs with a cushioned/contoured seat, which distributes the worker's weight ensuring no body part feels all the pressure must be preferred.
11. To minimise awkward body postures, chair should also be placed at an appropriate distance from the workstation, so that the workers can perform their tasks without stretching their elbows away from the body.
12. Workstation design must ensure that all the tools and materials are positioned to reduce risk of tilting too far or leading to an awkward body position. It can increase the level of stress/strain in arms, shoulders and the neck. This greatly increases the risk of injury which can be avoided by proper preventive actions and adhering to ergonomically designed principles of work.
13. Workers who need to stand for prolonged hours must be provided with anti-fatigue mats. These mats help in better circulation and reduce fatigue in lower body parts.
14. Emphasis should be given on frequent short breaks to stretch and change body positions. It allows legs, back, neck and eyes to rest in between long

working hours. Shorter breaks often reduce the risk of discomfort, fatigue and injury among the workforce.



Fig.: 5.7 – Correct Body Positions

MAINTENANCE AND STORAGE OF PROTECTIVE EQUIPMENTS

An effective system of maintenance and storage of protective equipments and tools is crucial to provide the level of protection they are intended or designed for. Therefore, one must always maintain an inspection schedule for all the protective equipments and tools including its shelf life. Inspection must include thorough check against any breaks, tears or any other visible sign of damage.

Maintenance also includes cleaning, examining, repairing, testing and replacing (in case it cannot be repaired) tools and equipment on a scheduled basis. Some Examples of Protective equipment are – Gloves, masks, protective helmet, safety shoes/boots, protective eye wear, ear plugs etc.

Adequate and proper storage facilities for storing of all protective equipments and tools when not in use is must. Employers must provide for a clean and safe place for the same. For example – Pegs for hanging clothing or safety helmets, case for safety glasses, a zip lock bags, shelves or racks for storing of ear muffs, gloves, masks etc.

The facility of storage must be appropriate and sufficient to protect the protective equipments from any kind of contamination, loss or damage due to coming in contact of water or sunlight. The place should be dry, clean and well sanitized and should also not be subjected to extreme temperatures.

It should protect the equipments against ageing and damaging. For hygiene purposes, one must consider separate storage from ordinary clothing storage in cases where protective equipments may become contaminated during use.

Duties of the workers in respect to protective equipments –

- All the protective equipments must be worn by the workers in accordance to the work requirements and instructions provided.
- Workers must ensure that all the protective equipments must be stored back carefully to their designated/ allocated storage areas after use.
- All the protective equipments must be inspected before use and any defect observed must be reported to the supervisor.
- It is the responsibility of the worker/employee to take due care of the protective equipments provided to them and do not make any modifications to the same them unless and until they are authorized and trained for its maintenance activities.



Fig.: 5.8 – Proper Storage Facility for PPEs

Activities

Activity 1

Prepare a chart with details of potential hazards and their possible solutions applicable at a workplace.

Materials Required:

1. Writing material
2. Coloured pencils/pens
3. Eraser
4. Ruler

Procedure:

- Collect information about the potential hazards and their possible solutions applicable at a workplace.

- Take a chart paper and prepare the chart by placing the collected information on it.
- Display the chart in your classroom.

Check Your Progress

A. Fill in the following blanks –

1. _____ is an unforeseen and unexpected incident demanding instant/immediate response.
2. _____ to a worker can cause a negative impact on his/her work performance and lead to increase cases of absenteeism.
3. A _____ should be designed keeping in mind factors such as workable heights, placement, reach, requirements and postures.
4. To minimise awkward body postures _____ should also be placed at an appropriate distance from the workstation.
5. Shorter _____ often reduce the risk of discomfort, fatigue and injury among the workforce.

C. State whether the following statements are True/False.

1. Tools and equipments should not have flexibility of usage and it should force the workers to use an unnatural body posture or motion.
2. Workers and employers must take collective active measures to adhere to an accident prevention plan.
3. Safety signs must not be displayed clearly.
4. Routine audits and checks for all potential safety hazards and emergencies are not necessary.
5. Workers must be instructed to follow all the rules in regard to the attire/uniform permitted for their job role.
6. Emphasis should be given on frequent short breaks to stretch and change body positions.
7. The facility of storage for protective equipments must be appropriate and sufficient to protect the protective equipments from any kind of contamination, loss or damage.
8. Workers must not ensure that all the protective equipments must be stored back carefully to their designated/ allocated storage areas after use.

Session: 3 Identifying and Reporting Malfunctions in Machinery and Equipment or any other Hazard at Workplace

Identification of malfunction in machinery/equipment or any other hazard at a workplace is an indispensable component of the health and safety management system. It is the first step in development of the safety procedures for prevention and controlling of any hazard.

A hazard is a source of any potential damage.

Identification of hazards includes the following:

- Identifying both existing and prospective workplace hazard
- Assessing or calculating the risks involved
- Determining and implementing the control measures
- Reviewing the situation

Workers must be trained to identify all the possible hazards associated with their job role and also know the control measures during an emergency situation to prevent any injury to people, property or environment from the same.

Workers must follow all the safety practices which comply with the standard operating procedures. They must regularly check/inspect the workplace, equipments, machines, tools for any abnormal changes, conditions or unanticipated emissions/leaks for identification of any perilous conditions. In case of an unsafe condition they must report them to their supervisor or authorized personnel and collectively work towards resolving the same.

Workers are exposed to various potential hazards while working near or on a machine. There is a risk of injury caused due to entanglement, friction or abrasion, cutting, stabbing or getting trapped in the moving parts of the machines. Therefore, it is suggested that workers must follow guidelines related to dress code/uniform/using protective equipments and safe working practices applicable while working near or on a machine.

Risk is also associated with noise, vibrations and radiations generated by the machines. Levels of the aforementioned must be monitored to prevent any health issues among workers. Workers must be also able to identify and

report any sparks or loose fitting which can cause fire accidents or electric shocks, over speeding or under speeding of parts of machines etc.

The following points must be checked for identification of possible hazards linked with machines, equipments, tools and services –

1. Identify use of the machine by considering the following points-
 - Cycle time & rate of production.
 - Intended use of the machine.
 - Different types of materials being used on it.
 - Amount of force being generated.
 - Range of motion or moving parts of the machine.
2. Identification of space required by the machine for safe operation of all tasks including access for maintenance and repairs.
3. Identifying the environmental limits of the machine such as the operating temperatures, humidity levels, and noise generation level.
4. Consideration of all the tasks performed by and on the machine such trial runs including
 - Regular operations
 - Change of tools
 - Scheduled maintenance of machine
 - Recovery from crashes/timeouts.
5. Identification of operation/ motions of machine such as –
 - Parts of the machine which are movable.
 - Range of motion of moving parts.
 - Type of motion (e.g., rotation, shearing, bending, cutting, punching)
6. Identify the entanglement hazards of the machine that can be caused due to coming in contact with rotating or moving parts of the machine.
7. Identify hazards due to cutting, where a worker can come in contact with cutting tools, saws, routers, knives, or any other sharp material.
8. Identify any potential hazard due to slips or fall in and around the machine due to the spills on the floor surface such as lubricating oils, grease, water etc.

9. Identifying any ergonomic issues caused while operating the machine. Ensure the following -

- Workers do not have to reach exclusively.
- Workers do not have to use excessive force.
- Workers do not have to perform movements at a very high speed.
- Machine cycle must be planned in accordance with the workers capacity
- Workers can perform work in multiple positions that promote a neutral body position.
- Work surface is adjustable according to the workers requirements.
- Worker has enough room space to move without striking anything.

10. Identify all the work that a worker must perform while operating the machine such as -

- Feeding stock into the machine
- Removal of final products from the machine
- Removal of scrap
- Scheduled and regular cleaning parts of the machine.
- Pre and Post shift safety checks.

Therefore, it is advisable to identify, report and correct any prospective risk which can lead to a hazard at a workplace, thereby ensuring prevention and control of any injury or loss.

SAFETY SIGNS AT WORK PLACE AND THEIR MEANING

- **First aid:**

It is an emergency treatment given to a sick or injured person. The main aim of first aid is to preserve life, prevent from further harm or injury and to start the recovery process. A first aid kit is used in giving the first aid. The sign of first aid which is mostly used is as follows –



Fig.: 5.9 – First Aid Sign

Fire exit:

This sign marks the way to nearest exit point during a fire accident.



Fig.: 5.10 – Fire Exit Sign

Assembly points:

This signage marks the area where the workers need to assemble in case of any hazard or emergency.



Fig.: 5.11 – Emergency Assembly Sign

Fire equipment:

This sign marks the location of storage area of firefighting equipments such as fire extinguisher, fire blankets etc.



Fig.: 5.12 – Fire Equipment Sign

Smoking ban signs:

This signs mark areas/location where smoking is not allowed/prohibited.



Fig.: 5.13 – Smoking Prohibited Sign

Machinery Hazards:

These signs mark the areas near the machinery where one needs to be cautious of his/her movements and actions for safety purposes.



Fig.: 5.14 – Machinery Hazards Sign

Hazardous substance:

This sign marks the areas where any hazardous or toxic substance is stored.



Fig.: 5.15 - Hazardous Substance Sign

Pedestrian access and no access:

These signs indicate where pedestrians can and cannot access respectively.



Fig.: 5.16 – No Pedestrians access Sign

Flammable substance:

This sign denotes the location of any extremely flammable substance being stored there.



Fig.: 5.17 - Flammable substance Sign

Wet floor :

This sign marks the areas with wet/ slippery floor to be cautious while crossing it.



Fig.: 5.18 - Wet Floor Sign

Activities

ACTIVITY 1

Prepare a report with pictures and details of all the safety signs applicable at workplace.

Materials Required:

- Writing material
- Pictures of safety signs
- Coloured pencils/pens
- Ruler
- Adhesive

Procedure:

1. Collect pictures and information about all the safety signs applicable at workplace.
2. Prepare a report with all the details.
3. Submit the same in your class.

Check Your Progress

A. Fill in the Blanks :

1. A _____ is a source of any potential damage.
2. _____ of hazard is the first step in development of the safety procedures for prevention and controlling of any hazard.
3. _____ hazards of the machine can arise due to coming in contact with rotating or moving parts of the machine.
4. _____ is an emergency treatment given to a sick or injured person.
5. _____ signage marks the area where the workers need to assemble in case of any hazard or emergency.

B. Write short answers for the following –

1. Mention points to be considered for identification of possible hazards in a workplace. (Any Five)

2. Identify and name the following safety signs –



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Session : 4 Reporting Emergency Situations

Identifying and reporting all hazards/emergency situations is of vital importance for the safety and security of the workplace. All such unsafe incidents must be immediately and directly reported to a supervisor or any other concerned authority. All the workers must be trained so that in case of any hazard or potential emergency situation, the standard procedure could be followed like reporting it to the supervisors expeditiously.

Employers must develop and set up a hazard reporting system for the workers. Implementation of such a system will make the workplace a safer and secure place to perform and work well.

All the workers must be trained in hazard identification and its control measures. They must be trained on the following points –

- **Identification of an unsafe condition** – This involves recognising any incident that might cause harm or damage to the people, machinery, tools or property. For example - Containers that are not labelled properly, insufficient stairway lighting, broken machine guards **etc.**
- **Identification of an unsafe act that must be reported** – This involves any inappropriate behaviour that could lead to an accident/cause an injury or any other damage. For Example – Worker using equipments in a careless manner or not using PPE while running a machine.
- **Procedure followed if any unsafe condition is witnessed** - Any such unsafe situation should be immediately reported to the supervisor. It can be in a form of a verbal complain, a hard copy of a form to be filled or an online complain system on the website of the company.
- **Follow up action post reporting the incident** – Workers must expect that the corrective and preventive measures will be taken within the expected time frame. In case of any delay, they must report it again till any necessary action is taken for the same.

Taking necessary preventive actions can save from potential injuries or any significant losses caused due to sheer negligence. Reporting of hazards ensures that employees are involved in the safety management system of the company and are aware of the safety guidelines followed in the company.

For making the reporting by the workers smooth and easy, the following points can be considered –

1. Making reporting procedures easy and possible.
2. Ensure that there is no negative impact or punishment linked with the process of reporting an emergency.
3. Workers who report the hazards or any unsafe incident should be rewarded or recognised for the same.
4. Posters or signs to encourage reporting of any unsafe practices at work can be placed within the work premises.

REPORTING PROTOCOL AND REQUIRED DOCUMENTATION

In case of any hazardous condition, all workers are responsible for reporting it to their supervisors. Supervisor is responsible to take corrective steps and in case of serious conditions, must fill the hazard reporting form along with the assistance of the worker. The following steps must be followed –

- Workers who identifies an emergency condition/concern must report to his supervisor immediately.
- The supervisor must respond promptly, take necessary actions to resolve the matter within the reasonable time limits.
- If the supervisor is not able to solve the situation, then he/she must report the matter to the manager or to concerned senior authority.
- The employee is responsible to draft a document/fill the form (Depending on the rules of the company) outlining the concerns and fact.
- The senior committee members will investigate the matter and ensure correction of the unsafe conditions.

The process of reporting the hazard immediately allows the workers to report the unsafe conditions immediately. This process allows a fast response and prevent further damage. Hazards can be reported verbally or by filling a form, generally called as a hazard reporting form.

Hazard reporting form is a document which is used to report an unsafe incident/ accident at the workplace and ensures that it has been reported formally and necessary corrective steps have been taken. It is used by the first line workers – such as factory workers.

Hazards Reporting Form

Use this form to report safety concerns

Employee Name		Employee Number
Department / Area		Supervisor Name
Describe Fully the safety concern or hazard:		
What can be done to make this situation Safe?		
YES		
YES	NO	Has the supervisor in that area been notified of the safety concern or hazards?
YES	NO	Has the maintenance team been notified of the safety concern or hazards?
Employee Signature		Report Date:

Fig. 5.19 – Hazard Reporting Form

EMERGENCY RESPONSES DURING A HAZARD/EMEGENCY

Any kind of hazard or emergency can occur anywhere and at anytime. To prevent the amount of loss and damage caused due to such unwanted incidents, employers need to provide relevant training to their employees to be adequately prepared to deal with any undesirable circumstances.

Emergency response training can be very advantageous for the employees to acquire knowledge on how to respond to an emergency situation. Employees must learn life-saving skills and acquire knowledge to save themselves and co-workers during the course of any emergency.

It is advisable to designate roles and responsibilities to every employee in the form of tasks they must perform during an emergency and train them to be specialised to fulfil the requirements of specific roles, For example –

specific employee may be trained to perform first aid in the event of any injury or specific group of employees must be trained to handle fire-fighting equipments in case of fire.

Details about the following equipments, people and locations must be displayed clearly at every workstation for reference for use during any emergency situations –

Location of emergency equipments –

- Fire alarm
- Fire extinguisher
- Fire hose
- First Aid
- Panic alarm
- Personal Protective Equipments

Emergency contact numbers –

- Fire station and employee trained in fix hazard handling
- Ambulance and first aid attendant
- Police
- Hospital

EMERGENCY RESPONSE PLAN

An emergency action plan involves allocating designated actions that all the employees need to take for their safety during an emergency situation. Some of the suggested actions to be taken in case of an emergency like a fire or chemical hazard, injury etc. are as follows –

- In case of a fire accident or a chemical spill, one must try to move quickly towards the nearest accessible exit door.
- Walk, do not run during an emergency and do not use elevators.
- Help other co-workers to evacuate along the way to exit.
- In case of fire, if the fire alarm does not ring automatically, try activating the alarm manually for notification of all other employees.
- Exit the building/factory premises and assemble in the allocated area of assembling during an emergency.
- If any person gets caught in fire then try to extinguish their burning clothes by using the drop and roll technique, dousing with some cold water and using an emergency shower or using a fire blanket.

- If caught in the area filled with smoke, then try and stay in lower positions as smoke will rise to ceiling level first. Drop down to your hands and knees and crawl toward the nearest accessible exit point.



Fig.: 5.20 – Emergency Response plan

- In case of any toxic spill or leak, alert all workers in the immediate area of spill.
- Wear your required personal protective equipments (PPE) like gloves, protective eye wear etc.
- In case of a minor spill try to contain the spill with spill absorbent material and clean the area where the spill occurred.
- Try to seek immediate medical help in case of any exposure to the spill contents.
- In case of a chemical exposure to the skin or eyes, try to immediately clean it with cool water for at least 15 minutes.
- Do not attempt to move or reposition a victim in case of a muscle, joint or bone injury, sprain or fracture as it can further deteriorate/worsen the condition.
- If there is any open wound injury or bleeding wound, then try to cover the wound with dressing/first aid at the earliest.

Activities

ACTIVITY 1

Prepare a sample report of an emergency situation at the workplace.

Materials Required:

- Writing material
- Ruler

Procedure:

1. Study an emergency situation at a workplace.
2. Prepare a sample report of the emergency situation.
3. Submit the same in your class.

Check Your Progress**A. Fill in the Blanks:**

1. All unsafe incidents must be immediately and directly reported to a _____.
2. _____ training can be very advantageous for the employees to acquire knowledge on how to respond to an emergency situation.
3. An _____ action plan involves allocating designated actions that all the employees need to take for their safety during an emergency situation.
4. In case of a fire accident or a chemical spill, one must try to move quickly towards the nearest accessible _____.

B. Write short answers for the following –

1. Describe briefly about how the workers must be trained in hazard identification and its control.
2. Mention suggested actions to be taken in case of an emergency. (Any Five)

Module 6**Industry and Organisational Requirements****Module Overview**

The Indian garment industry is well established and recognized worldwide and also enjoys a considerable demand from both domestic as well as global market. The growth of manufacturers and suppliers from developing countries like India, China, Pakistan, Bangladesh and others, and zeal to compete and offer products at competitive prices, the manufacturers have compromised with working conditions, safety and rights of workers. The recognition to Labour Standards and worker's rights, most of the international apparel buyers started focusing and pressurizing manufacturers to comply with the Labour Standards and Worker's rights. This resulted in increased awareness and compliance to code of conduct policies among Indian garment factories. Indian apparel manufacturers and suppliers are not only bound to follow government guidelines but they also must comply with Social Compliance Standards and Code of Ethics. Such compliance is mandatory not only for the manufacturers but also for their vendors, distributors and other collaborators involved in the supply chain.

Learning Outcomes

After completing this module, you will be able to:

- Define Standard organisational compliance and related documents
- Explain Customer specific regulations and requirements
- Describe Ethical compliance and related documents
- Explain Documentation and reporting of compliance deviation

Module Structure

Session 1: Standard organisational compliance and related documents

Session 2: Customer specific regulations and requirements

Session 3: Ethical compliance and related documents introduction

Session 4: Documentation and reporting of compliance deviation

Session: 1 Standard Organisational Compliance and Related Documents

WHAT IS ORGANISATIONAL COMPLIANCE?

Compliance means conforming to a rule. Compliance helps in better organisational control as it is a set of processes to ensure that the organisation as a whole abide by these set of regulations.

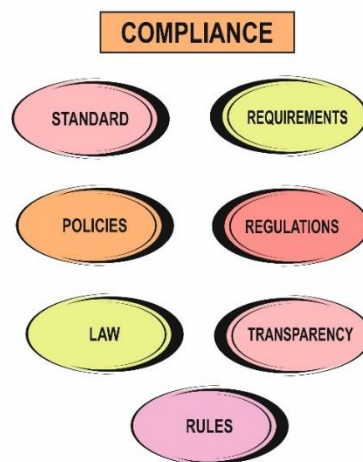


Fig.: 6.1 – Organizational Compliance

SIGNIFICANCE OF COMPLIANCE IN INDIAN GARMENT INDUSTRY

Compliance with respect to the garment industry must meet the audit requirements and refers to the following:

1. Quality of products
2. Safe and comfortable working environment

Apart from quality of products, International buyers are also demanding ethical manufacturing of products, which leads to the compliance of standards by garment manufacturers. The rise in export of garment products increases the demand for social compliance has also increased in the Indian Garment Industry.

Social Compliance

Social compliance refers to compliance in respect to social responsibility, ethical treatment of employees and the working environment. A code of conduct is followed regarding employee wages, working hours and work

conditions. In order to keep a check on compliance by manufacturing unit, regarding various environmental standards, a compliance audit is conducted regularly. Some of the common requirements of social compliance are as follows-

- i. **Child Labour**-Organisations must ensure no child under the age of 15 is employed.
- ii. **Forced Labour**- No person should be employed under any threat and if they have not offered their services voluntarily.
- iii. **Discrimination**- An organisation must not discriminate among its employees on factors like remuneration, promotion, training facilities etc.
- iv. **Working hours**- An organisation must comply with government rules and industry standards on working hours, break timings, public holidays etc.
- v. **Disciplinary Practices**- An organisation must not use any mental or physical abuse against the employees in the name of punishment.



Fig.: 6.2 – Social Compliance

INTRODUCTION TO AUDIT

Audit means to officially inspect, check or examine. Thus audit in organisational terms means check or inspection of various departments, resources and finances of an organisation. Audit is conducted regularly to ensure that no fraud or scam is caused by the organisation.

Audits and assessments ensure safety management, Security Management, and Risk Management. Aim of Auditing is to adhere to the prescribed policies and procedures and to verify compliance with regulatory requirements and industry standards. It helps to ensure that all programs are properly designed and implemented. Further, audits also helps in identifying programme deficiencies so that recommendations can be developed for corrective action.

Audit in Garment Industry:

Audit can be done by:

1. Internal Auditor - Employees or heads of a particular department
2. External Auditor - An outside firm or an independent auditor.

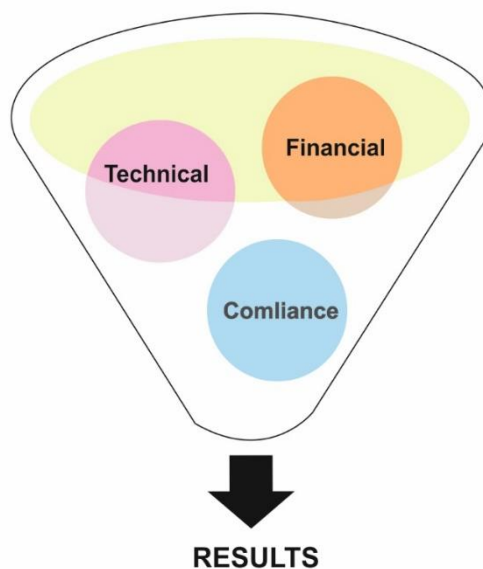


Fig.: 6.3 – Types of Audit

Compliance Audit

A basic Compliance audit may require the auditor to examine the rules, regulations, orders and instructions for their legality, adequacy, transparency and prudence. Auditors gather information through visual observation at the site, review of document and interviewing staff. This collected data is then compared with the applicable permits and regulations to evaluate the compliance to the applicable legal requirements.

Following information may be collected and reviewed by an auditor during compliance audit-

1. Licenses, permits and facility information
2. Child labour
3. Forced labour and discrimination
4. Freedom of association and collective bargaining
5. Right of worker
6. Disciplinary practice
7. Working hours
8. Wages, benefits & compensation
9. Workplace safety
10. Occupational health & welfare

11. Environment management
12. Management practice & sub-contractor /supplier control
13. Training records
14. Company policies

Technical Audit

Technical Audit (TA) is a very crucial task for garment manufacturing unit. Every buyer conducts a technical audit before confirming an order to any garment factory. Many garment buyers have their own technical audit checklist, which may vary from buyer to buyer. Audit must be conducted in a routine manner at different stages of garment manufacturing. Through Technical Audit, auditors check the ability of a manufacturing unit to make export quality garments as per order and specifications. The initial step of a Technical Audit is to check the plant outline and its suitability to complete the order. The objective is to pick the right manufacturing unit for the order.

Following information is collected by an Auditor during Technical Audit-

- General Information about the Plant like number of staff members, production facility, location etc.
- Production capacity
- Versatility in product manufacturing
- Quality control of raw Materials
- In-house quality system
- Production planning & executions
- Process control
- Availability of in-house testing facility
- Availability of in-house design team
- Housekeeping and maintenance of instruments
- Quality assurance process
- Lighting, fire safety etc.

Financial Audit

Financial audit is an examination or inspection of accounts books by an auditor. It is then compared with physical checking of inventory to make sure that proper documentation is being followed. The objective is to confirm the accuracy of financial statements prepared by the organisation. All the public listed firms are required to get their financial accounts audited by an independent auditor, before the results for any quarter is declared.

The idea behind financial audit is to check and verify the accounts by an independent authority to ensure that all books of accounts are maintained in a fair manner and there is no misrepresentation or fraud being conducted.

In India, independent financial audit for any organisation is conducted by chartered accountants licensed by The Institute of Chartered Accountants of India (ICAI).

Steps in auditing process:

Following are the four main steps in the auditing process:

1. **Defining the auditor's role and the terms of engagement.** It could be in the form of a work / authorization letter which is duly signed by the buyer.
2. **Planning the audit.** It includes detailed planning of deadlines and the departments the auditor would cover. Duration of audit may vary depending upon nature and area of work.
3. **Compilation of the information collected from the audit.** When an auditor audits the department, findings are usually put out in a report or compiled in a systematic manner.
4. **Reporting the result.** The results are documented in the auditor's report.

Phases of Audit:

There are three main phases of compliance audit in India:

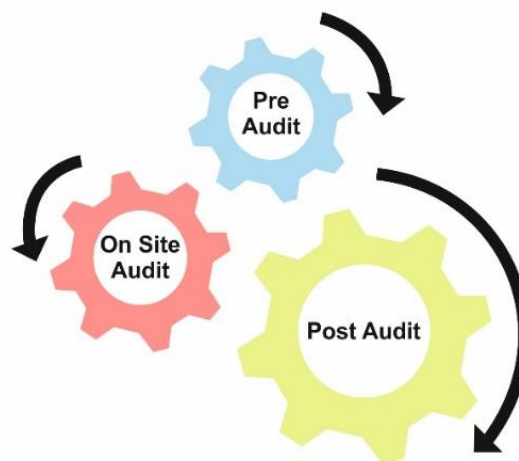


Fig.: 6.4 – Phases of Audit

i. Pre-Audit Phase

- Planning and organising the audit
- Establishing the audit objectives

- Scope and etiquette
- Reviewing the design of the programme by inspecting documentation.
- ii. On-site Audit Phase**
 - Conducting personal interviews
 - Reviewing records
 - Making observations to assess programme implementation.
- iii. Post-audit Phase**
 - Briefing the management about audit findings
 - Preparation of Final report.

CORE LABOUR STANDARDS

International labour organisation has set rules for core labour standards, to protect the rights of workers and to ensure that worker get good working conditions.

Rules are set of four fundamental and universal Human Rights, as conceived by International Labour Organisation:

- i. Freedom from forced labour
- ii. Freedom from child labour
- iii. Freedom from discrimination at work
- iv. Freedom of association and right to bargain collectively.

In most countries, all the export-import trade agreements require both the seller and buyer to meet the International labour Standards specially on the issues linked with Child labour and rights of workers.

These are the minimum ‘enabling rights’ which workers need to defend in order to improve their working conditions, to work in freedom and dignity. The aim behind this concept is to make sure that the apparel industries have labour contractors which don’t engage forced or child labour and get the supply chain of the suppliers audited.

Apparel Export Promotion Council (AEPC), which is an apex body of Indian apparel exporters, has designed a garment factory compliance program called ‘Disha’ (Driving Industry towards Sustainable Human Capital Advancement), with an aim to make India a global benchmark for social compliance in apparel manufacturing and export business. This Common Compliance Code project will prepare the Indian apparel manufacturers and exporters on a common platform towards a more social and environmentally compliant industrial environment.

Common Compliance Code

The common compliance code gives opportunity for the industry to negate international claims against child labour promotion in the garment industry. It also helps to improve the image of the industry and win more international businesses.

Some of the common compliance code guidelines for Indian Garment industry are:

- Employers must not be involved in unfair labour practices including child labour and forced labour.
- There should be no discrimination among workers' remuneration for work of equal value on the basis of gender, race, religion, age, disability, sexual orientation, nationality, political opinion, or social or ethnic origin.
- Employers should not threaten female workers with dismissal or any other employment decision that may affect their employment status negatively, in order to prevent them from getting married or becoming pregnant.
- Employers should ensure that proper air ventilation systems are installed within their factory premises to prevent airborne diseases among workers.
- If workers wish to form organisations or participate in union activities, including strikes, employer shall not restrict the workers in doing so by use any form of physical or psychological violence, threats, harassment, or abuse.
- Workers should be entitled to at a day rest in a week. If workers are required to work on a rest day, an alternative rest day must be provided in next week.
- Workers should be provided with paid annual leaves as per local laws, regulations and procedures. Employer shall not impose any undue restrictions on workers' use of annual leave or sick leave or maternity leave.
- Workers should be paid at least the legal minimum wage or the prevailing industry wage, whichever is higher.
- Employers should compensate workers for the hours they have worked. Workers engaged on a per piece rate payment scheme or any other incentive scheme, must be paid accordingly.
- There should not be any sort of unreasonable restraint in the freedom of movement of workers, including movement in canteen during breaks, using toilets, accessing water, or to access necessary medical attention.

- Garment exporters or manufacturer must ensure that none of their workers is less than 14 years of age, as per the guidelines for non-hazardous employment. Child labour is the most important concern in Indian Industries nowadays. Further, each worker shall have the right to enter into and to terminate their employment freely.

Indian apparel manufacturers must follow all the compliance related guidelines to comply with global standards. Compliance to such codes or guidelines also helps the industries to boost their image or to project a positive image and protect their goodwill in the market. The Indian garment industry must stress on strong compliance rather than competition of manufacturing cheaper garments.

INTERNATIONAL LABOUR STANDARDS

International labour standard is a set of legal standards and guidelines which set up basic principles and worker's rights at workplace. These standards aim at improving working conditions on a global scale.

Functions of International Labour Standards:

- i. To prevent disruptive competition through the defence of particular workers group and setting minimum wage and working conditions.
- ii. To promote constructive competition through definite rights, for e.g. workers involvement in decision-making, improvements in productivity and motivation of workers, increasing aggregate demand and promoting the creation of jobs, active labour market policies and ways of adjusting socially desirable measures.

Corporate Social Responsibility

What is Social Responsibility?

Social responsibility is “an organisation's obligation to increase its positive impact and reduce its negative impact on the society”. It can also be known as “the concept that business entities should also be concerned with the welfare of the society at large”.

The social responsibility of an organisation is referred to as ‘Corporate Social Responsibility’.

Corporate social responsibility (CSR) essentially means that the organisation should work in an ethical manner and it should also be in the best interest of the various stakeholders. Nowadays, this concept of Corporate Social Responsibility in Indian garment industry is gaining great popularity. More

and more organisations are trying to work in a way to protect the interests of the society at large along with the interest of its stakeholders including employees, customers and the suppliers.

Social Responsibility can be divided into two types:

a. Human responsibility refers to the responsibilities of the organisation towards the various 'stakeholders' in business parlance, including employees, shareholders, the government, customers, investors, suppliers, competitors and the society at large.

b. Environmental responsibility refers to the responsibilities of the organisation towards environment protection.

The scope of social responsibility extends beyond the legal responsibilities of an organisation. It has to be voluntarily fulfilled by the organisation; however there also are legal obligations.

Social Responsibility in the Garment Industry

The garment and textile industry is one of the largest industries in the world. It is also the biggest employer in India after agriculture. Globalization has made clothing affordable for all and competitive low prices. However, it has major negative impact on environment and society throughout the product life cycle. Production of textiles and garments requires consumption of vast energy. A considerable amount of wastes including sewage and discarded clothing is also generated which leads to the burden on the environment. Moreover, poor labour standards and poor working cum living conditions are additional outcomes of the ready-made Garment industry. Poor labour standards may include low wages, long working hours, hazardous work environment, workplace abuse and being excluded from unions.

Buyer companies in developed countries prefer outsourcing the production from overseas suppliers especially from countries where labour cost is considerably low, in order to keep the costing at the lower side as much as possible and also to avoid the ill effects of production and industrialization. Working conditions of labour and their human rights are a matter of great concern in developing countries such as in India, China, Bangladesh, Pakistan and other Asian countries. This poor condition leads to many tragedies like factory fire and labour abuse that again results in poor life for workers and even death.

Textiles and garment firms are realising their responsibilities towards its stakeholders, environment and society. The ways in which a textile firm can fulfil its responsibility towards various stakeholders are similar to those of firms in other industries, as is evident from the suggestive points mentioned below:

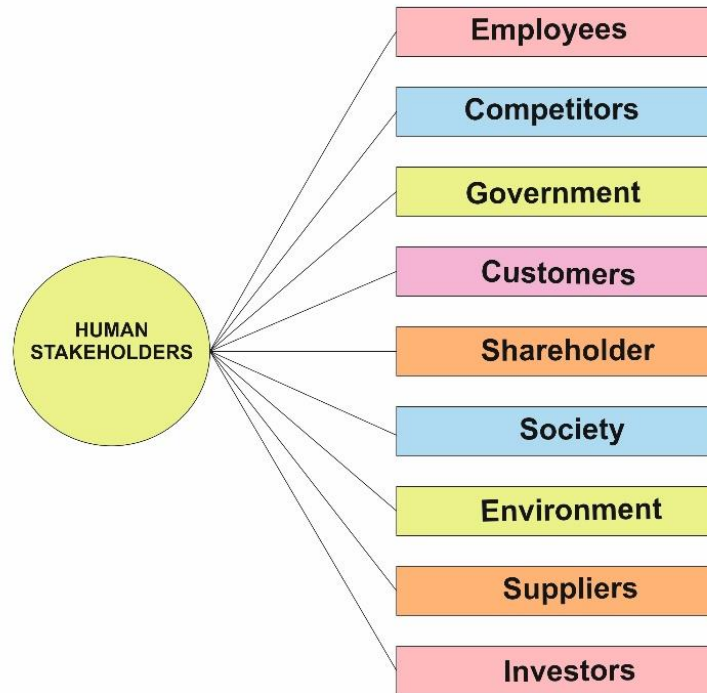


Fig.: 6.5 – Stakeholders in Garment Industry

1. Towards employees:

- By having ethical recruitment, remuneration, promotion and other policies.
By providing opportunities to the employees to voice their opinion and complaints and have an effective policy for the solution of these complaints.
- Ensuring a safe working environment for the employees.
- Having fair policies for the solution of employee disputes.

2. Towards shareholders:

- By representing a fair picture of the company's financial position and profit/loss to the shareholders.
- By rewarding them with a fair rate of dividend.

3. Towards the government:

- By providing the necessary information to the government as and when required.
- By paying taxes and dues timely.
- By abiding by the laws and regulations of the area in which the firm operates.
- Contributing to the economy through exports.

4. Towards customers:

- By providing quality products to the customers at reasonable prices.
- By undertaking constant research and development and coming up with innovative and more useful products from time.

5. Towards investors:

- By giving the investors a true and fair picture of the financial condition of the business.
- By ensuring a fair ROI (Return on Investment)

6. Towards suppliers:

- By ensuring timely and fair payment to the suppliers.
- By maintaining a good relationship with the suppliers.

7. Towards competitors:

- By indulging in fair and ethical practices, thereby raising the spirit of fair competition

8. Towards society:

- By involvement in activities that ensure development of area and society at large.
- By having a philanthropy arm to take care of the needs of the under-privileged.
- By creating job opportunities.

9. Towards environment:

- By ensuring the purchase of environment-friendly supplies.
By ensuring a pollution-free process of production.
By establishing a system of efficient disposal.
- By adopting practices which make the production and product eco-friendly.
- By adopting eco-friendly packaging.

Activities

Activity 1

Make a powerpoint presentation on CSR activities of a Firm.

Materials Required:

1. Writing material
2. Computer / laptop for PPT

Procedure:

1. Make a group of 4 students each.
2. Select a garment manufacturing firm
3. Enquire about its CSR activities through published literature or internet. (Volunteer in CSR activities if opportunity available)
4. Prepare a presentation document (preferably a PPT)
5. Present the presentation to the class.

Check Your Progress**A. Fill in the Blanks:**

1. _____ is conducted regularly to ensure that no fraud or scam is caused by the organisation
2. A _____ audit may require the auditor to examine the rules, regulations, orders and instructions for their legality, adequacy, transparency and prudence.
3. Compliance audit, Technical audit and _____ audit are three types of audits.
4. Pre-Audit, _____ audit and Post-audit are three phases of audit.

B. Write short answers for the following:

1. What are the three phases of audit? Explain.
2. What do you mean by audit? Explain its importance.
3. What is the significance of compliance in Garment Industry?

C. Write long answers for the following:

1. Explain types of audit.
2. Explain Corporate Social Responsibility.
3. Explain Core Labour Standards.

Session: 2 Customer Specific Regulations and Requirements

Customer specific regulations and requirements are the requirements developed by the customer with the expectations that the supplier will identify, implement and audit these requirements.

These requirements fall into following categories:

- i. Material specific requirement
- ii. Delivery requirements
- iii. General requirements
- iv. Process requirements (ex: calendaring)

Customers specific requirement cannot be ignored and seek to expand the standard or define how a customer wants a portion of the standard to be met.

Country specific regulations for sector and their importance:

There are several country based regulations and requirements which a manufacturer / supplier needs to comply with. Some of these regulations could be mandatory while the rest could be voluntary / suggestive which the companies are expected to follow. Compliance to all the regulations might give a company some competitive edge over others. There could be certain requirements specific for a market or specific to a product category.

1. MANDATORY REGULATIONS

There are several mandatory requirements that manufacturers and exporters need to comply with. This includes legal requirements concerning product safety, use of chemicals, product quality and labelling. Additionally, many buyers have created their own non-negotiable terms and conditions which all their suppliers are bound to follow. These requirements could be non-legal, but still mandatory. Following are the few textiles and apparel related mandatory regulations / guidelines followed worldwide:

i. REACH

REACH stands for Registration, Evaluation, Authorization and Restriction of Chemicals and applies to all products including textile and apparels to be exported to European Union.

Hundreds of chemicals are used at different stages of textile and apparel manufacturing. Some of these chemicals could be harmful to the user. Hence, it is essential to follow REACH regulations to avoid the possible harm to the user of the product. This restriction is imposed over a wide range of chemicals used in textile and leather and such restrictions could limit the use of these chemicals completely or partially as measured by weight.

A list of some of the important chemicals banned for textile and apparel sector is as follows:

a. Azo dyes and its aromatic amines–

Currently, around 60%-70% of dyes used for industrial purposes belong to the family of azo dyes due to its economic efficiency and usability. They are widely used in the textile industry to give vibrant colors to almost all materials including cotton, silk, wool, leather and other fibers. Overexposure to azo dyes can cause diseases like bladder cancers, liver cancers, and hematuria.

India has published legislation prohibiting the handling of a total of 112 azo and benzidine based dyes. In 1993, the Government of India prohibited the handling of 42 benzidine-based dyes. The Ministry of Environment and Forests further prohibited the handling of an additional 70 azo dyes in 1997.

According to the Indian import policy, import of textiles and textile articles is permitted subject to the condition that they do not contain any of the hazardous dyes (azo dyes) whose handling, production, carriage or use is prohibited in India under the provisions of the Environment (Protection) Act, 1986.

b. Tris (2,3-dibromopropyl) phosphate, tris (aziridiny) phosphin oxide, and polybrominated biphenyls (PBB) – Used as waterproofing and stain-repelling chemicals.

c. Perfluoro octane sulfonic acid and its derivatives (PFOS) – Used as biocide and preservatives

d. Dioctyl tin (DOT) compounds, tributyltin (TBT) compounds, and pentachlorophenol (PCP) – Used in metal trims and accessories (zippers, buttons, jewellery)

e. Polycyclic-aromatic hydrocarbons (PAHs), and phthalates – Used in leather products

f. Persistent Organic Pollutants (POPs) - used to make waterproof Textile material or flame-retardant fabric, and for leather finishing.

ii. ORR Chem stands for Chemical Risk Reduction Ordinance and is a regulation from Switzerland regarding use of chemicals. ORR Chem totally bans certain chemicals while allow them only for certain applications when no other substitute is available. The idea is to minimize the risk and possible harm from chemicals by limiting their use.

Similarly, Austria, Denmark, Finland, Norway, Germany and the Netherlands also have specific regulations for the use of some chemicals like Formaldehyde and PCP.

iii. Stockholm Convention is a global regulation to protect human health and the environment from chemicals that remain intact in the environment for longer periods, become widely distributed geographically, accumulate in the fatty tissue of humans and animals, and have harmful impacts on human health and the environment.

iv. Product Safety Regulations: It is buyer's responsibility to provide design of the product which is legally safe for consumers to use. However if a manufacturer / exporter is not sure about the safety of the product, he must discuss this with the buyer or check with the safety guidelines of the importer country. Before manufacturing a product for export, an exporter may always ask its suppliers for fabric, trims and accessories if they have exported their material before or are familiar with the legal safety requirements of apparel export.

a. Children's clothing regulations

Generally such regulations are formulated for children below 14 years of age. The idea is to avoid fatal incidents, strangulation and choking hazards. A few regulations have been developed by various countries as listed below:

- The European Union has a Specific Standard for the Safety of Children's Wear including bathrobes, pyjamas, nightshirts, etc. It does not apply to baby's nightwear. This standard does not require additional labelling on the product. General product safety directive of European Union restricts the presence of certain heavy material in packaging of children's clothing, including lead, mercury, chromium, and others.

EN 14682 – Cords and drawstrings on children's clothing, **EN 14878 Textiles** – Burning behaviour of children's nightwear – Specification and **ASTM F1816-97** – Standard Safety Specification for Drawstrings.

- Similarly, UK has The Nightwear (Safety) Regulations 1985, for children's clothing. The United Kingdom's **BS 4578 Standard** devises test methods for hardness and air permeability for infants' pillows.
- The Washington Children's Safe Products Act (CSPA) requires manufacturers or importers of children's products to report to the Department of Ecology of Washington, before placing in the market products that contain chemicals that are included on the "List of Chemicals of High Concern to Children".
- Similarly, State of Vermont Act 188 also stipulates that manufacturers or importers of children's products should report to the Health Department when these products contain chemical.
- Substances recorded in the "**List of Chemicals of High Concern to Children**".

b. Flammability or Fire Safety Standards

Countries like UK, Ireland, Netherland and Switzerland have specific legal requirements regarding apparel flammability. Flame retarding chemicals are used to avoid fabric flammability but this again is restricted under REACH, Hence a manufacturer / exporter has to check both REACH and Flammability guidelines for textile and apparel products.

There are national standards concerning the flammability of textile and apparel products in several countries. For ex: Standard for protective clothing, standard for protective gloves for firefighters, fire safety standard for bedding, standard for protective clothing with limited flame spread properties etc.

c. Standard for Personal Protective Equipment

CE stands for "European Conformity" and is an administrative marking which indicates conformity with health, safety and environmental protection. While exporting Personal Protective Equipment (PPE) to European Union, exporter is required to comply with the specific safety standards for the design, manufacturing, material use, testing and user instructions concerning PPE. The exporter is required to affix CE marking to indicate that the product is in line with the PPE safety requirements. CE marking is required only if one or more of the 25 CE marking directives cover the products being exported.

d. Biocide related regulations

If biocides are added to textiles to protect it from pests or bacteria, it must comply with the Biocidal Product Regulation (BPR) as well as REACH.

v. Labelling Requirements

With an aim to inform the consumer about the kind of apparel they are buying, it is required to affix a label to the product. It also educates the consumer about the material content, country of origin / 'Made in', product care, washing instructions, etc.

According to EU Textile and clothing regulation, products have to be labelled or marked before they are made available in the market for sale.

As per a Notification issued by the Ministry of Commerce on November 24, 2000, all pre-packaged products (intended for direct retail sale only) imported into India must carry the following declarations on the label:

- name and address of the importer
- generic or common name of the commodity packed
- net quantity in terms of standard unit of weights and measurement (in metric) / size if garment
- month and year of packing in which the commodity is manufactured, packed or imported, and the maximum retail sales price (MRP)
- fibre content

Footwear: Similar guidelines are applicable to footwear, which includes sizing and listing which standards are used. India follows the British size system for footwear. India has a voluntary Eco-Labeling scheme known as 'Eco-mark', which provides for easy identification of environment-friendly products. Criteria for the Eco-mark have been set for 16 product categories, including textiles and leather.

Following are some key points of labelling requirements:

a. Full fibre composition must be mentioned on the label of textile products. For example, Silk, wool, Nylon, Polyester, Cotton, Spandex etc. There is no mandatory standard for mentioning the fibre composition in most countries. However it is suggested as best practice to show the percentage of each fibre on the label. As per the mandatory labelling guidelines for textile and apparel products under the **Textile Labelling Act (TLA) of Canada**, it is mandatory to disclose fibre content information expressed in percentages by mass and the dealer identity information on the label.



Fig.: 6.6 – Fibre Content and Country of Origin label

b. Non-textile parts of animal origin must be clearly mentioned in the label (such as fur or leather)

c. The label should not contain abbreviations with the exception of mechanized processing codes.

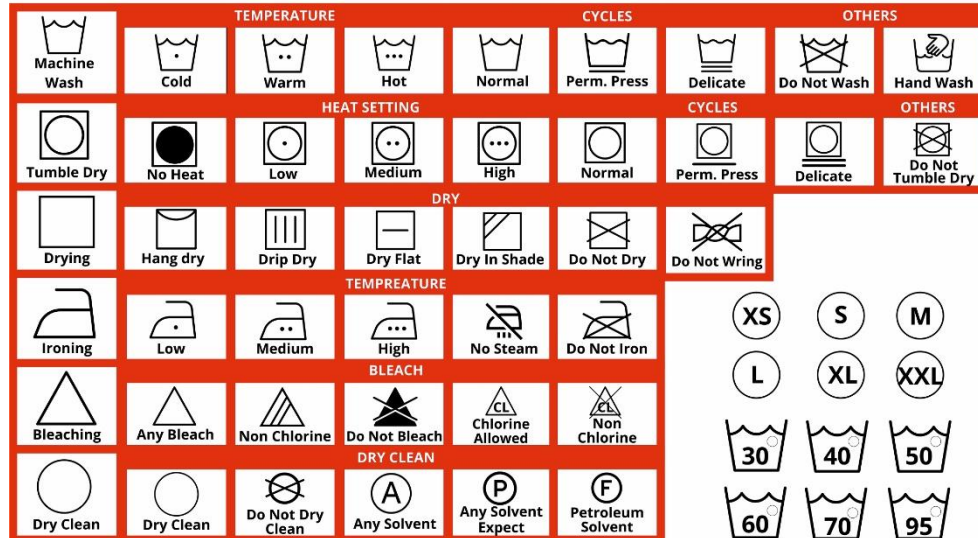


Fig.: 6.7 – Care Labels Symbols

d. Care instruction label is not mandatory under EU textiles regulation. However, if an exporter wishes to include them, care must be taken to use symbols as acceptable in the importer country.



Fig.: 6.8 – Care Labels

An ideal care instruction label must include information on:

- General care and warnings
- Washing
- Drying
- Ironing

- Dry-cleaning

e. Country of Origin is not a mandatory standard for exporting to most countries, however if an exporter wishes to include, it should be clearly labelled and should not be deceptive. For example, a product imported from China, must not be labelled as 'Made in India'.



Fig.: 6.9 – Brand, Size and Fibre Content Labels

f. Apparel products must carry a durable, legible, easily visible and accessible label, either on the product or on its packaging. Language of the label is preferably the language of the country of importer. For example, while exporting to Germany, the preferred language should be German. For apparels to be sold in Canadian markets, the care label should be in both English and French.

g. Size mentioning is not obligatory but expected on labels. Australia has defined size standards apparels too, which are:

- **AS 1344-1997:** Size coding scheme for women's clothing- Underwear, outerwear and foundation garments
- **AS 1954:1976:** Size coding scheme for men's clothing(including multiple fitting outerwear and industrial wear)
- **AS 1182:1997:** Size coding scheme for infants' and children's clothing- Underwear and outerwear

vi. Intellectual Property Rights (IPR)

Intellectual property (IP) is a legal concept which refers to creations of the mind for which exclusive rights are recognized. Under intellectual property law, owners are granted certain exclusive rights to a variety of intangible assets, such as musical, literary, and artistic works; discoveries and inventions; and words, phrases, symbols, and designs. Common types of intellectual property rights include copyright, trademarks, patents, industrial design rights, trade dress, and in some jurisdictions trade secrets. Illegal copy of registered apparel trademarks or design is considered as infringement to IPR. While selling own designs or apparels under a trademark, an exporter

must make sure that no Intellectual Property Rights are being violated. Similarly if designs are provided by the buyer, they will also be liable in case it is found to violate any IPR.

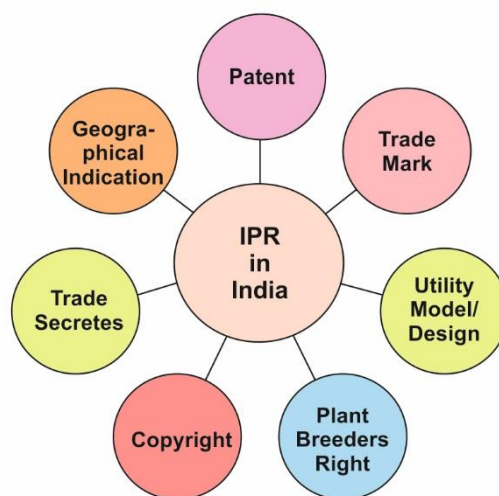


Fig.: 6.10 – IPR in India

2. VOLUNTARY STANDARDS

In addition to mandatory standards (including legal and non-legal), there are many services that buyers implicitly expect or at least highly appreciate if an exporter intends to do business with them.

A voluntary consensus safety standard (also known as a “non-government consensus standard”) is a safety standard for consumer products that establishes consumer product safety practices recommended to be followed by product manufacturers, distributors and sellers.

Buyers set their own standards for products. The exported products must comply to such standards along with the mandatory standard requirements. These standards can be based on the end use of the product or may be based on the product processing etc. Such standards are implemented by the buyer to meet their business goals of desirable quality product and desirable manufacturing for the product. These standards are different for different buyers.

For example:- The EU has a voluntary standard for Textiles known as **The Burning Behaviour of Children’s Nightwear**, which helps in complying with the GPSD.

CUSTOMER SPECIFIC REQUIREMENTS MANDATED AS A PART OF WORK PROCESS

As we have country specific regulations in this sector for export of textiles and apparel related products, similarly, there could be few customer / company specific requirements / regulations, which exporter/manufacturer needs to fulfil in order to do business with that customer.

Following are few basic types of customer specific requirements

1. Restricted Substances Lists (RSLs)

Apart from REACH guidelines, many fashion brands and retailers have created their own list of restricted substances, which they impress upon their suppliers to follow. Such company specific Restricted Substances Lists may be stricter than REACH. Suppliers intending to work with these firms are required to comply with these customer specific RSL along with other Country specific regulations.

Customer Specific Standards are often based on **Zero Discharge of Hazardous Chemicals (ZDHC)** guidelines on safe chemicals use.

2. Product design and development

Generally buyers have their own design team and provide new designs to suppliers. However, suppliers or manufacturers can also maintain their design team and suggest the buyers about new designs ideas. Buyers will always appreciate new designs, materials or production methods to make them stand out in the market and have a competitive edge over other brands.

3. Garment Care Preferences

Most customers prefer an easy handling fabric which can be hand washed or machine washed and easy to care.

4. Smaller Lead Time

Some apparel brands/buyers work on fast fashion concept and prefer a supplier / manufacturer who can work on deadlines and smaller lead time.

5. Complexities

Factories usually try to get easier work order based on available fabric, simple designs and large lead time. However, brands in order to stand out in the market might ask for complex designs and innovative fabrics. To work with such buyers / brands and to supply those with their specific requirements could be difficult. Also manufacturers / exporters are required to be flexible with workmanship, Minimum Order Quantity (MOQ) and price.

6. Location of Factory in GSP

As per EU's Generalised System of Preferences (GSP) there are around 71 countries worldwide which are preferred over on listed countries to manufacture and export to EU buyers. EU Buyers are also benefited with removal of import duties. Thus, buyers might have specific requirements for manufacturer from a country listed in GSP.

Activities

Activity 1

Visit a Garment export unit and make a report on Country specific regulations which they follow.

Materials Required:

1. Writing Material
2. Ruler
3. Adhesive

Procedure:

1. Make a visit to any nearby garment export unit.
2. Enquire about the countries where they export their product.
3. Enquire and prepare a report about the country specific regulations being followed for any export order.

Check Your Progress

A. Fill in the Blanks –

1. _____ stands for Registration, Evaluation, Authorization and Restriction of Chemicals.
2. _____ is an administrative marking which indicates conformity with health, safety and environmental protection.
3. With an aim to inform the consumer about the kind of apparel they are buying, it is required to affix a _____ to the product.
4. ZDHC stands for _____.
5. GSP stands for _____.

B. Write short answers for the following:

1. Explain 'Restricted Substances List'.
2. Give few examples of Children's clothing standards.

C. Write long answers for the following:

1. What are customer specific requirements?
2. Explain any 3 country specific mandatory regulations.

Session: 3 Ethical Compliance and Related Documents

Indian Garment industry is getting attention from consumers, social workers, welfare organisations and branded international buyers. Many international buyers are demanding their manufacturers / suppliers to comply with their 'Code of Conduct' and 'Code of Ethics' while placing an order.

Adherence to quality standards and employee satisfaction has become important parameters for measuring the organisation's performance. Manufacturers and organisations comply with regulations and codes, not only out of a need to act generously, but also for survival in a globally competitive environment.

In the light of growing competition among exporting countries and increasing demand for products that meet internationally recognised standards, it is essential for the manufacturers / suppliers to improve their safety and health compliance code and provide proper working environment in their factories. Several countries have also developed various international compliance standards on health and safety compliance. Exporters should follow these compliance codes to survive in the global market. Moreover, regular practice of compliance with code of conduct would ensure higher price of products, less employee turnover rate, smooth industrial relation as well as global image & reputation.

In a consumer market, brand name and reputation are most critical assets. Companies should adopt Ethical compliance code to protect their goodwill in the market. The Indian garment industry needs to be tough on compliance rather than competing with other developing countries manufacturing cheaper garments.

WHY CODE OF ETHICS IS REQUIRED?

Code of Ethics represents an organisation's self-made constitution / regulation which aim to provide general behavioural guidelines. Such guidelines are generally towards safe working conditions, prohibition of child labour, environment protections, work hours and wage rate control, equality and discrimination issues, labour safety standards, bribery and corruption, unfair practices etc.

Codes of Ethics are generally not as detailed as Code of Conduct. Code of Ethics represents an organisation's culture and values. Large organisations usually have a dedicated department of Corporate Social Responsibility to

take care of ethical practices of the organisation. Also it is a great tool for the organisation or the Brand to portray and improve brand image to the customers.

By following such ethical practices, it is conveyed that the brand is dedicated towards high quality products, comply with legal requirements and undertakes to protect the environment. Such message boost customers' confidence in the brand and products quality. Brands speak loud about their ethics and value on their websites and promotion campaigns to educate the customers and stand out in the market.

Attention to working conditions and labour related issues is also required as most of the buyers outsource their requirements from countries with lower wage rates in order to cut down on costs. But such manufacturer might not be following ethical and fair practices related with labour and environment. Hence, buyers link their code of ethics to work orders for manufacturers and compel them to respect all the labour and environment related guidelines which the buyer company believes in.

These ethics are required for:

- Increasing national competitiveness in terms of social compliance
- Increasing competitiveness of small scale manufacturers
- Reducing burden on manufacturers

In India, the **Apparel Export Promotion Council (AEPCC)** is committed towards legal compliance and ethical business practices and encourages members / exporters to comply with all applicable laws and regulations of the country, to meet all the **International Compliance Standards**.

Further, the council has designed a garment factory compliance program 'DISHA' (Driving Industry towards Sustainable Human Capital Advancement) that aims to spread awareness regarding the importance of compliance among Indian garment exporters.

Some of the important compliance codes in Indian garment industry are listed below.



Fig.: 6.11 – Code of Ethics

1. Working Hour and Wage Rate Compliance

- Garment factory must ensure that employees should get at least minimum wages according to the domestic law and as per the time spent by them in the industry.
- Employer should pay equal wages to both men and women employees, for performing the same work or work of a similar nature.
- Worker employed for more than nine hours on any day or for more than 48 hours in any week, should be entitled to wages at premium legal rates for such overtime work.
- Every worker should be given one holiday (for a period of 24 consecutive hours) in a week. Whenever a worker is required to work on a weekly holiday, he is to be allowed a compensatory holiday for each holiday so lost.
- Every worker is to be allowed at least half an hour rest interval after a maximum working of 5 hours at a stretch.
- Overtime work should be voluntary for employees and should be supported by legally required rate of compensation for such overtime period.
- No worker should be employed below the age of 14 as per guidelines of International Labour Organisation.
- There should not be any sort of forced labour whether in the form of prison labour, indentured labour, bonded labour or otherwise.

2. Workplace and Work Environment Compliance

- Organizations should ensure proper ventilation, sufficient light and air to provide the employees with standard working environment.
- Indian garment industries should provide the workers with comfortable sitting chair with back support and proper leg space.
- All employees should be treated with dignity and respect. No employee should be subject to any physical, sexual, psychological or verbal harassment or abuse.
- Right of employees to form association and collective bargaining should be respected and recognized. No employee should be subject to any sort of harassment, intimidation or retaliation for engaging in association or collective bargaining.

3. Non-discrimination compliance

- Organizations should not discriminate employees on the basis of physical characteristics, beliefs and cultural characteristics. All the terms and conditions of employment should be based on an individual's

ability to do the job. They should provide equal employment opportunities for all employees and associates irrespective of the employees' race, colour, religion, age, sex, creed, national origin, marital status, etc.

- Women workers should receive equal remuneration, including benefits, equal treatment, equal evaluation of the quality of their work, and equal opportunity to fill all positions as male workers.
- Women workers who avail maternity leave, should not face dismissal or threat of dismissal or loss of seniority or deduction of wages, and should be allowed to return to their former employment at the same rate of pay and benefits.

4. Health and Safety Compliance in Indian Garment Industry

- Employees should not be exposed to hazards, including glues and solvents, which may endanger their safety, including their reproductive health.
- No employee should work on machines without adequate training, knowledge and supervision.
- Industries should comply with international standard code, such as ISO(Indian Standards Organisation) or importing countries standard code to become competitive in international markets.
- Wiring should be in good condition with no broken junctions or wires sticking out at the end.
- Eye-wear and face shields should be provided in areas with danger of sparks, glare, hazardous liquids and excessive dust.
- Ear plugs or muffs should be given in places with excessive noise such as generator rooms and rooms with embroidery machine.
- Headgear and protective shoes are necessary for workers involved in loading and unloading operations.
- Factories should have effective fire extinguisher with proper usage instructions.

Activities

ACTIVITY 1

Visit a Garment export unit and make a report on Code of Ethics which they follow.

Materials Required:

1. Writing material
2. Ruler
3. Adhesive

Procedure:

1. Make a visit to any nearby garment manufacturing unit.
2. Enquire about the countries where they export their product.
3. Enquire and prepare a report about the Code of Ethics being followed.

Check Your Progress**A. Fill in the Blanks :**

1. Adherence to _____ and employee satisfaction has become important parameters for measuring the organisation's performance.
2. _____ represents an organisation's self-made constitution / regulation which aim to provide general behavioural guidelines.
3. Large organisations usually have a dedicated department of _____ to take care of ethical practices of the organisation.
4. _____ is committed towards legal compliance and ethical business practices.
5. Organizations should not _____ employees on the basis of physical characteristics, beliefs and cultural characteristics.

B. Write short answers for the following –

1. Explain 'Code of Ethics'.
2. Explain in brief about workplace and work environment compliance in a garment unit.
3. Discuss about wage rates and working hour's compliance for workers in a garment unit.

C. Write long answers for the following.

1. Write short note on compliance code guidelines for Indian Garment Industry.
2. Explain Health and Safety compliance in Indian Garment Industry.

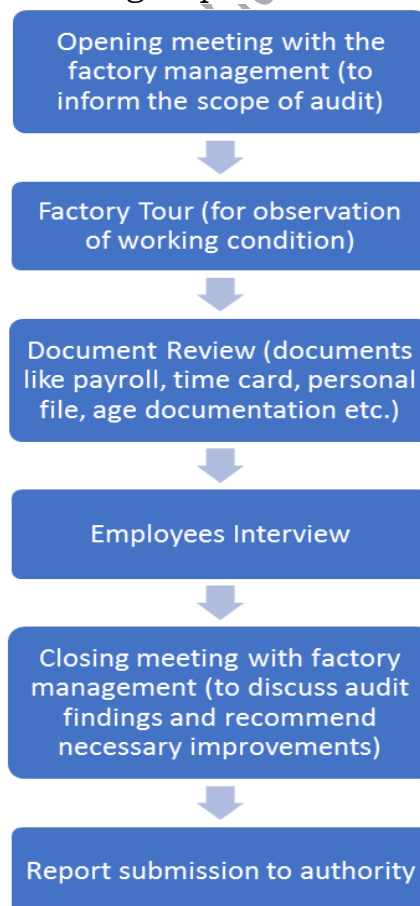
Session: 4 Documentation and Reporting of Compliance Deviation

INTRODUCTION

Social compliance deals with employee's health and safety, their legal rights and working environment from social perspective. To make a factory compliant to such national or International standards, it needs to follow local labour law and international social compliance requirements. Social compliance audit is generally related to child labour, forced labour, health and safety, abuse and discrimination, disciplinary practices, working hours, remuneration, freedom of association, management systems, etc.. Social compliance is a vital part of the apparel industry because it has an impact on a company's reputation and business.

IDENTIFICATION AND REPORTING OF ANY POSSIBLE DEVIATION

Social compliance audits conducted as per the Code of Ethics of different buyers are based on the following steps:



CORE LABOUR STANDARDS

COMPLIANCE CLUSTERS	COMPLIANCE POINTS
Child Labour	<ul style="list-style-type: none"> • Child Labourers • Documentation and Protection of young workers • Hazardous works and other worst forms
Discrimination	<ul style="list-style-type: none"> • Gender • Other grounds • Race and Origin • Religion and Political opinion
Forced Labour	<ul style="list-style-type: none"> • Bounded Labour • Coercion • Forced Labour and overtime • Prison Labour
Freedom of Association and collective Bargaining	<ul style="list-style-type: none"> • Collective bargaining • Freedom to Associate • Interference and discrimination • Strikes • Union Operations
Compensation	<ul style="list-style-type: none"> • Minimum wages • Overtime wages • Method of payment • Wage information, use and deduction • Paid leave • Social security and other benefits
Contracts and Human Resources	<ul style="list-style-type: none"> • Employment contracts • Contracting procedures • Termination • Dialogue, Discipline and Disputes
Occupational safety and health	<ul style="list-style-type: none"> • OSH Management systems • Chemicals and hazardous substances • Workers Protection • Working Environment • Health services and First Aid

	<ul style="list-style-type: none"> • Welfare facilities • Workers Accommodation • Emergency preparedness
Working Time	<ul style="list-style-type: none"> • Regular Hours • Overtime • Leave

These are 8 major compliance cluster which are divided into compliance points. These points are required to be checked during audit. The audit checklist may vary from organisation to organisation but a suggestive checklist is shown below:

a. Checklist for Child labour and young workers:

1. Employer having a reliable system to check age of worker before hiring.
2. Employer complying to guidelines regarding fitness of worker
3. Maintenance of a register of workers below 18 years of age
4. Workers below 18 years of age performing work which is hazardous by nature.
5. Workers engaged for more than permissible working hours.
6. Engagement of employer in child labour.

b. Checklist regarding wages and working hours:

1. Workers are paid their wages on time
2. Worker's wages are paid correctly as per norms and minimum standards.
3. Women workers are paid for maternity leaves.
4. Workers are paid correctly for annual leaves
5. Workers are paid correctly for festival holidays.
6. Workers are paid correctly for sick leaves.
7. Workers are paid correctly for casual Leaves.
8. Workers are paid correctly for duration of work stoppages.
9. An accurate pay-roll record is maintained by the employer.

c. Checklist for social security and other benefits:

1. Employer has provided compulsory group insurance for workers?
2. Employer pays correct compensation in case of worker's death.
3. Workers are paid correct compensation for work related accidents and diseases.

4. Employer has established a Provident Fund and deposit employer's share for workers as per norms.
5. Festival bonuses are paid to workers as per norms.
6. Workers are provided with wage slips.
7. Any unauthorized deduction is not made by employer from worker's wages / salary.

d. Checklist for worker working with chemical and hazardous substances:

1. Workers engaged for working with chemical or hazardous substances are effectively trained.
2. Employer has taken action and precaution to prevent exposure to chemicals or hazardous substances.
3. All chemicals or hazardous substances are properly labelled.
4. Employer maintains an inventory of chemicals and hazardous substances at workplace.
5. All chemicals and hazardous substances are properly stored.
6. Availability of adequate washing and cleaning facility in case of exposure to hazardous substances.
7. Employer possesses license for storage and use of chemicals.

e. Checklist for emergency preparedness:

1. Workers are trained for firefighting and rescue.
2. Availability of emergency exit window and doors.
3. Availability of alternative stairs.
4. Availability of firefighting equipment.
5. Availability and functioning of fire detection and alarm system.
6. Emergency exists and escape routes are clearly marked.
7. All flammable materials are safely stored.
8. Possible sources of ignition are appropriately safeguarded.
9. Periodic emergency drills are conducted.

f. Checklist for Health services and first aid:

1. Availability of required health facility and staff.
2. Employer complying with medical check-ups of workers.
3. Workers are trained for first-aid and first-aid team is formed.
4. Availability of readily assessable first-aid boxes.

g. Checklist for welfare activities:

1. Availability of adequate day care facility
2. Availability of adequate lunch room / canteen.
3. Availability of adequate rest rooms
4. Availability of adequate washing facility
5. Availability of clean and safe drinking water
6. Accessible toilets and washrooms.

h. Checklist for working environment:

1. Noise levels are acceptable.
2. Temperature and ventilations are acceptable.
3. Workplace is clean and tidy.
4. Workplace is adequately lit.

PROCEDURE TO FOLLOW IN CASE OF DEVIATION

After the compliance audit, in case of any deviations are recorded, the auditor prepares a **Corrective Action Plan (CAP)**. Such plans are reviewed periodically and worked upon to avoid deviations before next audit.

Following are the aims of CAP:

1. To identify the most important shortcomings
2. To understand the root cause of the shortcomings
3. To assign a responsible person
4. To propose corrective action
5. To reach goals within time

In order to ensure that suggestions of CAP are implemented, follow-up audits are done as soon as a number of improvements are achieved. Third party audits can also help the manufacturer / exporter to get better suggestions and audit reports.

Exit meeting with management

The exit meeting with management takes place at the end of the factory visit. The aims of the exit meeting are:

- To get management on board to implement the process- to improve labour practices.
- To present the main audit findings to management, check whether management agrees with the findings and ask a response from their end with respect to findings thereby unveiling the possible causes of the problems which are identified.

- To propose corrective action plans for improvements, discuss with management whether improvements are feasible and within timeframe.
- To present main audit findings to factory level trade union representatives or elected worker representatives.

Activities

Activity 1

Visit a garment manufacturing unit and make a report on Corrective Action Plan which they follow in case of compliance deviation.

Materials Required:

1. Writing material
2. Ruler
3. Adhesive

Procedure:

1. Make a visit to any nearby garment export unit.
2. Enquire about the countries where they export their product.
3. Enquire and prepare a report about the Corrective Action Plan followed in case of compliance deviation.

Check Your Progress

A. Fill in the Blanks:

1. _____ compliance deals with employee's health and safety, their legal rights and working environment from social perspective.
2. Social compliance audits are conducted as per the _____ of different buyers.
3. These are _____ major compliance cluster which are divided into compliance points.
4. After the compliance audit, in case of any deviations are recorded, the auditor prepares a _____.

B. Write short answers for the following –

1. Explain in brief the process of auditing compliance standards in a garment unit.

2. What precautions are to be taken by a Garment unit where chemicals or hazardous substances are used?
3. What are the guidelines regarding employment of child labour and young workers?

C. Write long answers for the following-

1. What procedure to be followed in case of any deviation in compliance with standards?
2. How should a garment unit be prepared for emergency?

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ANSWER KEY**MODULE 1****SESSION-1****Fill in the blanks**

1. Quilting
2. Applique
3. Adda work
4. Gota patti
5. fancy embroidery

True/False

1. True
2. False (it is finished using blanket/buttonhole stitch)
3. False (An Italian Word)
4. True
5. False (It creates a 3D pattern)

SESSION-2**Fill in the blanks**

1. Satin edge
2. Zig Zag
3. Abrasion
4. Mirror work
5. Embroidery
6. Piping foot

SESSION-3**Fill in the blanks**

1. Structural Design
2. Embroideries
3. Vertical repeat
4. Kashidakari
5. tossed/random

MODULE 2

SESSION-1

Fill in the blanks

1. graphic sample
2. spec sheet
3. Digitizer

SESSION-2

Fill in the blanks

1. wool fibers
2. interloping
3. Fur
4. Slippery

True/False

1. False
2. True
3. True
4. False
5. True

MODULE 3

SESSION-1

Fill in the blanks

1. correctable faults
2. Needles
3. rust
4. Organized
5. injuries
6. oiling

SESSION-2

Fill in the blanks

1. light
2. polyester

3. smooth and soft
4. Backing
5. specification sheet

SESSION-3

True/False

1. False
2. False
3. False
4. True
5. True

MODULE 4

SESSION-1

Fill in the blanks

1. Safety
2. Fire
3. Running
4. Disconnection
5. Smoke, fumes

Session-2

Fill in the blanks

1. Motivates
2. Deep
3. Disinfectants
4. Degreaser
5. Regular

SESSION-3

True/false

1. False
2. True
3. False
4. True
5. True

SESSION-4**Fill in the blanks**

1. Communication
2. Tone , method
3. Machine operating
4. Sensitive protective
5. Repairs, modifications, maintenance

MODULE 5**SESSION-1****Fill in the blanks**

1. Health, security
2. Fire extinguishers
3. Emergency
4. Oily
5. Proper sanitary facilities

SESSION-2**Fill in the blanks**

1. Emergency
2. Physical injury
3. Workstation
4. Chair
5. Breaks

True/false

1. False
2. True
3. False
4. False
5. True
6. True
7. True
8. False

SESSION-3

Fill in the blanks

1. Hazard
2. Identification
3. Entanglement
4. First aid
5. Assembly points

Identify and name the safety signs

1. Wet floor
2. Smoking ban sign
3. Hazardous substance
4. Flammable substance

SESSION-4**Fill in the blanks**

1. Supervisor
2. Emergency response
3. Emergency
4. Exit door

MODULE 6**SESSION-1****Fill in the blanks**

1. Audit
2. Compliance audit
3. Financial
4. On-site

SESSION-2**Fill in the blanks**

1. REACH
2. CE
3. Label
4. Zero discharge of hazardous chemicals
5. Generalised system of preferences

SESSION-3

Fill in the blanks

1. Quality standards
2. Code of ethics
3. Corporate social responsibility
4. Apparel export promotion council (AEPC)
5. Discriminate

SESSION-4**Fill in the blanks**

1. Social
2. Code of Ethics
3. 8
4. Corrective action plan (CAP)

GLOSSORY

Applique is a French word means embroidery that employs small patches or fabric pieces which are sewn on a larger fabric surface.

Cutwork is an Italian word which means a needle work technique related to a drawn thread work.

Decorative Design: It refers to the surface enrichments of the structural design by adding embroidery or buttons, trims of different materials or any other decoration. It enhances the quality of the product by giving it a richer look.

Embroidery thread are the threads used for embroidery. These may be cotton, polyester, silk etc.

Felt is a non- woven fabric mostly made by using wool fibres.

Gota Patti is small pieces of gota or zari in different shapes pasted onto the fabric using a fabric glue giving a 3D effect.

Graphic sample is a sample in which the garment has a single embroidered pattern which is constant in all sizes.

Hoop or embroidery frame is used to support the fabric during sewing by stretching the surface of fabric. Embroidery hoops or frames are either wooden, metallic or of plastic.

Knits are fabrics produced by knitting. Knitting is a process of inter-looping of yarns.

Lace is a term used for very delicate, unique patterned fabrics made with open holes.

Mirror-Embroidery is a beautiful form of embroidery also known as '*Shisha Work*'.

Natural fibres are fibers which are obtained from natural sources. They come under two categories one is plant based like cotton, linen etc. and the other is animal based like silk and wool.

Needle is a tool to do stitching or embroidery. It is available in different sizes.

Quilting is a technique where two or more fabrics are layered and stitched together to make a thicker padded material.

Satin is an extremely slippery fabric due to its constructional weave where there is formation of floats on the surface.

Sequins are the adornments used on fabrics, bags and footwear. Sequins are made of metal or plastic.

Spec sheet is a very important document which contains the details of new styles/ designs.

Structural Design: It is the fundamental component of design. It includes overall design of a garment with details like darts, pleats, tucks etc.

Synthetic Fibres are manmade fibres which are manufactured using chemicals like rayon, acetate, polyester, nylon, spandex etc.

Tissue, organza and **organdie** are very stiff and are made with the use of highly twisted yarns.

Velvet is a fabric which come under the category of pile fabric.

Wovens are the fabrics produced by weaving process.

Hydraulic systems is a system that works by employing a pressured fluid to function and accomplish duties.

Drilling machine: These machines in the apparel industry are those machines which are used to cut the drill marks in the garment pieces. These drill marks are used to identify the position of buttons, darts, pockets etc..

Debris are scattered pieces of waste material.

List of Credits

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