Subject: Garment Machinery and Equipment

Unit 3: Automation and deskilling devices

Quadrant 1 – e-Text

Learning Objectives

The learning objectives of this unit are:

- Outline the different types of automated workstations used in the garment manufacturing industry.
- Identify the need for a work aid for a given garment.
- Review the use of important work aids used in the garment manufacturing process.

3.1 Automated Work Stations

Stitching Jigs

When using edge guides one requires accurate cutting. However, when die cutting is not possible, stitching jigs are used especially when stitching parts. For example, when collars need identical points, cuffs, and patch pockets. Jigs are made of aluminum or plastic 2 layers, hinged, a slot cut to the shape of required stitch line, 2 pieces of garment parts laid in the center, closed to hold them firmly. The operator moves the jig, carefully controlling it. The disadvantage is that if larger seam allowances are required, extra fabric has to be trimmed off. Separate jigs are needed for every style and therefore, useful only when used for long production runs. Automatic jigs are also available.

Jigs are also known as profiles in the garment industry. A basic jig can be easily fashioned by a sewing mechanic by joining two plies of plastic sheets of required thickness, which have a groove for the needle to pass through.

The groove mimics the edge of the pattern where the sewing line needs to be. The only modification to be done is that a single needle lock stitch machine will be fitted with a roller presser foot, instead of a regular presser foot.

This conversion of a single needle lock stitch machine into a jig assisted work station, does not yield high productivity but assures the shape of the part is sewn consistently.
Higher level of technology has become available these days for jig / profile sewing operations. These machines are generally called as profile sewing machines. Here the operator's role is to set the two or three plies of fabric and interlining inside the profile, close and feed to the sewing head. Once the profile is fed, the machine automatically sews the profile as per its outer contour. To follow the contour of profile, the machine will use a mechanical sensor and turn the profile using pneumatic technology in the curves and corners automatically. Generally, the machine will have two operators setting up the profile and feeding them alternatively as the sewing cycle is short, compared to the time taken for setting the profile manually.

A fully automated workstation in apparel manufacturing industry aims to deskill a sewing operator totally and makes him a manual helper rather than someone handling a sewing machine. A regular sewing operator will pick-up, align, feed, sew, trim and dispose whereas, in an automated work station the operator or helper will be needed majority of the times to pick up, in some cases position the fabric in and start the machine. The machine takes control of sewing, trimming, and in majority of the cases disposing also.

By allowing the operator to be free for major part of the sewing cycles either the factory can use someone with very less skill or the operator can be used to operate multiple machines at the same time thus enabling them to reduce labour cost .Also the consistent quality products and higher productivity is achieved by automation. Majority of the automated sewing workstations will have the below parts apart from the sewing head.

- Folders.
- Thread cutters.

- Sophisticated guiding and positioning equipments operating before and during sewing.
- Stackers after sewing operations is complete.
- The handling devices used in such workstations will be mechanically and pneumatically controlled. This will increase consumption of compressed air and the space requirements can be high with these machines.

3.2 Modes of Working of Automated Workstations

1) Where the operator has to continuously feed the machine with parts on to a conveyor and the sewing cycle is short. The machine automatically positions the part and the conveyor takes the part to the sewing head. The machine automatically cuts and stacks the sewn part. One of the major machinery manufacturers in these kinds of systems is Atlanta attachment company from U.S.A.

2) The sewing machine does all the sewing action and the handling during the sewing. The preparation of parts to be fed into the sewing machine, loading the prepared assembly and unloading the stitched part will be done by operator. Since the operator here is involved, the probability of the machine head doing work continuously is reduced. Invariably, the machine will have to wait for unloading and loading of next piece. Also if the preparation takes more time than the sewing cycle time, more time is lost by the sewing head, which will remain idle. For example, profile sewing of collars and cuffs.

3) Complex sewing operations with additional folding or slashing is done accurately and quickly. Several parts needed for executing the operation are to be loaded on to the machine with the help of positioning devices that are either mechanical or optical. Once the loading is over, the sewing cycle commences which is very short. The utilization of this machine is also below 100%, due to all loading and positioning requirements.

Automatic welt pocket machines in trouser and jackets, automatic pocket attaching machines come under this category. Major machinery manufacturers like Duerkopp Adler specialize in these kinds of machines.

4) Long sewing cycles are automated like sewing all six or seven button holes of a shirtfront, where the operator does only the loading and unloading. To prevent the operator from being idle, more than one workstation will be operated by the same operator.

An example of this category is bottom hemming of Tee shirts. One of the major machinery manufacturers in these kind of systems is Atlanta attachment company from U.S.A

3.3 Deskilling Devices

Work Aids and Deskilling Devices

Any addition made to a basic sewing machine with the objective of making the work easier is generally called as work aids. They are also called as deskilling devices, as without these devices for executing the same operation higher level of skill will be required. Typically, a sewing operation is of short cycle in nature. The basic work content might vary anywhere from few seconds to 2 mins. All these cycles will have the below 6 stages. They are:

1. Pickup
2. Orientate
3. Match
4. Sew
5. Trim
6. Dispose

In a sewing factory the productivity is directly dependent on the needle making stitches. Out of the 6 elements of a sewing cycle, the time taken by the five elements other than the ”sew” constitute between 70 to 80 percent. By reducing the time taken for these non-value adding elements of the sewing cycle, the needle can be operated for more time and thus producing more garments. The basic aim of all deskilling devices is to reduce the skill level required for a operation and increasing the productivity of the operation. This results in reduction of manufacturing cost. Throughout the sewing cycles the operator constantly spends time on handling the material and manipulating it. Higher the material handling, lower are the chances of getting the required output and higher the chances of unwanted body motions and fabric creasing. Work aids aim to assist the sewing operator in reducing the material handling and boost productivity.

Types of Work Aids

The most commonly used work aids are those used for guiding or folding the fabric, trimming treads or other components and for stacking the work after sewing. The least common are those which assist is the initial picking up of the parts to be sewn. In terms of their working, they could be operated pneumatically, mechanically or electronically.

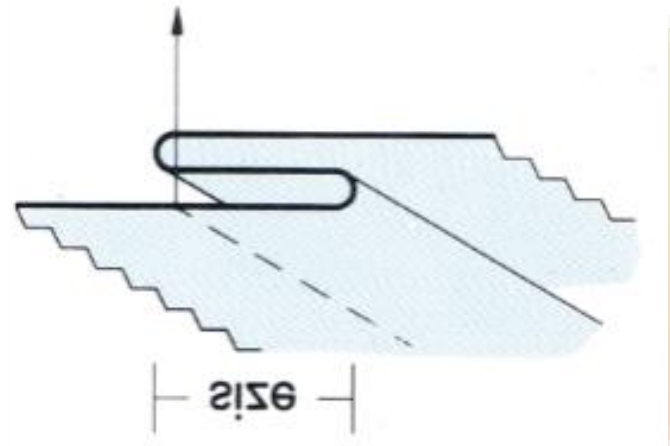
Some are built into the machine, such as a special motor, some are variations of the normal machine part, such as a special presser foot or some are completely separate added part. Pneumatic equipment is operated by high pressure compressed air that drives the mechanism. It is widely used to operate thread trimmers and wipers, chain cutters and positioning and stacking devices.

3.3 Attachments

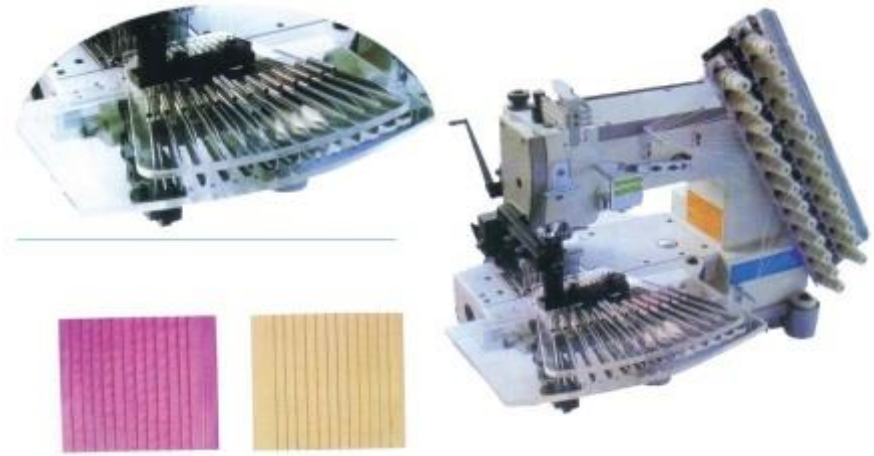
Attachments are devices that can be attached to the sewing machine without cutting through or changing the original frame of the machines. The removal of such an attachment leaves the

machine in its original condition. Sewing machines attachments either guide, position or prepare the fabric for sewing.

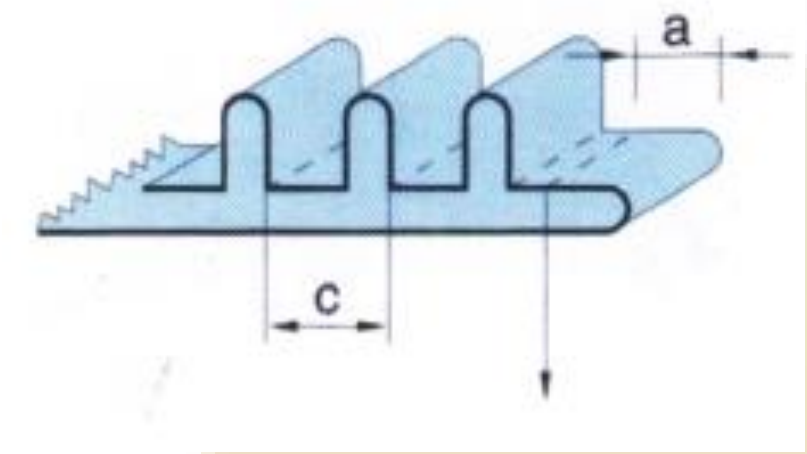
This is an attachment which prepares the fabric for sewing to create a single line of pintuck using an SNLS machine.



This is how the seam of pintuck will look after sewing.

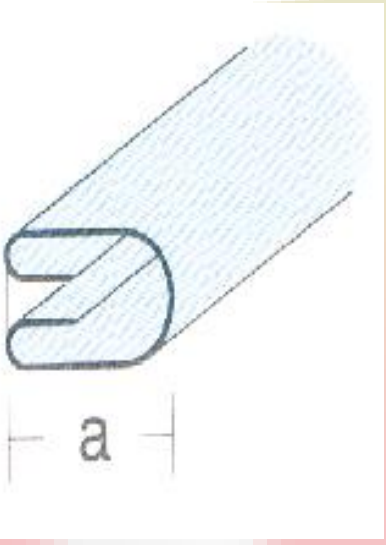


This is an attachment which prepares the fabric for sewing to create a multiple lines of pintuck using a Multi-needle chain stitch machine.



This is how the seam of pintuck will look after sewing. In this construction, the chain construction will be seen at the back of the garment part.

This attachment is used to create spaghetti straps. Here, a piping is sewn through the folder which is simultaneously, turned inside by the metal wire. This creates a tubular structure without the stitch seen on the outside.



This is the seam diagram for a spaghetti attachment.

3.4 Guides

Guides do not move or fold the fabric during the sewing operation. The guide is actually a focusing device, which enables the operator to position the fabric correctly and quickly during the operation.

Here are a few occasions where guides can be used:

- A superimposed seam is constructed using two plies. The operator has to ensure the seam allowance to be the same throughout the stitch line.
- An extra piece like a lace or cord is to be placed on a part a certain distance away from the edge of the part.
- An extra part like pocket needs to be sewn on to the bigger garment part.

Edge Guides

These are metal guides which have an upright section and a flat section. The flat section has slots through which the guides are bolted to the machine bed. The upright section forms the physical barrier beyond which the fabric cannot travel.

When the upright edge is parallel to the stitching line, the operator makes sure that the two or three plies aligned are exactly butting against the upright section.

This ensures that the seam allowance remains constant, and is equal to the distance between the needle and the upright section of the guide.

The operator need not worry about concentrating both on the needle point and the seam edge. This enables him to concentrate solely on stitching which increases the speed of sewing.

A constant seam allowance is obtained and quality is improved. In case of overlock machines, the edge guide does not allow the operator to trim more than required. This helps maintain the correct size.

Types of Edge Guides

Edge guides are of two types.

1. Straight: This is used only when the seam line is straight.
2. Curved: This has the shaped curve allowing the operator to move the aligned curved seam continuously, without stopping for realigning of seam

Rack Guides

Rack guides are useful when a lace, trim or braid needs to be placed on to a garment part. These trims are generally wound in reels. A operator has to unwind and position them in the correct place under needle. A rack guide is attached to the machine frame in front of the presser foot having the same width as the trim. The trim goes through the rack guide and is fed to the needle.

Positioning Attachments

Positioning attachments are used when a smaller garment parts needs to be positioned on a bigger part. The operator needs position the smaller part relative to both vertical and horizontal directions. For examp, while positioning a pocket on the left front of a men's shirt the operator has to position the pocket from the HPS (Highest point of shoulder) and the edge of the placket. Traditionally, a helper with a template of the left front with holes for the pocket position will be marking the points with the help of a water soluble marker. To replace this, we can put a edge guide to the back of the needle, parallel to the shoulder line and another edge guide to the right indicating the edge of the front part.

Once the front is positioned, it is understood that the top corner of the pocket should be under needle position. This will remove one helper operation.

3.5 Folders

Folders are used where fabric must be folded prior to sewing. In most cases, they are separate devices attached to the machine. Where the scale of folding is small, the folder is contained in the presser foot itself.

Folders are mostly used on machines having more than one needle. They are made of highly polished metal, over which the material can pass smoothly. Their use depends on the type of garment they make, and are justified only for moderate and high volume production. Folders enable great increase in production along with high standard of control over quality. When using folders, several factors to be taken into account, for example, when attaching separate strip preferable continuous, sequence of construction of garment. Folders are of many types depending on the seam they construct, those which fold the fabric to finish an edge called hemmers, those which join garment sections and those which add a section of self-fabric or other material to the garment (Bound Seam), referred to as binders.

3.6 Hemmers

Hemmers give either narrow fold or boarder fold. A different hemmer is used depending on the width of the finished seam. From 5mm to 40 mm a separate folder maybe used. A narrow hem folder makes a double rolled hem, used to finish edges of scarves and handkerchiefs (Pico) and for shirt bottom Swing Hemmer is used.

A hem wider than 5 mm requires a separate folder. Stitches used are 301, or 103. When using 401, the hem would be folded down rather than up. Folders are also combined with specialized machine feed system, to avoid roping effect, when finishing hems especially wider hems. Swing

Out Folder is used, when sewing shirts out dresses. The beginning and end of the hem is bulky, due to the placket front. The start of the hem might need to be turned freehand. Spring hemmers are used for thick and thin seams or crossover seams.

Folders are used commonly for sewing shirt front plackets. They not only simplify the operation, but also reduce the number of operations, therefore increasing productivity. The use of this folder is most effective on twin needle machines. For example, front placketing using twin needle or four needle machine top center plaid folder. Folders join major garment parts together. The most common one is used for jeans construction. The lap fell folder 401 twin needle machine folder can be used on a flat bed or feed of the arm machine. Folders are also available which add self-fabric or other material to a garment are binders (Bound Seam). This is done either to finish edges neatly or create a decorative effect or both. For example, Sleeve placket binder is used on single needle machine. Rolls of binding are fixed on rack guides in such a manner, that the fabric is supplied straight to the main fabric.

It is important to know all the operations for which standard folders are available as folders are a major deskilling device, which aids in getting high productivity using lower grade sewing operators. Though the use of folders is welcomed from the manufacturer viewpoint, care has to be taken to be taken to get approvals for seam constructions from the buyers, as few constructions do not give the exact appearance as wanted by buyers.

For instance, a polo T shirt sleeve can be hemmed in the component stage, which will make use of a folder and flat hemming is quicker. When the side seam is sewn in the garment stage, the end of sleeve has the protruding side seam which can be tacked in using a lockstitch machine. Though this construction is easier for the factory, some buyers might prefer the sleeve hem to be done after side seam is attached to hide the end of seam in the hem.

3.7 Other Work Aids

Other work aids include those which aid the operator to separate work from the machines, without picking up a pair of scissors. In most cases, the operator Chains off the parts which are later cut apart with scissors. The threads should be cut very close to the end of the seam and in case of chain stitch, 1 cm is left at the end to avoid unraveling. The left ends are then hand trimmed at a later stage. A simple method often used in lockstitch machines is a metal edge behind the needle bar, which is sharp enough for the thread to be cut. However, lengths will vary. It is not suitable for chain stitch as when threads are pulled, it will cause the stitch to break.

In some machines, knives are provided behind the presser foot. These are operated by knee press, to operate the material which has passed the knife or photo electric or infra-red detector, which senses the presence or absence of fabric. Suitable knives are also used to cut reinforcing tape elastic or other material. These are also called impact cutters. On lock stitch, underbed trimmers are combined with a needle positioner motor. It cuts the thread below the throat plate. When activated by operators it heels back on the treadle.

When the machine stops the machine and does not operate the thread cutter, the machine stops with the needle positioned down. When a thread cutter is operated, the needle is automatically raised. It saves time and no trimming is required at a later stage.

3.8 Latch Back Device

A Latch back device is another type of work aid, found in overlock machine. Locking is done by either stitch condensation or bar tacking or lockstitch. Activities which a machinist performs during the sewing cycle, such as raising the presser foot, backtacking at the end of a seam etc., can be programmed into a microprocessor controlled machine, along with the needle positioner and thread cutting. These machines are referred to as integrated sewing units (ISU). They are used for label attach, topstitching patch pockets, collars, cuffs etc., the amount of handling is

considerably reduced. The raised presser feet allows fabric insertion, lower presser foot commences sewing with backtack and sew from and cut at the end of the cycle.

Compressed air is used to avoid curl edges of jersey fabric, during overedging, when hems are double rolled, to push the fray ends into the fold of the hem. To cool over heated machines clean, dry compressed air is used. It requires a compressor, and a storage vessel which acts as a reservoir, an air cooler to maintain constant temperature, air filter pipework, drains to remove moisture, and flexible tubing to carry air to individual work place. When the valve is opened, air enters the cylinder, which drives the piston and carries out the required work.

3.9 Stackers

The type of stackers depends on the size of the garment that is being disposed. Stackers are adjusted to the height of the table and parts are off loaded into boxes for smaller sewing parts. For larger sewing parts, the operator passes the piece off the back of the machine over the horizontal bar of the stacker. Pneumatic operation moves the bar away from the machine, so that the garment falls aside. The bar then returns to its former position to await the next garment.

3.10 Slack Feeder

The slack feeder ensures materials are fed in a relaxed state. From the rollers, the material hangs in a long slack loop. A tension occurs when this relaxed loop is pulled by the machine. Elastics are sewn and stretched, which gives a uniform gathering.

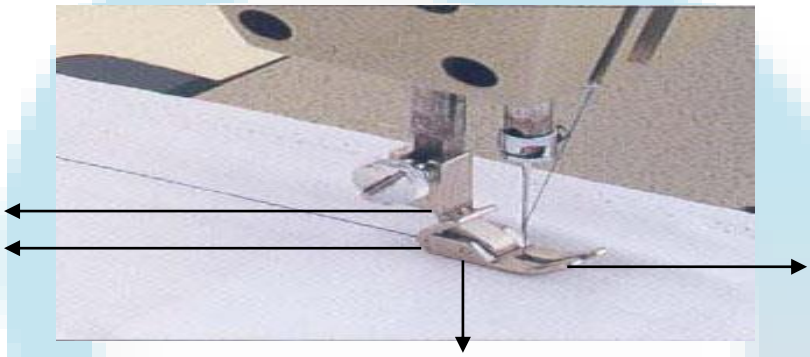
3.11 Motor Rollers

Motor rollers meter the right amount of elastic with a puller feed mechanism.
They are used for wide elastics sewn with 4 needles. The fabric is folded round the elastic by means of a folder.

3.12 Presser Foot

Presser foot is a Feed System Component. The function of the presser foot is to exert pressure to the top of the fabric. This prevents the fabric from flagging and ensures it does not get displaced during the sewing cycle. The presser foot is attached to the presser bar, which in turn is in

contact with springs. The spring compression is controlled by a thumb screw nut, which is used to adjust presser foot pressure.



The section that contacts the fabric is the shoe. The lower surface of the shoe is the sole. The amount of pressure can be adjusted for stitching speed and fabric type and weight. Flagging can be avoided by more pressure and a smaller needle hole. The toe is the front portion that does not contact the sewed surface. It is responsible for holding, guiding and positioning the unsewn fabric.

The heel is the back portion which holds the fabric and retains its position for feeding and stitching action to take place. Soles are very smooth surfaces. But can be toothed or channeled depending on the application. The presser foot has a hinge compensation or elevator compensation action or a combination of both. The former is the action of tilting the sole plane. The latter is raising the entire shoe up and down. Both these actions occur, when fabric of unequal thickness passes through it. Side elevator compensation is the raising of one of the two shoes where the presser foot has two shoes.

Various types of presser feet are available for various special operations. For example, Hinged Foot, compensating Foot, Piping Foot, Zipper, Teflon, cording, hemming etc. Each area of the Presser foot has various applications For example, short toes for stitching curves, long toes for straight seams, channeled soles for fitting over bulky lapped seam. Motor rollers meter the right amount of elastic with a puller feed mechanism. They are used for wide elastics sewn with 4 needles. The fabric is folded round the elastic by means of a folder.

Compensated Presser Foot

The compensated presser foot, enables seams of accurate width to be sewn and this allows the operator to work faster.

It is used in any situation where there is difference in height to the left and right of an edge and stitching is required at a specific distance from the edge.

They are also used for attaching and topstitching raised seams, which have been created by turning the seam allowance to one side.

3.13 Applications of Compensated Presser Foot

TOPSTITCHING A SEAM:

This is done by the compensating feet, which is created by turning the seam allowance to one side. These could be such things as, topstitching a lengthwise seam on skirt or pair of trousers or the lower edge of a waistband.

CLOSING DOWN A SHIRT COLLAR:

They are used for closing of seams, such as inside of a shirt collar or the lower edge of the waistband where sink stitching is required.

SINK STITCHING:

It is called sink stitching as the name suggests, it is a stitching which sinks under the turned edge of fabric. It is also referred to as the stitching in the seam shadow. When it is accurately sewn, it is almost visible.

Types of Compensated Presser Foot

This is a right compensated pressure foot.

This is a left compensated foot.

Double compensating presser foot is used for uniform and precise top stitching. This foot can be used for both Right or Left top stitching.

Two step compensated is used when the operator has to perform two different tasks requiring two different width of compensation on the same side.

Examples are, edge stitching and top stitching of collar by the same operator.

Half Zip Foot

Half zip foot enables the stitching to be close to the teeth of the zip.

Narrow Toed Presser Foot

Narrow toed presser foot also enables one, to give a close stitching to the teeth of the presser foot, but with an improved fabric control.

Gauging Foot

Gauging foot is a presser foot which is used as the simplest ruffling mechanism.

It must be set continuously into a single ply of fabric, before attaching it to another in a garment.

Split Ruffling Foot

Split Ruffling foot is a special presser foot, which can be used to ruffle one fabric on to another, without any tendency for the top ply to ruffle.

Piping Foot

Piping foot is ideally suited for fine uncorded piping on medium to heavy-weight fabrics. A ridge in the sole of the foot under the left edge provides a guide for the piping edge. The right hand side of the sole is hollowed out, allowing the free passage of the added thickness of the piping. Different piping foots are available for straight or curved, corners or to aid in stitching along bulky trims, such as webbing, strapping and hook-and-loop tape.

Teflon Foot

Teflon foot are used in combination with Teflon feed dog. They are used in stitching finer shinier fabrics on which, the metal marks by feed system components can leave shiny marks after ironing.

Hemmer Foot

Hemmer foots are used when the hemming is very narrow, for example in the hemming of handkerchiefs.

Quilting Foot

Quilting foot is used to stitch parallel lines of quilting. This pressure foot acts as an edge guide.

3.14 Conclusion

To summarize, in this unit you have learnt about the possible usage of Automated Work Stations and their benefits. Further, you also got an overview of how to use Deskilling Devices to improve productivity and quality.