10 Electronic and Computer Applications in the Clothing Design and Production

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10.1 Introduction

Considering the recent conditions, apparel producers must produce quality products in a short period with low costs to be able to compete in the world market. Also, you must research and develop many products and make production time shorter in order to get a share in the apparel market. This situation, makes it a must to change the production phases and pre-production phases from human-based to automation by computer aided design, computer and electronic aided manufacturing systems.

The intense competition in the foreign markets forces apparel producers to analyze their inputs that form the costs. Hence, there are certain improvements about automation which reduce the costs. Automation can be defined as the process of reducing the human work in the production phase. With the help of automation, the addiction to worker becomes lessened and switches the quality dependence from worker to the machine which is easier to adjust and to control.

In general, the advantages of all Computer Aided Design (CAD) / Computer Aided Manufacturing (CAM) systems are as follows:

- Allowing flexibility in production
- Better quality of production
- More sophisticated quality-control facilities
- Reduction in production times
- The opportunity to work fewer stocks (Groover, 1996)

10.2 Electronics and Computing In Modelling Department

CAD systems are used in preparation stages of model design, pattern making, marker planning and grading in clothing industry.

10.2.1 Model Design

CAD systems are equipped with functions to create fashion illustrations. Some of these functions are as follows:

- Free drawing
- Graphics drawing
- Pattern design templates
- Design enlarge or shrink
- Regional deformation or bending the pattern
- Color changes on the pattern
- The infinite possibilities of shading on design and model
- Dressing prepared design on garment model
- All drawings, designs and models drawn on paper or fabric can be transferred by scanners (Öndoğan, 1997)

10.2.2 Computerized Pattern Design, Grading And Marker (Cutting Plan) Making

After completion of model design, measurement of the design and patterns must be prepared. The body size results of previous studies are used during operation of measurement. Then the patterns are prepared according to these measurements for garment production.

The necessary arrangements on the main pattern are made. Then the pattern grading is made according to the measurement table which is already prepared.

Cutting plan preparation means placing the model patterns according to number specified in the order of production, and fabric characteristics. The system provides the chance to place of patterns during preparation of the cutting plan. The user is able to change the places of model and patterns manually (Öndoğan, 1997).

Another convenience provided by CAD systems is saving the patterns and cutting plans in a digital environment. Patterns and cutting plans can be stored and reused if needed (Öndoğan, 1994).

10.3 Electronics and Computing In Cutting Department

Cutting room is a critical department which affects the quality of the product and is where the cutting, spreading and arrangement of the fabric is made. Modernization in the cutting room has started with fabric spreading machines and has continued with computerized cutting planning systems has come to cutters which shortens the time and effort requiring cutting processes.

10.3.1 Automatic Fabric Spreading Machines

The automatic fabric spreading machines move on the railed system which combine two spreading tables and can be used on both tables at the same time. The fabric spreading process in the automatic fabric spreading machines can be automatically made by entering the parameters.

The spreading process must be started by using a control panel and the layers must be controlled by the operator. The machine has back and forth motion to make spreading. Automatic fabric spreading machines have types, which the operator standing or sitting in an armchair (Taylor, 1995, Erdoğan, 2003).

Figure 10.1: Fabric Spreading Machine (www.astasjuki.com)

Fabric spreading machines consist of the following sections;

- The engine
- Fabric tension control
- Photocell
- Worker carrying mechanism
- Electronic counter
- Cutter
- Fabric roll carrying mechanism
- Optional lighting
- Right and left spreading

10.3.2 Computer Aided Cutting Systems

Correct cutting process increases the productivity in the sewing room. NC cutter (numerically controlled cutter) is used in 1969 for the first time. With CAM (Computer Aided Manufacturing) systems, it's possible to get a fast and sensitive cutting and hence the time loss caused by operators who match the fabric pieces, is gone. CAM system also allows you to cut the pieces which touch or are really closer to each other, perfectly. This lets you save fabric in total. When you do the cutting with CAM system, there will be no difference between the layers of fabric; hence the productivity of the sewing room increases (Taylor, 1995).

Computer aided cutters are divided into two basic groups; electronic cutters and mechanical cutters. Classical round knives and upright-knifed cutters form the mechanical cutters. Round knives are used on low surfaces or on only one layer of fabric. Laser cutters make the cutting process by burning the fabric. Laser cutters are used on one single layer of fabric because with more layers of fabric, melting yarns may stick to each other and decrease the sensitivity of cutting. Water-jet cutters use the high pressured water. Water-jet is common for cutting leather and rubber surfaces (Erdoğan, 2003).

Computer aided fabric cutters cut fabrics according to marker plans which are prepared before. Machine can be connected to marker plan system online or offline. Computer aided cutters make a more sensitive and faster cut than manual systems. Cutting process is done by machine head which is rotated by computer to x and y directions. The other parts of cutter are table, control panel, command panel and vacuum system.

Figure 10.2: Computerized Fabric Cutting Machine (www.astasjuki.com)

10.4 Electronics and Computing In Sewing Room

In the production of apparel, the sewing time in a standard machine is 17% of the whole time. Rest of the time is spent on taking the piece, placing fabric into the machine and making adjustments. Technological developments and the necessity of doing good work in short time, lead the apparel producers to automation in the sewing room as well.

10.4.1 Electronics In Sewing Machine

Electronic lockstitch sewing machines are a part of automation as well. These machines allow you to adjust the speed of sewing at the beginning and hence the quality increases.

The operations in this machine are controlled by the operation panel. The places of the keys on the panel are easy to remember and use.

Figure 10.3: Electronic Sewing Machine (www.brothertr.com)

On automatic lockstitch sewing machines there are following features;

- Adjusting the diving time and speed
- Stopping the needle anywhere
- Hardening automatically (back tack stitch)
- Adjusting the sewing length
- Ending the sewing with photocell which sense the end of fabric
- Starting with slow start button
- Automatic thread trimming
- Automatic presser foot lifting

Another group of machines that supply the automation in the sewing room are computerized sewing machines. As you know, the worker starts the operation in computerized sewing machines and prepares the next piece while the sewing processes. There are many newly developed computerized sewing machines depending on the wide range of products. Computerized sewing machines are mostly used in factories that produce shirts, trousers and suits.

Some of these machines:

- Computerized pliers sewing machines
- Computerized hip pocket sewing machines
- Computerized flap pocket sewing machines
- Computerized belt loop sewing machines
- Computerized belt sewing machines
- Computerized side sewing machines…etc. (Taylor, 1995)

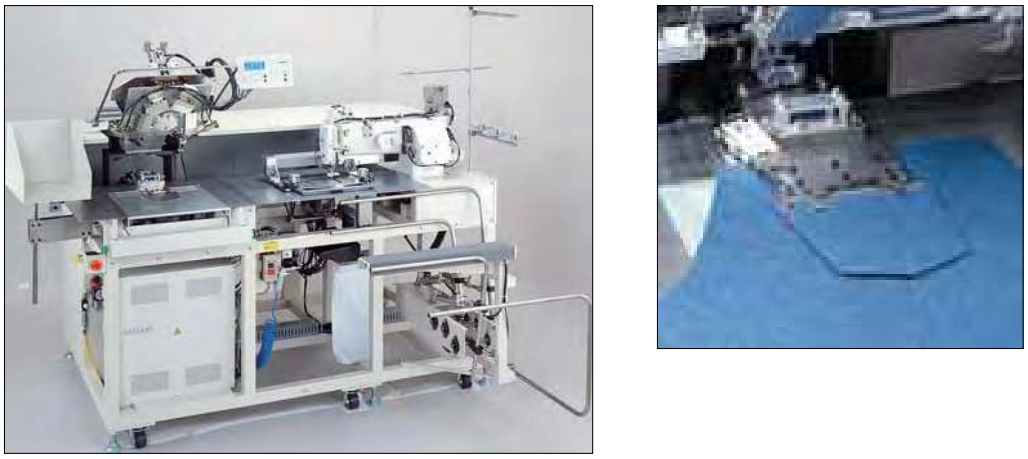

Figure 10.4: Hip Pocket Automaton (www.astasjuki.com)

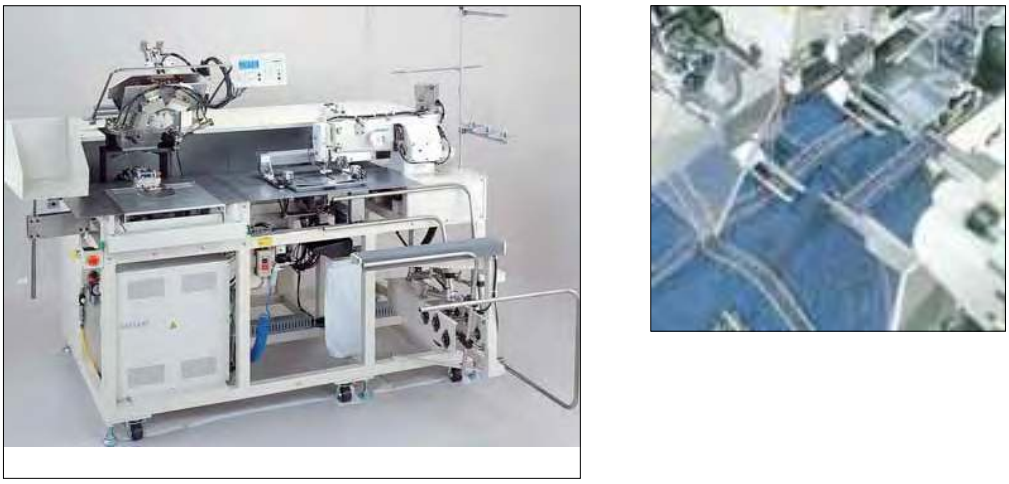

Figure 10.5: Belt Loop Automaton (www.astasjuki.com)

The most common computerized sewing machines are buttonhole, button and bar tacking computerized sewing machines.

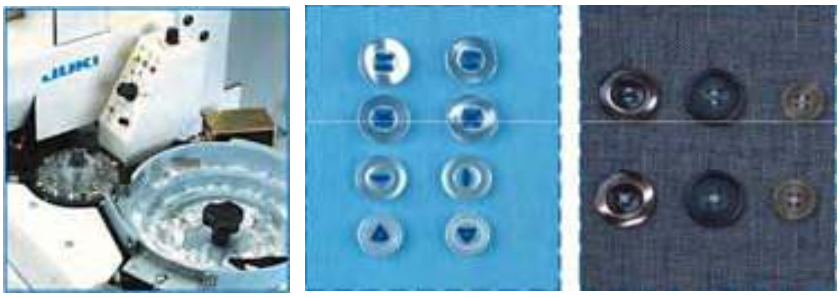

Figure 10.6: Button sewing automaton (www.astasjuki.com)

10.4.2 Computerized Embroidery Machines

From past to present Embroidery machines have a major technological development. The first examples of these machines run with jacquard principle. Today these machines are computer aided. Embroidery machines have program packages. The machine works automatically with pre-designed patterns.

Figure 10.7: Computerized Embroidery Machines (www.brothertr.com)

Embroidery machines are lock stitch machines. Pattern formation is possible with the movement of the machine pulley (pantograph). Needle and looper are moved by the movement of main motor shafts arm. Stitch formation is related with this motor. Pattern formation is related with the pulse (step) motors. These motors are more numerous than one. According to the design of the pattern, pulse motors move the pantograph right to left and front to back. Patterns in computer language are converted to stitch design thanks to the pulse motors. Pulse motors guide the pulley for new location after the needles are come out of the fabrics. Pulley doesn't move when the needles are inside the fabrics.

It is possible to work with different colors in pattern belongs to the number of needles. Every needle works with each color in turn. It is viewed that only one needle works on each machine head during the machine running. The machine stops automatically when the thread is finished or broken thanks to electronic sensors. There is also an electromechanical system that cuts the thread in the end sewing embroidery.

10.5 Computerized Movers

The process of moving doesn't enrich the product even though moving is required in each stage of production. Therefore, it's aimed that the minimum cost, to be flexible and efficient, should minimize the need for personnel and space by using movers. Especially the small quantity orders, a wide variety of styles and quick response requirements make the moving process more complex (Tait, 1997).

During the process of moving, the products are moved by hangers. Therefore, the system has these advantages;

- Less wrinkle and staining (less ironing and stain removal)
- Less preparation time for workers
- No interferences of models and colors
- Transferring the production data every time to managers

Figure 10.8: Computerized Movers (www.astasjuki.com)

During computerized moving, each hanger unit is numbered with barcodes. Following info can be given on barcodes;

- Stations
- Process
- The model name
- Standard duration of transactions
- Type of operation
- The daily target
- The number of clothing on each hanger unit,
- Size
- Color
- The customer name…etc.

This information is given by production number in loading stations. The hanger unit is unloaded and the garment is sent to packaging unit, after all transactions completed. Empty hangers are returned to loading station. After loading, hanger units go to their destinations without any intervention.

10.6 Computerized Production Management and Control

Production management and control means to assemble materials, machinery and labor resources to provide the production and controls of the desired qualities, quantities and efficiency with the lowest time and cost (Özaltay, 2002).

The apparel companies must use the information technology, automation to achieve their goals. A variety of software was developed for apparel companies. Companies can check the new models, new collections and the status of their orders over the internet. This software, allows apparel companies to get information about all processes from preliminary costs to delivery.

Computer aided production management and control, can be used in a textile company for the following processes;

- Security
- Preliminary cost
- Proforma cost
- Customer management
- Marketing and sales
- Material requirements planning
- Time planning
- Order management
- Stock control
- The purchase
- Production follow-up
- Production management
- Delivery
- Packing list
- Current accounts
- The actual cost (Çepoğlu etal, 1997)

The production management and control can be done correctly thanks to this system. The companies will use these systems more efficient to preserve their place in competitive market.

10.7 Conclusion

Nowadays, apparel producers have to follow the fast improving technology in order to get a place in the world market. This situation requires automation in all steps of the process. But ready-made clothing producers should be careful with their choice of machine and go for the most suitable one for the factory and product range. And the producers should also watch out for the reliability of the company.

10.8 References

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