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The Benefits of using Computerized system over Manual System in Apparel Production

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Abstract **-** Bangladesh's clothing industry is the backbone of the country's economy. One of the most crucial first phases in the apparel industry is to create and develop garment patterns based on the anticipated apparel's specifications, and then to plan the marker and cut the fabric according to the pattern pieces. These can be done manually or with the use of Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM) software (CAM). The garment business has been transformed by computer-aided design (CAD) and computer-aided manufacturing (CAM). Because fabric costs account for a large portion of the cost of garment manufacture, it is critical to properly utilize the fabric and reduce the percentage of fabric waste (percent). Additionally, minimizing production time will reduce lead time even more. Although CAD/CAM is expensive, it has a number of economic and technological advantages over other methods.

Index Terms **–** Apparel, CAD, CAM, Cutting, Pattern, Spreading, Cutting.

I. INTRODUCTION

The textile industry which is an important segment of Bangladesh's manufacturing industry, Bangladesh is one of the leading exporters of RMG products in the world. More than 80% of our foreign currency is being earned through export of RMG products [1]. CAD systems are mostly utilized in the apparel sector in activities such as garment design, pattern preparation, pattern grading, and marker creation. Interactive manipulation of garment components is possible using two-dimensional (2-D) CAD systems, which is faster and easier than the traditional drafting procedure for pattern making [2].

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Computerized sewing machines, fabric spreading, and cutting systems are examples of CAM systems [3]. The quality control of the textile product is aided by feedback at various stages of manufacturing and subsequent modifications performed by automated control devices [4]. Increased equipment usage is one of the key benefits of CAM systems [5].With the increasing competition and decentralized manufacturing garment industries are looking forward to the different software solutions to systematize the processes and to overcome their challenges [6]. As a result, better products are manufactured faster and more easily with significant productivity gains [7]. In order to achieve the desired enhancement of competitiveness, additional applications and integration should be fostered. The apparel industry can benefit from application of CAD/CAM processes already in effect in other industries but further progress will demand development of more specific processes and equipment [8].

For quantitative analysis data are needed to be collected from the both manual and CAD/CAM unit. For any bias treatment primary data collection method is the best option to collect practical data relative to the research topics or concerned areas. To do so, specific materials or machines and different productions sections of an industry or industries where both manual and CAD/CAM system is present are needed to be specified. If quantitative data can't be found in respective field, self-experimental study may be regarded as an alternative.

This research study includes both the industry-based data and self-conducted experiment to establish a ground for comparing manual system and CAD/CAM system in apparel industry. Quantitative analysis is carried out in pattern designing and in cutting section activities. For taking primary data, Esquire Knit Composite Ltd. is chosen where both manual and CAD/CAM system is used in cutting section. Time is taken for pattern designing for both manual and CAD system by the authors as manual pattern designing facilities was not found. Other than that

secondary data for manual pattern designing was not also available from trust worthy source and research items on manual system was hardly available.

II. MATERIALS AND METHODS

A.Materials and Machines

The work reported in this paper based on gathering of information like productivity of both CAD/CAM as well as Manual. The investigation was conducted in Esquire Knit Composite Ltd. industry in Bangladesh where there were two types of production facilities. One production unit was using CAM system and manual methods of fabric spreading and cutting.

TABLE I.

MEASUREMENTS OF DIFFERENT BODY PARTS

Body parts	Measurement in cm
T-shirt length	70
½ chest	50
Shoulder	13.5
Back neck length	24
Front neck drop	9.5
Back neck drop	4
Arm- hole straight	27
Sleeve length	23
Sleeve opening	20

For making pattern of short sleeve T-shirt, CAD system named Lectra Modaris V6R1 and manual method is carried out through self-conducted experiment. Using the below chart, pattern is made separately in Lectra CAD system and manually by hand sketching.

Fig.1. Short sleeve man's T-shirt

Lectra Brio X250 auto fabric spreader, KM-AUV-MACK straight knife cutting m/c, Kawakmai GP50G computer-controlled knife cutting.

Fig.2. Straight knife fabric cutting and Semi automatic fabric spreading machine

B.Methods

Comparative research is the process of comparing two or more objects with the goal of learning something new about one or all of them. This method frequently incorporates numerous fields into a single investigation. When it comes to technique, the overwhelming consensus is that comparative research has no unique approach. The flexibility that the multidisciplinary approach provides is advantageous.

In comparative studies, there are some procedures that are significantly more common than others. The bulk of comparative studies that use quantitative data show that quantitative analysis is far more commonly conducted than qualitative analysis.

The author created pattern drawings, making tables, and size set tables for the basic t-shirt that served as the basis for this study. The research outcomes were obtained using two methods: the manual approach and the CAD method. The primary areas for doing the research were then identified.

For the manual and CAD working methods, these were determined individually. Time spent drawing patterns, time spent spreading fabric, time spent cutting fabric, and spreading productivity were all areas where observations were made.

A basic t-shirt was chosen as a model from which the measurements were taken to make the TABLE I. After

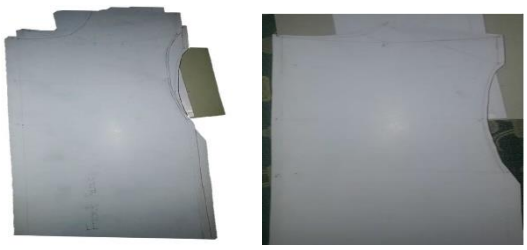

Fig.3. Front part and back part

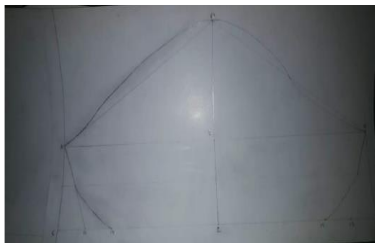

Fig.4. Sleeve of a short sleeve man's T-shirt

That using the measurement of the TABLE I. pattern of back part, front part, sleeves were made. Time required for preparing the patterns of the above-mentioned garments using CAD and Manual system was studied. ln this regard average time required for each operation was observed by using the stopwatch.

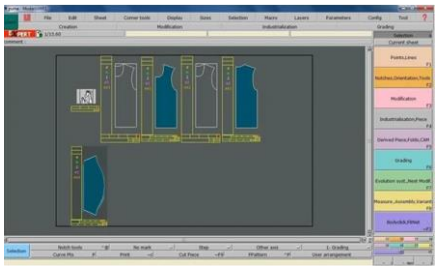

Fig.5. Pattern of short sleeve T-shirt in CAD

Spreading parameters:
Number of plies =78
GSM = 160
Construction = Single jersey
Color = Navy blue
Lay Length = 3yd 10 inch
Width = 74 inch

Cycle time for spreading each ply both for manual and CAM system was taken with stop watch and manpower employed was counted.

Cutting parameters:
Number of plies = 78
GSM = 160
Construction = Single jersey
Color = Navy blue
Lay Length = 3yd 10 inch
Width = 74 inch

Time for cutting per piece was taken both for manual and CAM system with stop watch and manpower employed was counted.

III. RESULTS AND DISUSSIONS

Time required in pattern designing was taken for pattern making in both manual and CAD system. Figure 6 shows that the time required in designing, CAD system is significantly lower than manual method. It can be seen that on average, CAD is three times faster than manual method. In manual method, the sketching of points according to specific measurement takes more time but in CAD system after putting the measurement, sketching can be done easily which takes less time. Other than that, the pattern design is more smooth and improved in quality in CAD.

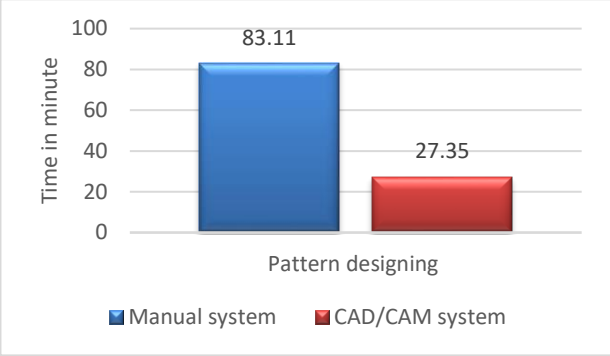

Fig.6. Variations in time requirement in pattern designing

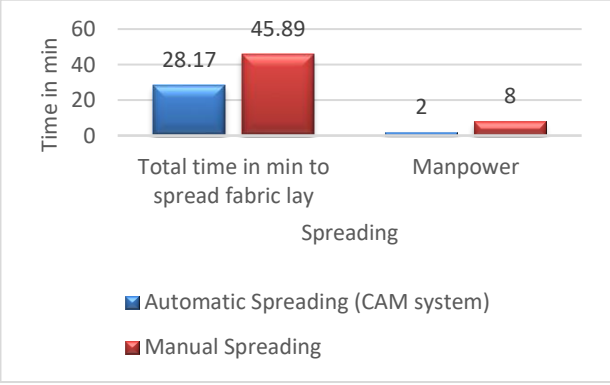

Fig.7. Time measured to spread fabric lay

From figure 7 to spread a lay of 78 ply time required in cam system is more than 1.5 times lesser than manual spreading method

Additional time is also taken in manual cutting for fatigue and changing directions of cutting.

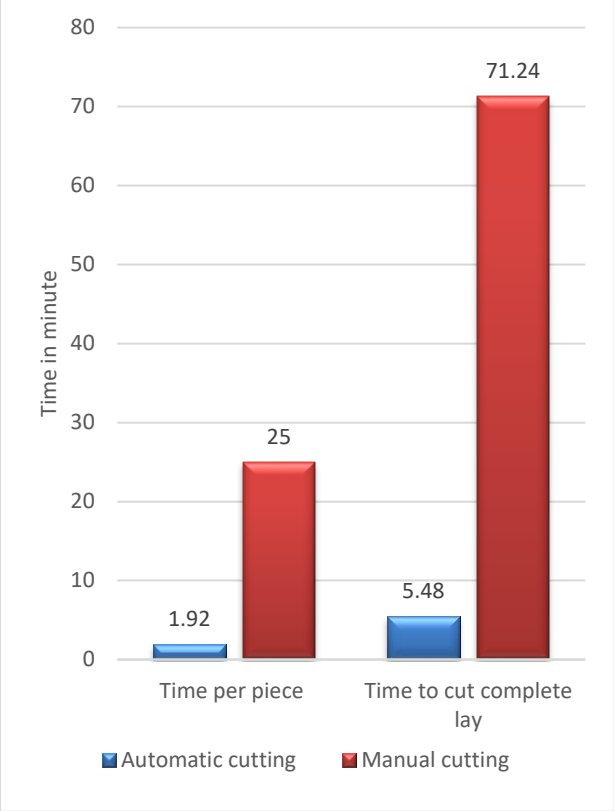

Fig.8. Time measured for fabric cutting

From figure 8 to Cut a lay of 78 ply time required in cam system is more than 13 times lesser than manual cutting method.

IV. CONCLUSION

Based on the comparative study, it is found to be less productive and efficient than CAD/CAM system. For pattern generation CAD system is more efficient and takes lesser time than manual pattern designing. In cutting section increased productivity is observed for CAM system. For spreading semi-automatic works 1.5 times faster than manual spreading and for computer controlled cutting system 3 times faster working rate is also observed. At the same time limitations of CAD/CAM systems are also mentionable. To overcome these limitations more advanced CAD/CAM suites like 3D body scanner and automatic CAM system can be employed.

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