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Effect of Garment Size Ratio and Marker Width Variation on Marker Efficiency for both Manual and Computerized Marker

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ABSTRACT

Marker making is one of the crucial activities in cutting room. An efficient marker minimizes the fabric wastages during cutting. A good marker is indicated by its efficiency. The increasing in marker efficiency means the more fabric utilization because fabrics are cut following the guidelines of marker. In this study, 06 (six) markers (both manual and computerized) were produced for 06 (six) size ratios individually with constant marker width. Again another 03 (three) markers (both manual and computerized) were made for three different marker widths with constant size ratio. Then a comparison was prepared for both manual and computerized markers based on marker efficiency. It was found that there have significant changes in marker efficiency due to changes in size ratio and marker width.

Keywords: Manual Marker, Computerized Marker, Size Ratio, Width Variation

INTRODUCTION

Marker making is one activity in garments manufacturing that is the process of determining the most efficient layout of the pattern pieces for a specific style, fabric, and the distribution of sizes [1]. A marker is a picture of organized arrangement of all pattern pieces for a particular style and the sizes to be cut from a single spread [1], or marker is a thin paper which contains all patterns of garments of all sizes for a particular style or design in such a way that, fabric wastage would be least [2]. The main objective of marker making is to confirm the maximum utilization of fabrics. Any reduction in the amount of the fabric used per garment leads to increased profit [3]. The production cost is usually reduced for the minimization of fabric wastage [4]. Marker efficiency is calculated in cutting room which is really much glorified, as it is easily proven in terms of percentage of fabric consumption [5]. Marker efficiency is the ratio between the summation of the area of all patterns on a marker and the area of that marker expressed as percentage.

$$\text{Marker efficiency} = \frac{\text{Area of all patterns on the marker}}{\text{Area of marker}} \text{X } 100\%$$

Marker efficiency depends on some factors such as marker planner, size of garments, marker length, pattern engineering, fabric characteristics, marker making methods, marker width and style of garments [6]. Devices performing high-tech services in the apparel industry are commonly referred to as 'CAD/CAM'. In the apparel industry, CAD systems are mainly used in various processes such as garment design, pattern preparation, pattern grading and marker making [7]. In CAD systems, there are so many software for using in garment marker making besides manual methods. Optitex is one of the widely used CAD software in garments designing and marker making. The origin of this software is Israel. Pattern designing, marker making, virtual fitting test, 3D effect etc of garments can be made by using optitex software which is very effective before starting garment manufacturing [8]. The main purpose of this study was to compare manually produced marker and computerized automatic marker based on efficiency with different garment size ratios and various marker widths.

METHODOLOGY

Markers can be made by manually drawing patterns directly on to the fabric/paper or by manipulating and plotting computerized pattern images. In this study, both manually i.e. patterns drawing on marker paper and computerized

marker were produced. Here Optitex was used as CAD (computer aided design) software. To perform the study a marker was produced by computer for a particular style of T-shirt of 03 (three) different sizes (S, M and L). Total 06 (six) computerized markers were made for 06 (six) garment size ratios. Then another 06 (six) markers were made according to the previous 06 (six) ratios manually. The following size ratios were used to produce markers for both manual and computerized marker making processes.

	(A)	(B)	(C)	(D)	(E)	(F)
S	1	2	1	1	2	2
M	1	1	2	2	2	1
L	1	1	1	2	1	2

After that, 03 (three) computerized and 03 (three) manual markers were made for 03 (three) different marker widths. Widths of three markers were 27.1 inches (this width was used i.e. fixed for previous 06 markers), 41 inches and 55 inches. Then the efficiency of each marker was calculated using the area of patterns and area of marker. Finally, the comparison was checked between manual and computerized marker based on efficiency for various size ratios and marker widths.

EXPERIMENTAL DATA ANALYSIS

Marker efficiency calculation for different garment size ratios -

(A) Ratio = 1:1:1

Computerized marker:

$$\text{Size ratio} = 1:1:1, \text{Length} = 69.2 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 1875.32 \text{ square inches and Pattern area} = 1575.39 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 84\%.$$

Manual marker:

$$\text{Size ratio} = 1:1:1, \text{Length} = 70.85 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 1920.035 \text{ square inches and Pattern area} = 1575.39 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 82.05\%.$$

So, the efficiency of computerized marker = (84-82.05) % = 1.95% is higher than manual.

(B) Ratio=2:1:1

Computerized marker:

$$\text{Size ratio} = 2:1:1, \text{Length} = 89.39 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 2422.469 \text{ square inches and Pattern area} = 2013.07 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 83.09\%.$$

Manual marker:

$$\text{Size ratio} = 2:1:1, \text{Length} = 90.10 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 2441.71 \text{ square inches and Pattern area} = 2013.07 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 82.44\%.$$

So, the efficiency of computerized marker = (83.09-82.44) % = 0.65% is higher than manual.

According to that data analysis, the miniature marker of computerized marker and manual marker are given below in figure-01 and figure-02.

(C) Ratio = 1:2:1

Computerized marker:

$$\text{Size ratio} = 1:2:1, \text{Length} = 91.80 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 2487.78 \text{ square inches and Pattern area} = 2089.74 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 84\%.$$

Manual marker:

$$\text{Size ratio} = 1:2:1, \text{Length} = 94.80 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 2569.08 \text{ square inches and Pattern area} = 2089.74 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 81.34\%.$$

So, the efficiency of computerized marker = (84-81.34) % = 2.66% is higher than manual.

(D) Ratio = 1:2:2

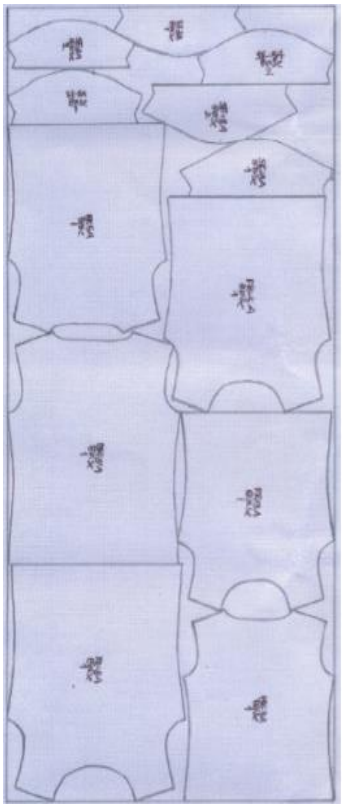
Computerized marker:

$$\text{Size ratio} = 1:2:2, \text{Length} = 117.95 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 3196.54 \text{ square inches and Pattern area} = 2704.1925 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 84.60\%.$$

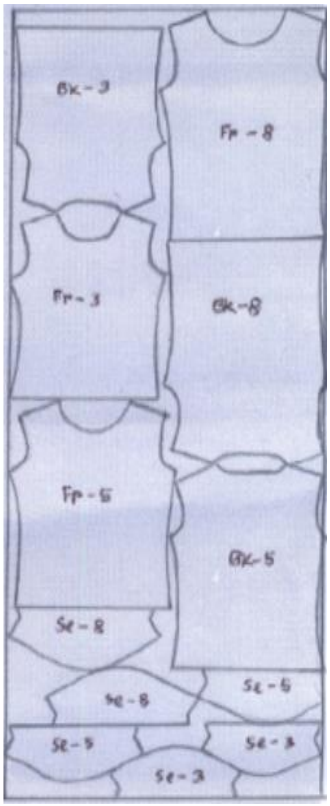
Manual Marker:

Size ratio = 1: 2: 2, Length = 119.20 inches, Width = 27.1 inches,
Marker area = 3230.32 square inches and Pattern area = 2704.1925 square inches.
The efficiency of this marker = 83.71%.

So, the efficiency of computerized marker = (84.60-83.71) % = 0.89% is higher than manual.

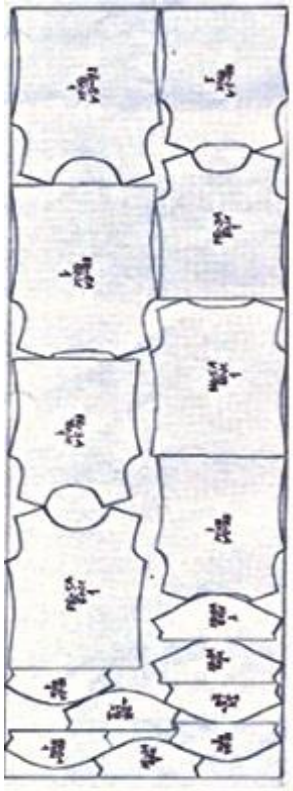


(a) Computerized Marker

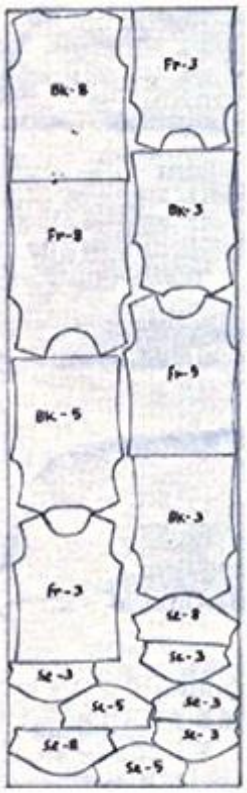


(b) Manual Marker

Fig. 1 Miniature Marker (ratio=1:1:1)



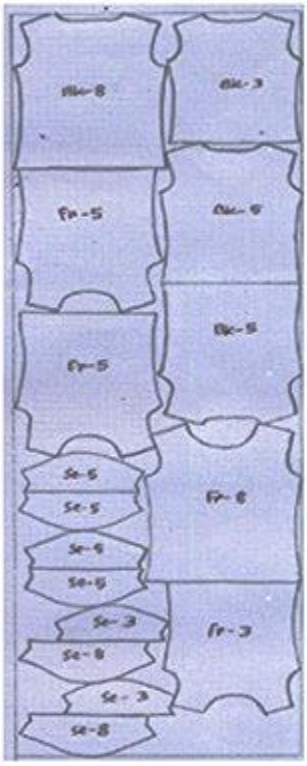
(a) Computerized Marker



(b) Manual Marker

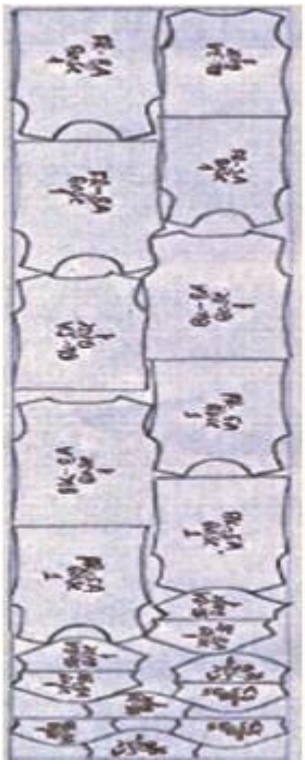
Fig. 2 Miniature marker (ratio=2:1:1)

(a) Computerized Marker



(b) Manual Marker

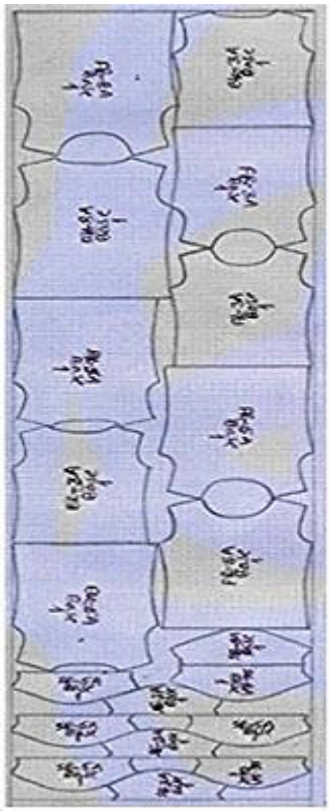
Fig. 3 miniature marker (ratio=1:2:1)

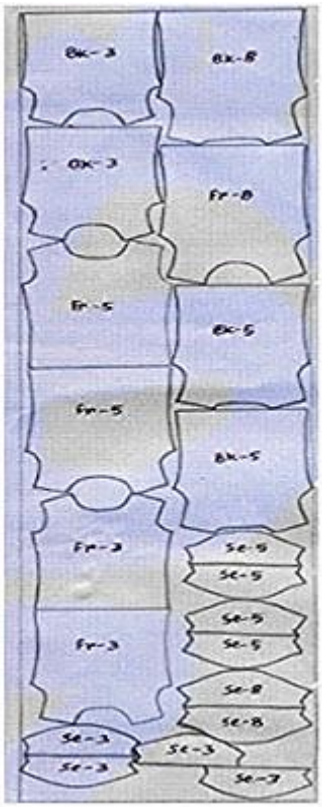


(a) Computerized Marker

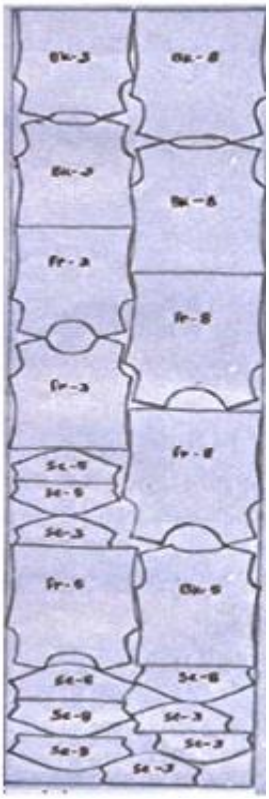
(b) Manual Marker

Fig. 4 miniature marker (ratio=1:2:2)





(a) Computerized Marker (b) Manual Marker
Fig. 5 miniature marker (ratio=2:2:1)



(a) Computerized Marker (b) Manual Marker
Fig. 6 miniature marker (ratio=2:1:2)

(E)<u>Ratio= 2:2:1</u>

Computerized marker:

$$\text{Size ratio} = 2:2:1, \text{Length} = 113.25 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 3096.075 \text{ square inches and Pattern area} = 2528.92 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 81.68\%.$$

Manual marker:

$$\text{Size ratio} = 2:2:1, \text{Length} = 115 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 3116.50 \text{ square inches and Pattern area} = 2528.92 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 81.14\%.$$

So, the efficiency of computerized marker = (81.68-81.14) % = 0.54% is higher than manual.

(F) <u>Ratio = 2:1:2</u>

Computerized marker:

$$\text{Size ratio} = 2:1:2, \text{Length} = 115.28 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 3124.088 \text{ square inches and Pattern area} = 2627.658 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 84.10\%.$$

Manual marker:

$$\text{Size ratio} = 2:1:2, \text{Length} = 116.10 \text{ inches}, \text{Width} = 27.1 \text{ inches},$$
$$\text{Marker area} = 3146.31 \text{ square inches and Pattern area} = 2627.658 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 83.51\%.$$

So, the efficiency of computerized marker = (84.10-83.51) % = 0.59% is higher than manual.

Marker Efficiency Calculation for Different Marker Widths:

Here it is presented that how the marker efficiency can be changed due to width change. Here size ratio is constant.

(A)<u>Width = 41”</u>

Computerized marker:

$$\text{Size ratio} = 1:1:1, \text{Length} = 45.38 \text{ inches}, \text{Width} = 41 \text{ inches},$$
$$\text{Marker area} = 1860.58 \text{ square inches and Pattern area} = 1575.39 \text{ square inches.}$$
$$\text{The efficiency of this marker} = 84.67\%.$$

Manual marker:

$$\text{Size ratio} = 1:1:1, \text{Length} = 45.50 \text{ inches}, \text{Width} = 41 \text{ inches},$$

Marker area = 1856.50 square inches and Pattern area = 1575.39 square inches.
The efficiency of this marker = 84.44%.

So, the efficiency of computerized marker = (84.67-84.44) % = 0.23% is higher than manual.

(B) Width = 55"

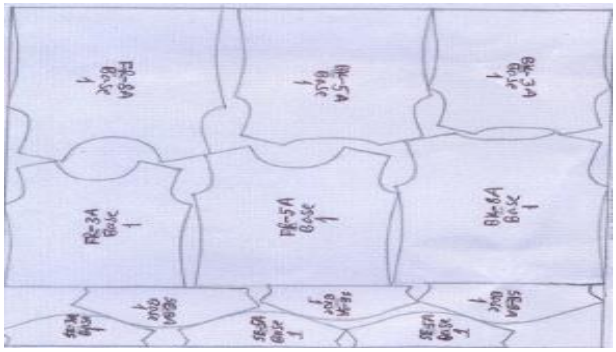
Computerized marker:

Size ratio = 1: 1: 1, Length = 35.06 inches, Width = 55 inches,
Marker area = 1928.30 square inches and Pattern area = 1575.39 square inches.
The efficiency of this marker = 81.69%.

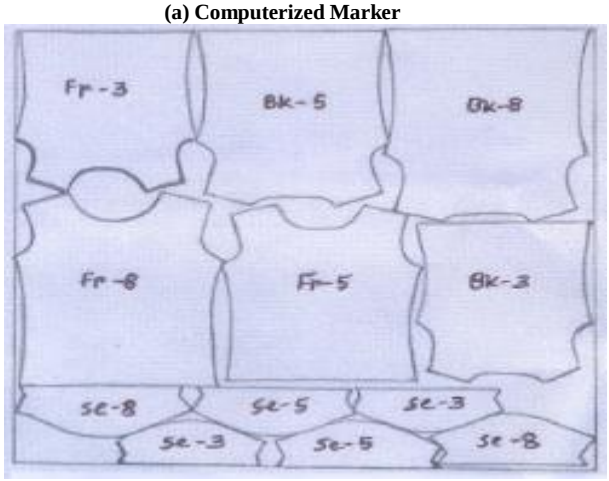
Manual marker:

Size ratio = 1: 1: 1, Length = 36.75 inches, Width = 55 inches,
Marker area = 2021.25 square inches and Pattern area = 1575.39 square inches.
The efficiency of this marker = 77.94%.

So, the efficiency of computerized marker = (81.69-77.94) % = 3.75% is higher than manual.

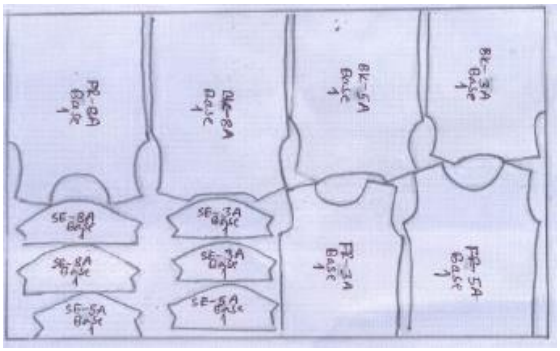


(a) Computerized Marker

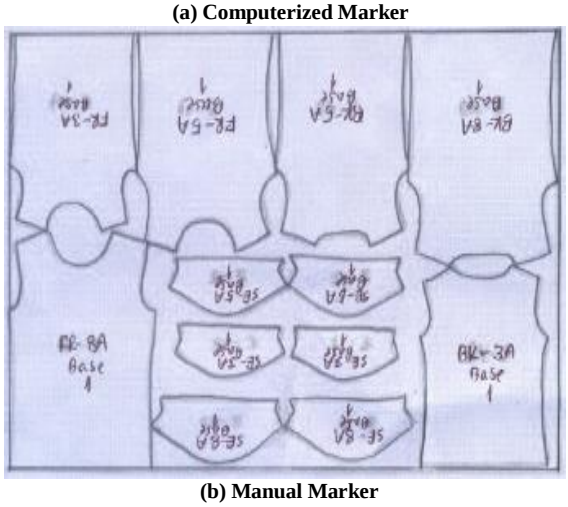


(b) Manual Marker

Fig. 7 Miniature marker (ratio=1:1:1; width=41")



(a) Computerized Marker



(b) Manual Marker

Fig. 8 Miniature marker ratio=1:1:1; Width=55")

RESULTS AND DISCUSSION

Effect of Size Ratio on Marker Efficiency (Manual Marker)

Table-1 Marker Efficiency of Manual Marker for Size Ratios

Size ratio	Marker Efficiency (%)
1:01:01	82.05
2:01:01	82.44
1:02:01	81.34
1:02:02	83.71
2:02:01	81.14
2:01:02	83.51

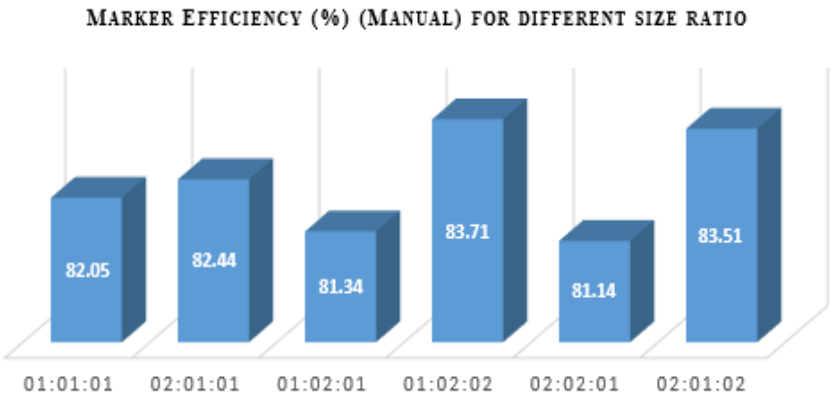


Fig. 9 Effect of size ratio on marker efficiency (manual marker)

Fig. 9 signifies that the marker efficiency is higher when the size ratio is 1:2:2 and the efficiency is lower when the size ratio is 2:2:1. In the ratio 1:2:2, the number of large parts of garments is higher so that other less amount of small parts is easily placed in gaps between large parts. As a result, the efficiency is higher in case of ratio 1:2:2.

Effect of Size Ratio on Marker Efficiency (Computerized Marker)

Table-2 Marker Efficiency of Computerized Marker for Size Ratios

Size ratio	Marker Efficiency (%)
1:01:01	84
2:01:01	83.09
1:02:01	84
1:02:02	84.6
2:02:01	81.68
2:01:02	84.10

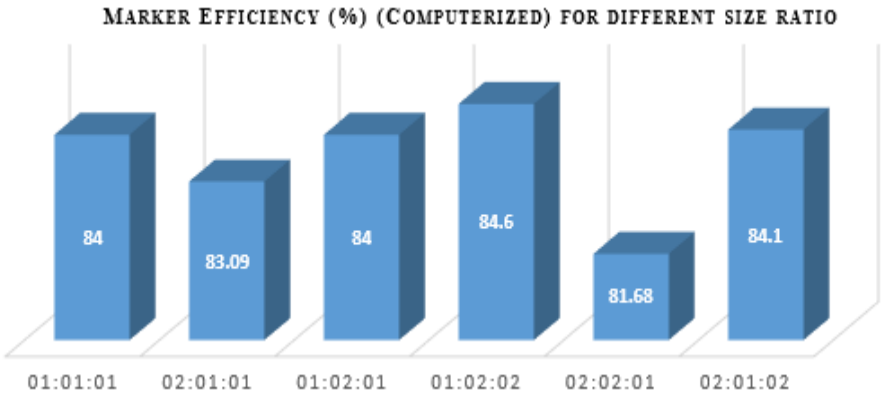


Fig. 10 Effect of size ratio on marker efficiency (computerized marker)

The fig. 10 represents that the marker efficiency is higher when the size ratio is 1:2:2 and the efficiency is lower when the size ratio is 2:2:1 in case of computerized marker. Due to higher number of large parts of garments, other less number of small parts are easily placed in gaps between large parts. So, the efficiency is higher in case of ratio 1:2:2.

COMPARISON BETWEEN MANUAL AND COMPUTERIZED MARKER

Effect of Size Ratio on Marker Efficiency

From the fig. 11, it is easily understandable that the efficiency of both manual and computerized marker is highest when size ratio is 1:2:2whereas the efficiency is lowest in case of ratio 2:2:1.

Table -3 Comparison on Efficiency of Manual and Computerized Marker Based on Size Ratios

Size ratio	Marker Efficiency (%) (Computerized)	Marker Efficiency (%) (Manual)
1:01:01	84	82.05
2:01:01	83.09	82.44
1:02:01	84	81.34
1:02:02	84.6	83.71
2:02:01	81.68	81.14
2:01:02	84.1	83.51

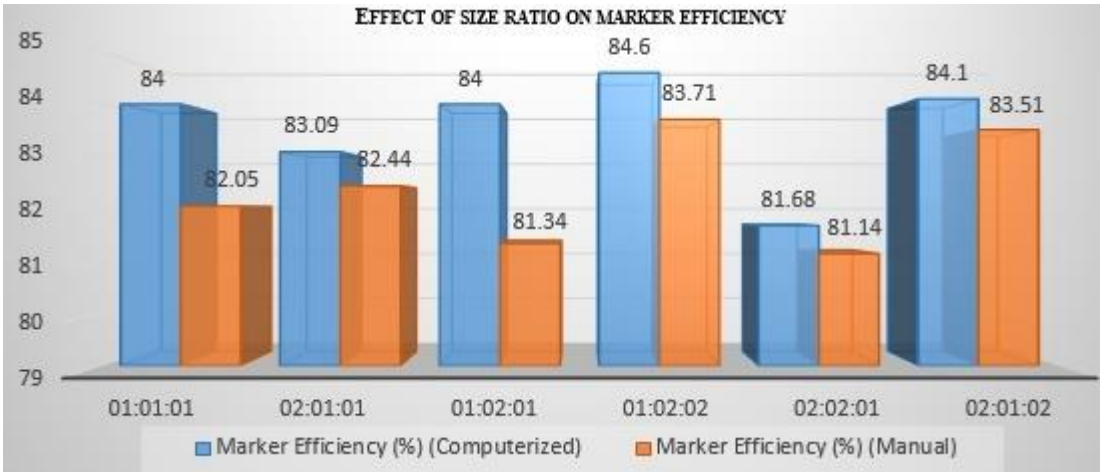


Fig. 11 Comparison between manual and computerizedmarker (effect of size ratio on marker efficiency)

Effect of Width on Marker Efficiency (Manual Marker)

Fig. 12 shows that the efficiency increases with the increasing of width, but after a certain width efficiency starts to fall. For 41 inches width the efficiency is the highest whereas the efficiency is the lowest for the width 55 inches.

Table -4 Efficiency of Manual Marker for Various Widths

Size ratio	Marker Width (inches)	Marker Efficiency (%)
1:01:01	27.1	82.05
	41	84.44
	55	77.94

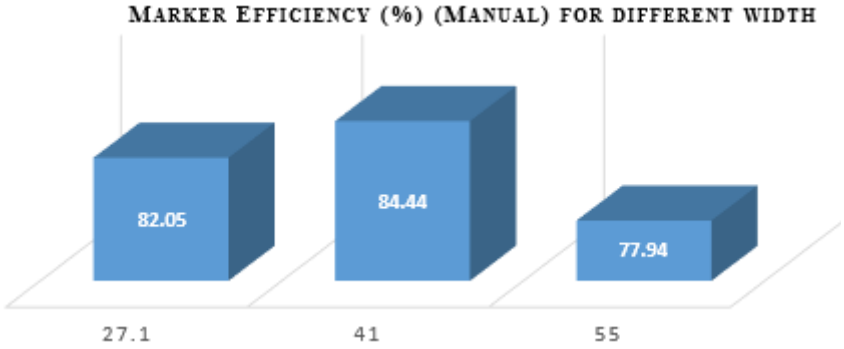


Fig. 12 Effect of width on marker efficiency (manual marker)

Effect of Width on Marker Efficiency (Computerized Marker)

From the fig. 11, it is easily understandable that the efficiency of both manual and computerized marker is highest when size ratio is 1:2:2whereas the efficiency is lowest in case of ratio 2:2:1.

Table-5 Efficiency of Marker for Different Widths

Size ratio	Marker Width (inches)	Marker Efficiency (%)
1:01:01	27.1	84
	41	84.67
	55	81.69

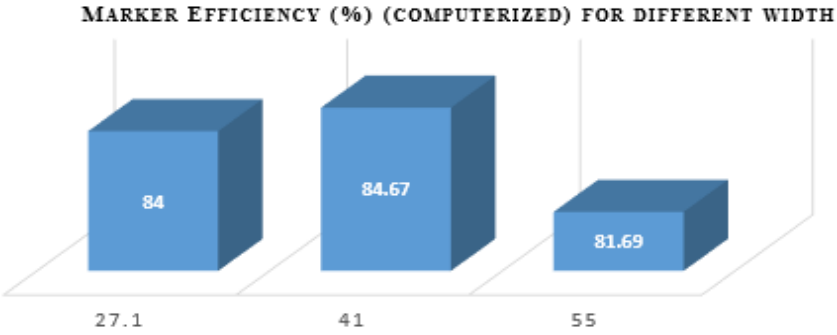


Fig. 13 Effect of width on marker efficiency (computerized marker)

The fig. 13 contains denotes that the efficiency increases with the increasing of width and decreases after a certain level. For 41 inches' width the efficiency is the highest whereas the efficiency is the lowest for the width 55 inches.

Comparison between Manual and Computerized Marker (Width Variation)

From the fig. 14, it was found that both markers have the highest efficiency in case of width 44 inches and least in case of width 55 inches.

Table-6 Efficiency of both Manual and Computerized Markers

Size ratio	Marker Width (inches)	Marker Efficiency (%) (Manual)	Marker Efficiency (%) (Computerized)
1:01:01	27.1	82.05	84
	41	84.44	84.67
	55	77.94	81.69

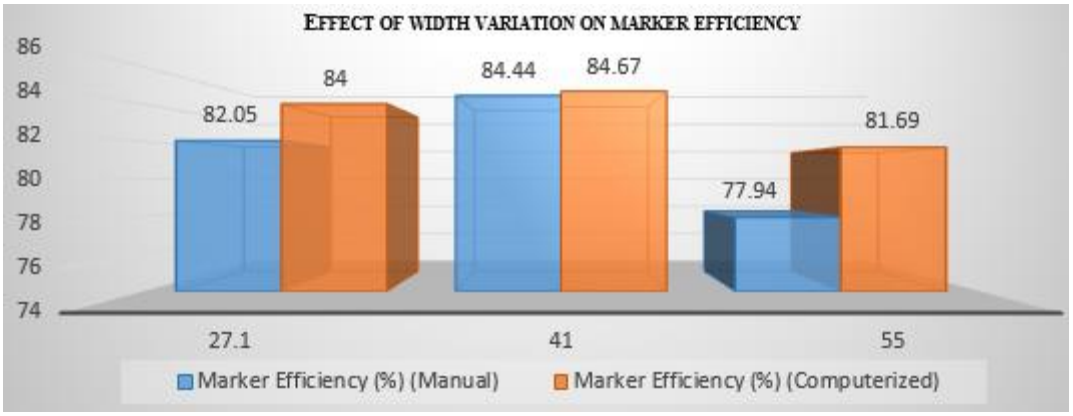


Fig. 14 Comparison between manual and computerizedmarker (effect of width variation on marker efficiency)

CONCLUSION

Marker is very important for increasing garments production. If the marker is not made accurately and efficiently the whole cutting activity will be hampered badly. As a result, the fabric wastage will be higher and the production will be lower. In this research, it was tried to identify some factors which increase marker efficiency. From this work, it was clearly identified that marker efficiency changes significantly due to the variation in garment size ratio and marker width.

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