INVESTIGATION OF MARKER EFFICIENCY COMBINING DIFFERENT SIZE GARMENTS AND USING DIFFERENT WIDTH MATERIALS

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Professional paper
UDC: 687.1:677-037
DOI: 10.5937/tekstind2403040N

Abstract: *Marker efficiency is a very important term in garment industry. We all know that in cutting section of garment industry there is a high possibility of fabric wastage. And with the high marker efficiency we can decrease the wastage. And obviously the lower wastage will secure the loss of time and money. In the garment industries marker planning is done with a single marker width with single size set ratio. But, variable marker width with variable size ratio can be used for maximum marker efficiency. By using variable marker width and variable size set we wanted to maximize the marker efficiency in this research. After getting the maximum average efficiency it was found more efficient than the factory for a particular style. This will help in achieving more profit and loose wastage. We here increased the marker efficiency by 6.01% more than the Factory efficiency and by which we decreased a huge amount of fabric wastage besides getting more profit than before.*

Keywords: marker planning, marker Efficiency, variable marker width, variable size set, CAD software.

ISTRAŽIVANJE EFIKASNOSTI KROJNE SLIKE KORIŠĆENJEM ODEVNIH PREDMETA RAZLIČITIH VELIČINA I MATERIJALA RAZLIČITIH ŠIRINA

Apstrakt: *Efikasnost krojne slike je veoma važan pojam u odevnoj industriji. Svi znamo da u krojačnici industrije konfekcije postoji velika mogućnost pojave neopravdanog otpada materijala. Ali sa visokom efikasnošću krojne slike možemo smanjiti gubitak materijala. I očigledno će manji gubitak materijala obezbediti gubitak vremena i finansijskih sredstava. U industriji konfekcije izrada krojne slike se vrši za jednu širinu materijala i za jedan komplet veličina odevnih predmeta. Ali, promenom širine krojne slike i promenom veličina delova odevnih predmeta u krojnoj slici može se poboljšavati efikasnost krojne slike. U ovom istraživanju korišćenjem promenljive širine krojne slike i veličina delova odevnih predmeta u krojnoj slici želeli smo da maksimiziramo efikasnost krojne slike. Nakon dobijanja maksimalne prosečne efikasnosti utvrđeno je da dobijena nova efikasnost je bolja od fabričke za konkretni model odevnog predmeta. Ovde je povećana efikasnost krojne slike za 6,01% od efikasnosti krojne slike u fabrici i time se smanjuje ogromna količina otpada pored toga što se ostvaruje veći profit nego ranije.*

Ključne reći: planiranje krojne slike, efikasnost krojne slike, promenljive veličine krojne slike, set promenljive veličine, CAD softver.

1. INTRODUCTION

Marker is a thin paper which contains all the pattern pieces of a garment. Before cutting marker is made to minimize the wastage of fabric. The main objective of marker making is to reduce cost, to improve quality of garment, to reduce cutting time, to increase the production scale. The ratio of all patterns on the marker paper to total area of the marker and if it is expressed by % this is known as the marker efficiency.

Marker Efficiency(%) = [Area Consumed by All pattern on the marker / Total area of the marker] * 100

If marker efficiency is more, then fabric wastage % will be lower.

If marker efficiency is low, then fabric wastage % will be higher [1-3].

The companies want to reduce fabric wastage through efficient utilization of resources. But this issue is unsolved till now in the garment industry for traditional marker making using CAD software with same marker width and same size ratio. In the cutting section of some garment manufacturing industries Conventional marker making is done till now. But instead of conventional Method Computer Aided Manufacturing (CAM) or Computer Aided Design (CAD) software can be used for increasing efficiency of Marker. And that software can increase garment manufacturing efficiency and cost-effectiveness [3,4]. However, the marker efficiency is still now a matter of concern although majority of garment industry use software for planning the marker. But we come out with new concept and idea to increase the marker efficiency by doing the marker plan with a new vision. As we can see that 0.5% increase in the marker efficiency will decrease high level of fabric wastage.And in this Project we have tried to do this work, and we think that we have successfully implemented our idea through this project [5,6].

The objectives of the study are as follows:

1. To reduce the fabric wastage by increasing efficiency of marker
2. To share a new idea to the garment industry for increasing marker efficiency
3. To decrease the cost of production and increase profit.

2. METHODOLOGY

To perform the experiment a series of activities has been done sequentially. The activities are described in the following,

1. Data collection: To perform the task a renowned factory was selected. The permission was granted from the higher authority. After being permitted the data has been collected from the CAD (Computer Aided Design) section for the convenient of the experiment. A marker planning sheet has been collected for a particular style with all details. The planning was done for a fixed marker width. The experiment was carried out for knit fabric.

2. Investigation over Planning sheet: A detailed study was done over the planning sheet to find out all the parameters and information's. After gathering information's, data has been collected from cutting section to find out the available applicable marker width for planning.The marker width should always less than the marker width.All the pattern pieces were laid following all pattern in different direction.

3. Marker Planning with variable marker width: After gathering all necessary data from the industry, marker planning was done in CAD software of our university with variable marker width. To plan, the sizes were divided into different segments and each segment was divided into two subdivisions containing three sizes & two sizes. Then each segment was implemented in the planning with applicable all the marker width to determine the marker efficiency for each segment. Then the better efficiencies of each segment were investigated through graphical presentation. All the pattern pieces were laid following one pattern in one direction.

4. Suggestion for the factory: After the investigation suggestion was suggested to factory for the betterment of the profit as well as betterment of the company [7-10].

2.1. Specifications of Software used

The marker planning of ours was done by Modaris Software. The details of the software are given in the following:

Software name: Lectra-modaris
Model: Modaris V6R1
Founded by: Lectra Systems,Inc
Founded in: 1973
Head quarter: Paris,France
Language Support: English
Protype: Modaris 3D Fit
Software Type: CAD/CAM
Virtual type: 2D/3D

In the factory the marker planning was done by the following software

Software Name: Gemini Pattern Designer X17
Model: X17
Founder: Traian LUCA

Founded in: 2004
Head quarter: Lasi, Romania
Language Support: English
Software Type: CAD
Virtual type: 2D/3D

3. FACTORY PLANNING VS PROPOSED PLANNING

The factory marker planning done by Gemini Pattern Designer X17 software is detailed below with all parameters and efficiency percentage:

Table 1: Table of Factory Marker Planning Information

Order Name	Size Set	Size Ratio	Marker Width	Marker Length	Efficiency %
456J-ZF-N-TEST ord	S,M,L, XL,XXL	1:3:4:3:1	165	731	86.72%

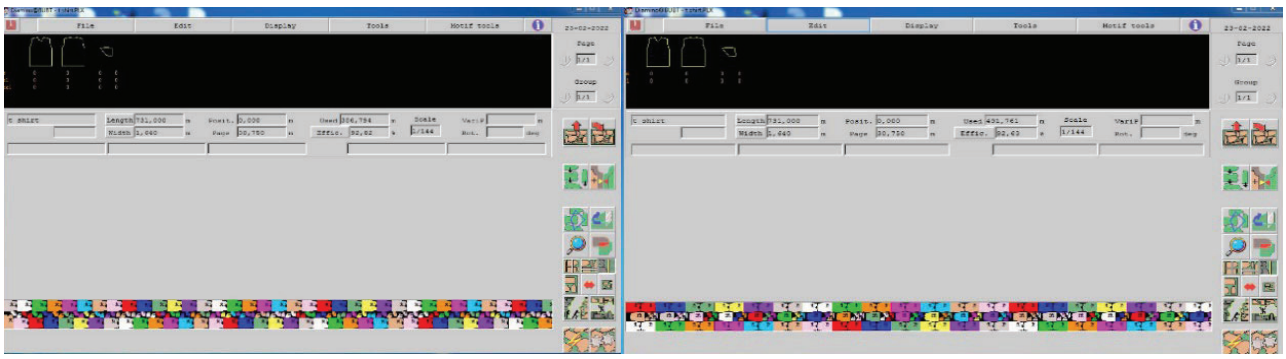
Figure 1: Figure of Factory Marker Planning

Experiment Design

To perform the task, the factory marker ratio was divided into two part. One part contained two sizes another part contained three sizes. From 120 different combinations 10 segments were chosen because those were the representatives of 120 combinations. And it was ensured by doing several combinations. For example, with 1:3:4 & 3:1 size ratio 1,2,3&4 number segment was done but for another it was repeatedly same.

Table 2: Table of experiment Design for 1-10 segment

ORDER NAME	Segments	Sub Division	Size Ratio	Efficiency % with variable Marker Width (Cm)			Maximum Efficiency % With Width Of The Fabric	Average Efficiency % Of Each Segments With Marker width
				164	165	166		
456J-SF-N-TEST ord	1	S:M:L	1:3:4	86.76%	86.51%	85.94%	86.76%(164cm)	87.99%(164cm&166cm)
		XL:XXL	3:1	87.80%	88.90%	89.23%	89.23%(166cm)	
	2	S:XL:L	1:3:4	87.33%	86.27%	86.77%	87.33%(164cm)	88.33%(164cm)
		M:XXL	3:1	89.33%	88.45%	87.89%	89.33%(164cm)	
	3	XXL:M:L	1:3:4	89.78%	90.32%	88.97%	90.32%(165cm)	90.29%(165cm&166cm)
		XL:S	3:1	88.94%	89.87%	90.27%	90.27%(166cm)	
	4	XXL:XL:L	1:3:4	90.56%	91.47%	92.64%	92.64%(166cm)	92.26%(166cm&165cm)
		M:S	3:1	89.77%	91.89%	90.67%	91.89%(165cm)	
	5	S:M:XXL	1:3:1	91.32%	92.37%	90.67%	92.37%(165cm)	92.07%(165cm&166cm)
		L:XL	4:3	89.57%	90.67%	91.77%	91.77%(166cm)	
	6	S:XL:XXL	1:3:1	92.82%	92.65%	91.89%	92.12%(164cm)	92.73%(164cm)
		L:M	4:3	92.63%	92.38%	92.18%	92.73%(164cm)	
	7	S:L:XXL	1:4:1	91.67%	89.71%	89.94%	91.67%(164cm)	91.07%(164cm&166cm)
		XL:M	3:3	89.49%	89.73%	90.48%	90.48%(166cm)	
	8	M:XL:L	3:3:4	90.31%	89.84%	91.89%	91.89%(166cm)	90.70%(166cm&165cm)
		S:XXL	1:1	88.76%	89.51%	87.94%	89.51%(165cm)	
	9	XXL:M:XL	1:3:3	91.97%	90.18%	89.81%	91.97%(164cm)	90.95%(164cm&166cm)
		L:S	4:1	87.88%	89.47%	89.94%	89.94%(166cm)	
	10	S:M:XL	1:3:3	91.76%	89.51%	89.77%	91.76%(164cm)	90.91%(164cm&165cm)



(a) (b)

Figure 2: a) Figure of Planning of S, XL, XXL; (b) Figure of *Planning* of M & L

Table 3: Segment 1-10 Efficiency

S1	S2	S3	S4	S5	S6	S7	S8	S9	S10
87.99%	88.33%	90.29%	92.26%	92.07%	92.73%	91.07%	90.70%	90.95%	90.91%

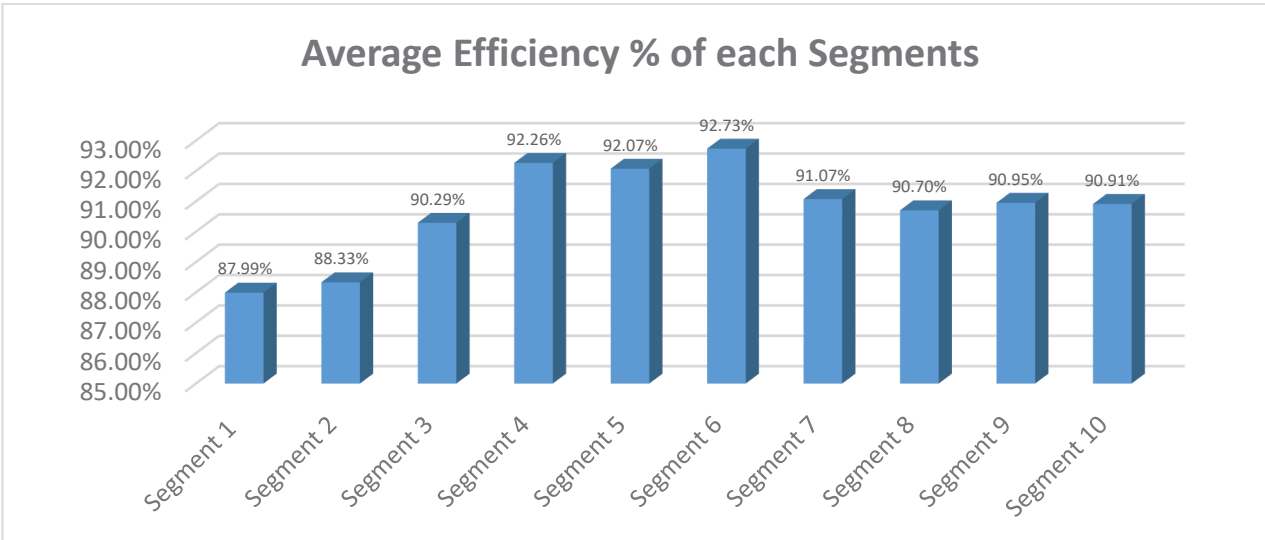


Figure 3: Figure of Average efficiency of each segment

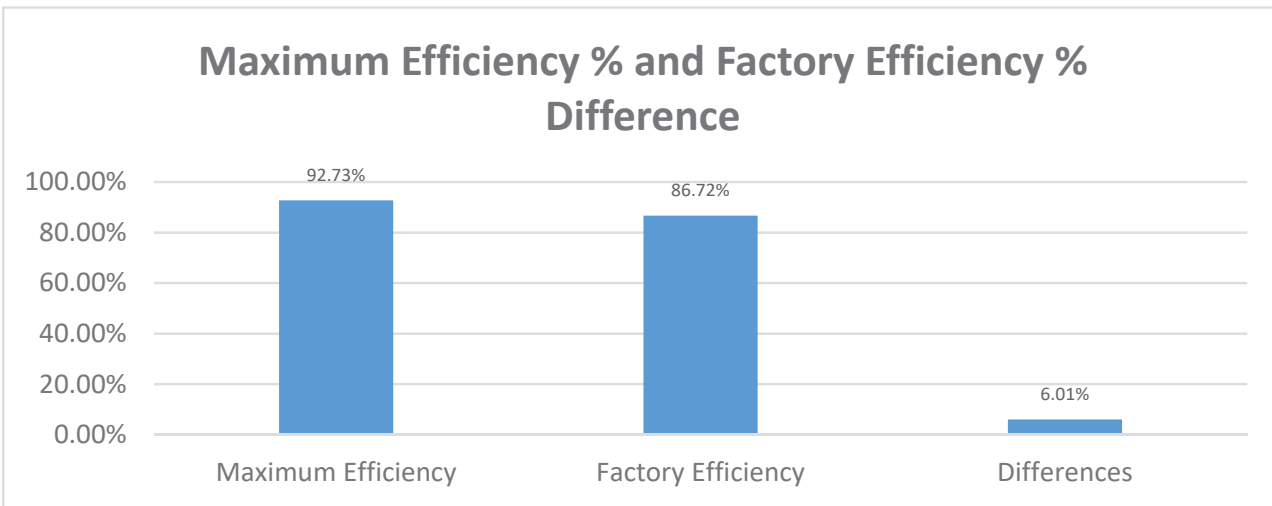


Figure 4: Figure of Maximum Efficiency and Factory Efficiency and differences

Here, this graph showed us that the segment 6 having 92.73 % efficiency which is 6.01% more than the Factory's marker efficiency which was 86.72%. Because in this segment more utilization of space is occurred. In every segment where more utilization of space is occurred efficiency increased and Vice versa. Most of the industries include all sizes of the order in one marker but we can plan two markers instead of one containing the segments of all sizes. This project work was done in that theme, because we think that the marker efficiency will be more effective and less costly than the traditional process of planning the marker.

4. CONCLUSION

This experimental work showed us that maximum efficiency can be achieved is 92.73% where as in the factory the same order Efficiency is 86.72%. And the experimental work showed 6.01% more efficiency than the factory plan. So, more fabric utilization was possible and more profit was achieved.

Here we used single jersey fabric which GSM is 180 Total Cost of fabric $8 per kg. Here, No of Lays-113 Marker pieces -12 and Consumption is-2.5 kg for one lay of fabric. So total cutting kg of marker lay-(2.5×113) = 282.50 kg and if we use the factory marker plan the marker efficiency will be 86.72% and the wastage will be: (282.50×13.28)/100 =37.52 kg.

And if we use our marker efficiency which was 92.73% and 6.01% more than the factory marker efficiency. Then the Wastage will be: (282.50×7.27)/100 =20.54 kg. That means we can save 16.98 kg of fabric by this marker planning with variable size sets and variable marker width.

Fabric utilization can be maximized (37.52 kg -20.54 kg) × 8$ = 135.84$ (Aprrox-11,410Tk) Cost Savings:

Table 4: Difference between Factory Planning & Proposed Planning

HEADING	FACTORY PLANNING	PROPOSED PLANNING
Efficiency	86.72%	92.73%
Fabric Wastage	37.52 Kg	20.54 Kg
Cost of Loss	300.16 $	164.32 $

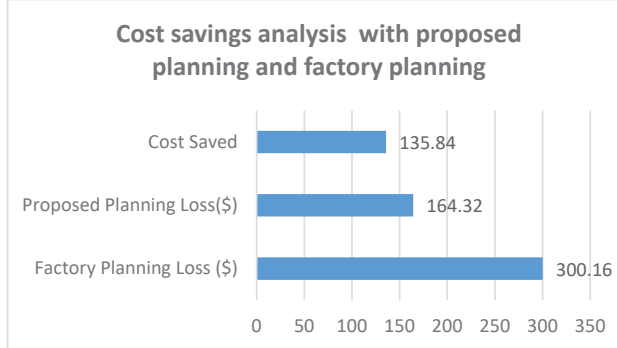


Figure 5: Difference between Factory Planning & Proposed Planning

Marker efficiency is very crucial term in apparel industry. The maximum fabric utilization is depended on this marker efficiency. So, more the marker efficiency, more the fabric utilization and more the saving of fabric as well as more the profit. In this research an attempt has been taken to increase the efficiency having all same parameters of the industries. No industry applies variable width of marker for different size set of garments. But it may be a crucial point to increase the marker efficiency. Though time may be an important barrier in this case, but more profit will heal this drawback. Because in cutting section it is less time required then sewing and sometimes cutting section become more advance than the sewing department. So, it is not wise to be so advance without ensuring maximum efficiency, though it is possible. In this research it is demonstrated that maximum efficiency is possible with variable marker width and size set for a single style. And 6.01% more efficiency has been found than factory.

ACKNOWLEDGEMENT

A special thanks to Sadman Ahmed khan for his restless support and direction.Md Sharif Ahmed's support for data collection from factory is also mentionable. Thanks to Md Nazrul Islam and Sayed Morsalin for their countless hours in lab and manuscript making with me. Their constructive feedback and insightful suggestions played a pivotal role in elevating the overall quality of this study. This work doesn't receive any financial support from any organisation or person.

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Primljeno/Received on: 10.08.2023.

Revidirano/ Revised on: 20.03.2024.

Prihvaćeno/Accepted on: 24.03.2024.