

Impact of Marker on Cut Plan in Garment Production

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ABSTRACT: One of the most crucial activities that take place in cutting room is Cut Order Plan. A Cut Plan consists of several lays, and for each lay is done a marker. It is very important to find the best solution of a Cut Plan (based on lay indicators) but at the same time, for a lay plan, it is very important to be careful in marker planning and marker making. Marker efficiency, a subset of Cut Order Planning, is much hyped, as it is easily quantifiable in terms of percentage of fabric consumption.

For this paper's purpose, we have studied a specific order. Markers are made by manipulating and plotting computerized pattern images with Gemini CAD (Gemini Cut Plan and Gemini Nest Expert). For a Cut Plan of this order, we calculated indicators such as weighted efficiency and lay consumption and then it is taken into account, the possibility of having markers with a different efficiency. So the point was to see the influence of a different marker efficiency on Cut Plan Efficiency and consumption.

Finally, we saw that the marker has a direct impact on Cut Plan. If we make only one of two high efficiency markers, the benefit diminishes. High efficiency care should be for all markers. All high efficiency markers resulted in a high efficiency and low consumption Cut Plan.

KEYWORDS: Marker, Cut Plan, weighted efficiency, lay consumption.

I. INTRODUCTION

One of the most crucial activities that take place in cutting room is Cut Order Plan. Cut Order Planning is deciding the combination of markers, and lays for a particular order. This activity is also termed as "lay plan", "cut plan", "lay lot plan", etc. [1]. There are many facets of Cut Order Planning, and reducing fabric consumption is just one of them [2]. Cut Order Plan is one of the tools which, if properly used, can result in major cost saving. Fabric is the core of apparel manufacturing [3]. A Cut Plan consists of several lays, and for each lay is done a marker.

A major activity of the cut - plan is marker making that is the process of determining the most efficient layout of the pattern pieces for a specific style, fabric, and the distribution of sizes [4]. A marker is a diagram of a precise arrangement of pattern pieces for a specific style and the sizes to be cut from a single spread [4], or marker, is a thin paper which contains all necessary pattern pieces for all sizes for a particular style of garments in such a way that, fabric wastage would be least [5]. Marker efficiency, a subset of Cut Order Planning, is much hyped, as it is easily quantifiable in terms of percentage of fabric consumption [1]. We need to make a selection of sizes to be placed together in a marker for the purpose of textile economy. Any reduction in the amount of the cloth used per garment leads to increased profit [7]. The minimization of fabric wastage is crucial to the reduction of production costs [8]. A higher efficiency marker results in better savings. However, if we make only one of two high efficiency markers and overlook the remnant and smaller markers, the benefit diminishes [1].

Marker planning is always a very open & creative process. Marker planning is a highly skilled activity and different people have different attitudes for this kind of work [9].

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The way how the lay plan will be done, is decided by the layer man based on work experience, in order to achieve a higher efficiency. Different lay plan give a different percentage of weighted efficiency. We will concentrate on the influence that different marker efficiency have in a Cut Plan.

For this paper's purpose, we have studied an order with 200 jackets of sizes 38-40-42-44-46-48-50-52-54, with respectively 15, 20, 30, 30, 35, 25, 20, 15, 10 pieces. Markers are made by manipulating and plotting computerized pattern images with Gemini CAD [6] (Gemini Cut Plan and Gemini Nest Expert). For a Cut Plan of this order, we calculated indicators such as, weighted efficiency and lay consumption and then is taken into account, the possibility of having markers with a different efficiency (realized by the Gemini CAD). So the point here is to see the influence of a different marker efficiency on Cut Plan Efficiency and consumption.

II. EKSPERIMENTAL: MATERIAL AND METHOD

The study focuses on a lay plan with four lays, for a given order, in cutting section. We know that markers may be made by manually tracing master patterns onto fabric or paper or by manipulating and plotting computerized pattern images [4]. In this study, we will use the second method of marking, and the software that the company uses are Gemini CAD (Gemini Cut Plan and Gemini Nest Expert). With Gemini Cut Plan (GCP) we can be able to plan the size combinations on markers and to plan the lays to obtain the required quantities, calculate the input and efficiency, set and print the order report, print the markers on a plotter, export the markers for the automatic cutting machine and save and manage data in files on the computer hard disk or in databases for cutting plans. The Gemini Nest Expert application is used to optimize the markers [6].

We have studied an order with 200 jackets of sizes 38-40-42-44-46-48-50-52-54, with respectively 15, 20, 30, 30, 35, 25, 20, 15, 10 pieces.

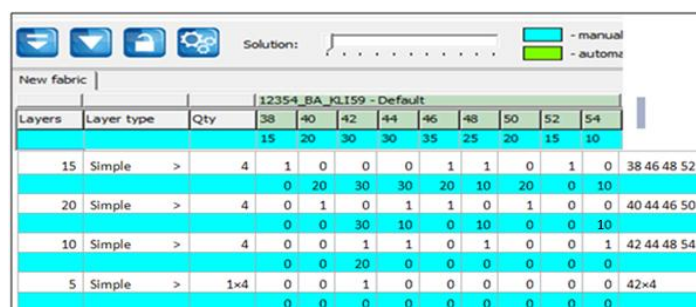
The method used in this study is based in:

1. Plan and realize the lays to obtain the required quantities according to the given order and plan and realize the size combinations of markers (in a way to have the best results of efficiency).
2. Realize cut plan's markers with different efficiency and take into account different efficiency results of a marker to see the influence on a Cut Plan efficiency.
3. Discussion of results.

III. EXPERIMENTAL RESULTS AND DISCUSSIONS

Gemini Cut Plan gave us different suggestions of Cut Plan, to the order in study, and we chose the solution below, because after calculations that we made, it had the best indicators. This solution consists of four lays: the first with 15 plies has the sizes 38-46-48-52, the second lay with 20 plies has the sizes 40-44-46-50, the third lay with 10 plies contains the sizes 42-44-48-54 and the fourth lay, with 5 plies, contains 4 times the size 42.

Tab. 1 Cut Plan of a studied order



Layers	Layer type	Qty	38	40	42	44	46	48	50	52	54
15	Simple	>	4	1	0	0	0	1	1	0	1
			0	20	30	30	20	10	20	0	10
20	Simple	>	4	0	1	0	1	1	0	1	0
			0	0	30	10	0	10	0	0	10
10	Simple	>	4	0	0	1	1	0	1	0	0
			0	0	20	0	0	0	0	0	0
5	Simple	>	1x4	0	0	1	0	0	0	0	0
			0	0	0	0	0	0	0	0	0

The table 1 shows a scheme of Cut Plan, for the order in study. This Cut Plan consists of four lays and in each of them are four sizes.

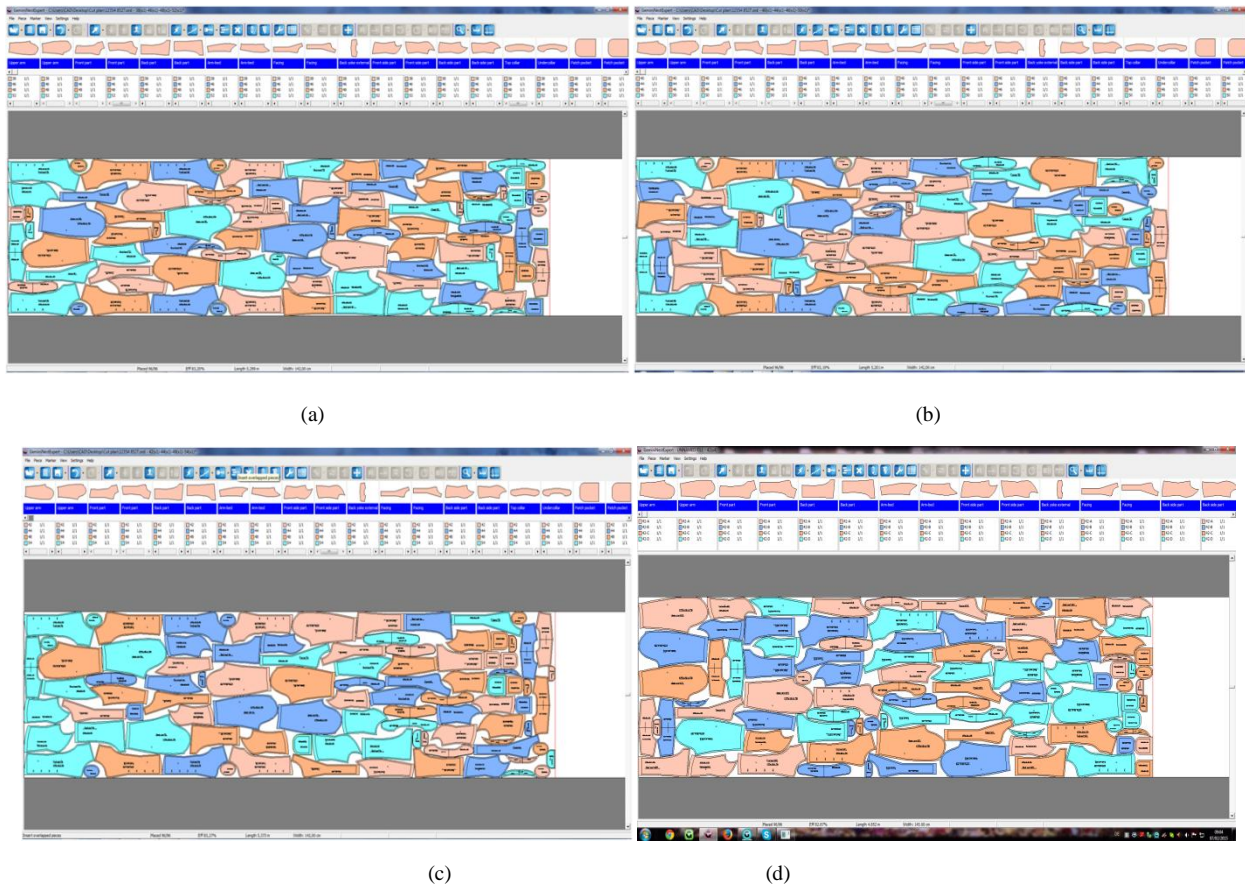


Fig. 1. Four markers belonging to four lays of a Cut Plan for a studied order, (a), (b), (c), (d).

The figure 1 shows the markers of four lays of Cut Plan. The markers are done with Gemini CAD, and for each marker we have respective marker efficiency and marker length. Certainly, we have tried to have a very good result.

Tab. 2 Marker efficiency and marker length of four lays

Lays	Marker Efficiency [%]	Marker Length [m]
1	83.20	5.349
2	83.19	5.251
3	83.27	5.423
4	82.87	4.902

The table 2 presents the parameters of four markers, of four lays of Cut Plan: Marker efficiency and marker length. This parameters are very important in way to calculate laying indicators. To estimate the quality of markers across the order, weighted efficiency metric should be used. This tells us the efficiency of markers over the whole order, weighted according to its number of plies [1]. First, we will calculate the weighted efficiency. From the Gemini CAD we have the marker efficiency and the length for each lay.

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$$\begin{aligned} \text{Weighted efficiency} &= \frac{\sum(\text{Efficiency} \times \text{Plies})}{\text{Total plies}} = \frac{(83.2 \times 60) + (83.19 \times 80) + (83.27 \times 40) + (82.87 \times 20)}{200} \\ &= 83.17\% \end{aligned}$$

Let's estimate now the lay consumption for a given solution of lay plan. Lay consumption is an indicator of overall consumption of the order and it takes into account the influence of all the markers over the order in terms of plies [1].

$$\begin{aligned} \text{Lay consumption} &= \frac{\sum(\text{Marker length} \times \text{Plies})}{\text{Total pieces cut}} = \frac{(5.349 \times 15) + (5.251 \times 20) + (5.423 \times 10) + (4.902 \times 5)}{200} \\ &= 1.319 \text{ metres.} \end{aligned}$$

The usage of fabric will be based on lay consumption. This number is necessary for calculating fabric requirements.

$$\text{Total consumption} = \text{Lay consumption} \times \text{Total pieces cut} = 1.319 \times 200 = 263.8 \text{ metres.}$$

So, we calculated weighted efficiency and the lay consumption, for a Cut Plan solution. Let's see now what is a result of a Cut Plan's weighted efficiency and lay consumption if efficiency's values and marker lengths are different (higher efficiency and lower marker length). So we tried to make markers again, and after some tries we had the results shown in the table below.

Tab. 3 New values of Marker efficiency and the Marker length, of four lays, of an order's Cut Plan

Lays	Marker Efficiency [%]	Marker Length [m]
1	83.91	5.156
2	83.02	5.113
3	82.49	5.322
4	84.06	4.875

The table 3 presents the new parameters of four markers, of four lays, of the same solution of Cut Plan: Marker efficiency and marker length.

Let's calculate again weighted efficiency and lay consumption of the same lay plan.

$$\begin{aligned} \text{Weighted efficiency} &= \frac{\sum(\text{Efficiency} \times \text{Plies})}{\text{Total plies}} = \frac{(83.91 \times 60) + (83.02 \times 80) + (82.49 \times 40) + (84.06 \times 20)}{200} \\ &= 83.285\% \end{aligned}$$

$$\begin{aligned} \text{Lay consumption} &= \frac{\sum(\text{Marker length} \times \text{Plies})}{\text{Total pieces cut}} = \frac{(5.156 \times 15) + (5.113 \times 20) + (5.322 \times 10) + (4.875 \times 5)}{200} \\ &= 1.28 \text{ metres.} \end{aligned}$$

$$\text{Total consumption} = \text{Lay consumption} \times \text{Total pieces cut} = 1.28 \times 200 = 256 \text{ metres.}$$

IV. CONCLUSION

By the study that we have done, we conclude that markers have a direct impact on lay plans and the most important thing is that, in cutting section, is very important to realize a proper solutions of Cut Plan and in the same time to realize markers with high efficiency and low length, in way to have a best results of fabric consumption because the fabric is the core of apparel manufacturing. Lower fabric consumptions mean lower product's cost.

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