

Research Article

Minimized Knit Fabric Cutting Wastage Percentage from Width Variation Fabric Rolls: In the Context of the Ready-Made-Garment Industries of Bangladesh

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Abstract

This study tries to measure the minimization of cutting wastage of knit fabric in cutting section of garments industry due to width variation problem. Regular cutting production system cut the fabric as per provide marker width, causes short cut panel size (for less width) or fabric wastage (for excess width) in different layer and later on need to arrange this fabric quantity again to meet the production demand, ultimately time consuming and profit margin becoming lower. In regular basis cutting system required on average 2.55% extra fabric for short measurement cut panel where the color sticker can control the fabric width accurately and can minimize this wastage within 0.45% in cutting. This paper will provide an inclusive idea for fabric width controlling in different stages from dyeing mill to cutting input of cutting department and based on define fabric width by color sticker (Green, Yellow and Blue) cutting production can easily identify and spread the fabric on cutting table to get the higher efficiency. This data and information of this experiment may directly help to fabric and cutting production as well as Garment Industry for minimizing the fabric wastage and achieving the higher profit margin.

Keywords: Cut Panel Rejection, Controlling fabric width by Color Sticker, Cutting Wastage, Consumption, Marker, Width Variation Fabric Rolls

Introduction

Fabric width define the area available for marker making. It is an important parameter for influence marker efficiency. Fabric width evenness is very much important factor to control the expected marker consumption. Different fabric width in different layer causes fabric wastage either due to excess in selvage or narrower width cause inappropriate cut panel size that can't be used in garment. Comparing woven and knit fabric, majority width variation problems come from knitted fabrics. Maintaining knit fabric required width quite difficult due to GSM (grams per square meter) and shrinkage parameter as well. It is very much important to control the knitting, dyeing and finishing process to get the required marker width in cutting. In this study we have worked to define each fabric roll identification based on marker width either it's ok or less or more by attaching additional round color sticker.

If fabric meets the required marker width then Green sticker, for more width-Blue sticker and less width-Yellow sticker will be attached on fabric roll (considering +/-1 inch as a marker standard allowance).

Objects of the Study

The main objectives of this study are

- To minimize the knit fabric cutting wastage percentage from the different width variation rolls.
- Control the dia measurement short cut panel rejection percentage minimization.
- Ensure every single fabric roll actual width as per pre-defined marker to maintain the calculated efficiency in garment costing.
- Track every fabric roll from dyeing batch, finishing stage, packaging, store received, quality checking point, and warehouse inventory to cutting input process (Solid and print both categories).

Besides this identified width roll gives the awareness before fabric spreading on table. It will directly save the fabric wastage from cutting section and minimize the re-cut requisition sheet for extra material issues

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which is time and cost consuming. Also, this process helps to finish the cutting quantity at a time with sewing production demand at a time together ultimately maximize the organizational profit margin as well.

Regular Cutting Process

Fabric cutting is the initial stage of garment manufacturing process. The quality of garment finished product (garment body) is formed in this process. Before mass cutting production it's better to cut pilot quantity if need. But in regular cutting process especially small garments item's not following the pilot or partial cutting as a result there might be occurred fabric wastage. Most of the organization received weekly basis cutting schedule without urgent basis priority. In cutting department its seen lot of communication gap between production and quality team in terms of garment shipment date and quality report. Also not maintain the proper documentation of data. Fabric cutting activities can be organized easily by maintain standard operating procedure (SOP) to find out the right information at right time to make the decision and it's can save time and wastage both together.

Sometimes its noticeable cutting team not maintain the proper pattern adjustment based on fabric shrinkage report and getting negative comments on fit assessment, incorrect size ration in cutting, no notch mark, numbering mismatch, cutting fabric in regular marker and so on. It's quite difficult to recover this mistake after completing the fabric cutting. If we can take awareness and necessary steps before cutting then we can get more advances from here also can save fabric wastage.

In regular cutting process, Cutting received the required fabric from warehouse and proceed for standard relaxation time. Besides they received the marker from CAD (computer-aided design) as per pre-defined fabric width. After fabric relaxation automatic spreading machine spread the fabric on cutting table and it would be cut on regular marker by hand cutting or automatic cutting. Sometime marker needs to revised based on solid, stripe or print fabric inspection report. Fabric running shade (length or width wise), Spirality, shrinkage parameter can be the reason of revised marker also. To minimize the garment part to part shading due to running shade, decision can be group marker, block marker or join marker.

Excess width in selvage causes fabric wastages and makes over consumption in cutting process because the excess measurement is not including in marker. It's totally wastage of fabric. Sometimes in printing fabric width is more than required print screen measurement, as a result screen can't cover the all area of fabric and the un-print area is totally wastage. Sometimes excess fabric (out of marker width) cut be length wise and measuring the weight of cut panel for requisition issue to fabric team.

Narrow width in selvage causes short measurement cut panel size which is rejected itself and its makes others panel reject also due to pair of body. Especially which garment items contain more panels, all would be rejected due to one panel short measurement to control the part to part body shading. Sometimes the rejected short panel can be used in small size body and the others affected body are separated if it's eye match with the others pair to use it but it's very low percentage of possibility otherwise all are considered as rejected cut panel in cutting.



Figure 1: Spreading fabric width variation rolls on cutting table

During the cutting process many types of problem can be arise, some of problem comes from solid fabric and some of comes from AOP (all over printing) process. Fabric inspection report gives the inspection result to the team. Basically 4-point inspection system widely used in textile sector for fabric checking. It's an inspection tools which satisfying internal team and customer side as well. Inspection reports helps to understand the quality performance in terms of color, weight, measurement, hand feel, finish and others requirement of garment production. In 4-point system each yard of fabrics defect considers maximum 4 point. Considering this report fabric marker would be decided and cut panel would be check as well. Normally for long items garment as long pant, pajama, leggings, jogger, romper, cami, zip top etc. there would be 100% cut panel check and small garment as underwear, brief, boxer, trunk, panty, hipster, bra, thong etc. might be check or not based on fabric inspection report.

The rejected cut panel are classified accordingly to the rejection type and the concern team would be responsible to replace this quantity immediately. Here we found many problems for cut panel rejection during cutting as yarn contamination, foreign fiber, dirty sports, color sport, yarn missing, lycra burn out, crease mark, line mark, sinker mark, oil sport, print join, dyeing hole, GSM cut hole, pin hole, uneven dyeing, soda mark spot, slub, knots, thick and thin, dia measurement short etc.

Cut panel inspection minimizes the sewing rejection from garment production which is very costly due to accessories cost and productivity though cut panel checking is related to manpower cost.

After completing the cutting process, there would be issue a requisition sheet to fabric team due to width variation excess quantity, measurement short cut panel, fabric hole, line mark, sport and for other problems together. Rejection cut panel, fabric inspection report, consumption weight MU (material utilization) team approve the requisition and send to QA (quality assurance) team if any cut pcs or measurement short panel can be use or not. If can't use then fabric team need to arrange this extra quantity fabric to meet the production demand.

This extra quantity fabric needs to arrange newly where need to arrange yarn for knitting, greige production time and then dyeing as well. Also, there is a possibility to have batch to batch shading issues. Normally this extra quantity fabric will be issues separately to cutting team, finally waste of time and material cost along with the risk of short shipment

garment delivery. From the customer side, manufacturing factory gets 5% more or less shipment tolerance where less shipment makes negative impression to customer and positive shipment profitable for factory. If material arrangement time cross the shipment date then the condition goes to short shipment decision. Minimization of cut panel rejection can be a very good option for smooth production, on-time delivery with positive shipment quantity.

As per regular cutting report data, for fabric problem there needed around 4 to 5% additional fabric where only width variation problem consumes 2.55 % of cutting rejected cut panel quantity. Below data table will help to understand the actual re-cut scenario in cutting production floor.

LIZ FASHION INDUSTRY LIMITED MANUFACTURING PLANT
 15-2-23
 SECTION: Hemming
 FLOOR: _____
 REQUISITION ID: _____
 REQUISITION NAME: _____

BUYER:	ITEM DESCRIPTION	COLOR/ SHADE	REQUIRED QTY	MU ISSUE QTY	REMARKS
	<u>2206451</u>	<u>glaciera</u>	<u>1-kg</u>	<u>FABPI-35</u>	<u>Cutting Re-cut</u>
AP NO:	<u>2206447</u>	<u>citibeneer</u>	<u>1.5-kg</u>		
	<u>2206446</u>	<u>Halogen Blue</u>	<u>2-kg</u>		
PO No:	<u>50T Cotton M. Spandex</u>				
FABRICATION					
GSM	<u>135</u>				
WO	<u>85172</u>				
				<u>Total Quantity</u>	

Department Head: _____ MU: _____ Merchandising Head: _____

Handwritten notes on pink sticky note:
 Due to measurement short, joint, spot, line mark, & Dh short problem.
 As per above rejection near 3% by fabric for being...
 as per re-cut requisition physically check measurements short, joint, spot, line mark, not useable for...
 Use from WO-85172
 Slip date 08-09-23
 13/2/23
 13/2/23

Figure 2: Re-Cut Requisition Sheet

Table 1: Cut Panel Rejection Analysis Report in Regular Cutting

PO	Color	Fabrication	GSM	Order Qty	Consumption	Regular Basis Cutting (Re-Cut) Requisition											Rejected (%)	Avg Rej. (%)	Dia short Cut Panel	Dia Short Rej. (%)	Avg Dia Short Rej (%)
						Re-Cut Requisition Qty															
						Dia Short	Dyeing Hole	Print Rej.	Line Mark	Joint	Spot	Rej. Panel	Rej. Qty								
2244315	Glacias AOP	95% Ctn 5% Els Jersey	175	2002 Pcs 37 kg	0.018	46	0	0	2	0	1	49 Pcs	0.88 kg	2.38%	5.07%	35	1.70%	2.55%			
2244316	Crowd Dancer AOP	95% Ctn 5% Els Jersey	175	2002 Pcs 37 kg	0.018	43	0	0	4	3	1	51 Pcs	0.92 kg	2.49%		43	2.10%				
2244317	Halogen Blue	95% Ctn 5% Els Jersey	175	2002 Pcs 37 kg	0.018	81	0	0	9	7	3	100 Pcs	1.8 kg	4.86%		82	3.99%				
1929272	Black	95% Ctn 5% Els (1X1 Rib)	200	5940 Pcs 51 kg	0.008	300	0	0	13	18	44	375 Pcs	3.2 kg	6.27%		300	5.02%				
1091163	Chambray Blue	100% Ctn Jersey	140	6660 Pcs 170 kg	0.026	87	15	10	5	15	0	132 Pcs	3.5 kg	2.10%		87	1.38%				
1090973	New White	95% Ctn 5% Els Jersey	160	15736Pcs 421 kg	0.028	174	59	12	5	38	52	340 Pcs	9.52 kg	2.26%		174	1.16%				
1077971	Bering Sea	100% Ctn Jersey	140	9056 Pcs 219 kg	0.025	193	91	0	26	63	21	394 Pcs	9.85 kg	4.50%		193	2.20%				
1091331	New White	95% Ctn 5% Els Jersey	160	3552 Pcs 87 kg	0.025	71	28	0	21	28	67	215 Pcs	5.31 kg	6.10%		71	2.01%				
1079335	New White	95% Ctn 5% Els Jersey	160	3004 Pcs 110 kg	0.038	34	2	0	9	13	45	103 Pcs	3.95 kg	3.55%		34	1.17%				
1079335	New White	95% Ctn 5% Els Jersey	160	3004 Pcs 110 kg	0.038	36	5	0	11	18	33	103 Pcs	3.95 kg	3.55%		36	1.24%				
108515	Jet Black	95% Ctn 5% Els Jersey	160	2720 Pcs 199 kg	0.074	38	3	0	75	14	0	130 Pcs	9.6 kg	4.83%		38	1.41%				
1089706	Navy	100% Ctn Jersey	160	7060 Pcs 475 kg	0.067	309	213	0	118	42	0	850 Pcs	57 kg	12.00%		309	4.36%				
1047541	Bright White	95% Ctn 5% Els Jersey	220	568 Pcs 46 kg	0.081	40	6	2	1	5	8	62 Pcs	5kg	10.87%		40	7.01%				
1079334	New White	95% Ctn 5% Els Jersey	160	3014 Pcs 141 kg	0.046	55	29	10	69	21	26	210 Pcs	9.6 kg	6.81%		55	1.78%				
206	Grey Marl	95% Ctn 5% Els Jersey	140	12468 Pcs 314 kg	0.026	202	91	0	53	63	21	430 Pcs	11 kg	3.51%	202	1.65%					

Methodology

This experiment has been done based on knitted solid, Printing and Stripe both types of fabrics in a garment manufacturer named Liz Fashion Industry Limited, sister concern of LDC group, located in Bangladesh and

its fabric dyeing supplier named Horizon Group (Knit Dyeing). Here we used primary raw data from the fabric store, dyeing factory and cutting floor. There are many team involvements to control this process. How we have conducted this project with three color stickers experiment are following the below steps

Color Sticker

Sticker paper is a sheet of paper that has an adhesive backing and easy peel off paper behind it. It is printed on laser print and electronic cutting shape. The shape size is round color sticker with 50 mm diameter. A single paper sheet (L-32 cm×W-25cm) contain 24 Pcs round sticker. Approximate sticker cost 8 to 10 cents per dozen in local market manufacturer price.

- Green Sticker: Fabric width is same as marker requirement
- Blue Sticker: Fabric width is wider than marker requirement
- Yellow Sticker: Fabric width is narrower than marker requirement



Step 01 (Dyeing Factory)

In dyeing factory, firstly need to ensure the greige fabric information which is mentioned from knitting production. Grey store keeps all the greige information and provide the data to batch program as per plan order sheet.



Figure 3: Width checking

Fabric width would be control as per order sheet requirements in stenter and compacting machine delivery. During the fabric finishing in compacting machine this sticker will be attached on the fabric roll. Operator will check the fabric width in three point (first stage, middle and last stage) and write the actual width on the color sticker. Supplier information level and color sticker both will be attached together inside the poly bag. Fabric roll will be separated in group wise in the store area for delivery. Supplier quality check the full batch quantity fabric roll as per organizational

procedure and from customer side it would be check randomly (10 to 20%). Based on inspection report there would be delivery decision or re-process if required and store make the delivery challan with proper information.

Step 02 (Store)

Store are very important department to supply the materials and support to the production team with proper inventory controlling and traceability. Store will received the fabric as per group wise identified color sticker roll mentioned in supplier (dyeing factory) delivery challan and organized the pallet or rack accordingly. In automated warehouse it's easy for material traceability but for manual store material needs to issue fabric manually. From the garment shipment ex-factory date production and material control team set the cutting and sewing plan and following this plan cutting team prepare the requisition. After getting the fabric requisition from cutting section store will issue fabric in same way as per color sticker group of bunches. In terms if partial cutting quantity, firstly store will issue the green sticker fabric, then yellow and blue sticker fabric roll considering marker efficiency.



Figure 4: Fabric receive

Step 03 (Cutting Requisition)

A material requisition or material request is an official document used by the production team to request material to full fill the manufacturing demand. Its issue for a specific work order or sales order request with material details information. It can be issues one or more times unless meet the demand. Production planning control (PPC) team provide the cutting and sewing plan as per shipment schedule and based on this cutting team will create the Material Requisition (MR) to warehouse. Store will review the inventory against the mentioned sales order or work order

number then issues it. Material requisition can be full quantity batch fabric or partial quantity as per garments ex-factory schedule.



Figure 5: Fabric Receive in Cutting

Step 04 (Fabric Relaxation)

To ensure the proper body measurement of garment panel after cutting, relaxation process is very important. It's one of the major points of body measurement fit or shape control. It provides uniform shape before and after cutting. Fabric would be unrolling first after receiving it from store for uniform tension relaxation. There are separated zone for white and color category fabric due to controlling dust or sport issues. Fabric rolls keep separate based on color sticker group wise. Based on fabric construction and composition it would be relax properly. Sticker wise separated roll will help to uniform fabric spreading.



Figure 6: Fabric Relaxation

Step 05 (Fabric Spreading)

Fabric spreading basically helps in cutting in every lay plain, flat and uniform tension to get required length and width in marker dimension. It smooths the piles height in spreading lay. After completing proper relaxation of fabric, it would be spread by automatic spreading machine based on marker length. Normally two operators are maintaining every lay manually after automatic lay cutting. Normally one fabric roll contains 20 to 25kg weight, after spreading it there need to insert length wise yarn to control the numbering mistake and avoiding garment part shading. In case of any unexpected quality, cutting inform the concern merchant and related concern team.



Figure 7: Fabric Spreading

Step 06 (Fabric Cutting)

To separate the fabric parts according to marker plan fabric is cut by manual hand cutting or computerized cutting (auto-cutting). Auto cutting machine is provide the high efficiency and accurate uniform cutting panel. After fabric spreading on cutting table, if fabric width cover marker area then it would be proceeding for regular basis cutting. In terms of less or excess width marker would be checked or revised by CAD (Computer Aided Design) team. Based on garment small or long items, marker efficiency can be more or less. For less efficiency cutting team will make re-cut requisition to fabric team. Fabric or quality team also review the physical lay condition on cutting table. Mutually requisition sheet will be approved and arrange the extra quantity by fabric team.

Comparison Data Analysis

Here we analysis randomly 15 garments PO (production order) styles regular fabric cutting report and more than 15 garments PO styles fabric cutting report following color sticker information.

Table 2: Panel Rejection Analysis Report following Color Sticker

Color Sticker Wise Cutting (Re-Cut) Requisition																		
PO	Color	Fabrication	GSM	Order Qty	Consumption	Re-Cut Requisition Qty								Rejected (%)	Avg Rejection (%)	Dia short Cut Panel	Dia Short Rej. (%)	Avg Dia Short Rej (%)
						Dia Short	Dyeing Hole	Print Rej.	Line Mark	Joint	Spot	Rej. Panel	Rej. Qty					
1091163	Chambra y Blue	100% Cotton S/I	140	8880 Pcs	0.026	17	41	18	0	13	0	89 Pcs	2.3 kg	1.02%	1.90%	17	0.19%	0.45%
1091162	Chambra Blue	100% Cotton S/I	140	12135 Pcs	0.026	42	100	15	8	25	0	190 Pcs	4.95 kg	1.16%		42	0.26%	
1090974	Morning Glory	95% Cotton 5% Spandex jersey	160	12384 Pcs	0.028	22	179	30	0	18	6	255 Pcs	7.15 kg	2.10%		22	0.18%	
1090973	Morning Glory	95% Cotton 5% Spandex jersey	160	23982 Pcs	0.028	107	99	34	0	22	8	270 Pcs	7.56 kg	1.15%		107	0.46%	
1090974	New White	95% Cotton 5% Spandex jersey	160	8256 Pcs	0.028	23	72	4	3	6	13	121 Pcs	3.4 kg	1.15%		23	0.22%	
1090973	New White	95% Cotton 5% Spandex jersey	160	15988 Pcs	0.028	94	107	8	2	28	38	277 Pcs	7.76 kg	1.18%		94	0.40%	
1077971	Black Iris	100% Cotton S/I	140	9056 Pcs	0.025	27	69	0	11	23	9	139 Pcs	3.5 kg	1.60%		27	0.31%	
1091330	New White	95% Cotton 5% Spandex jersey	160	10176 Pcs	0.025	23	46	0	11	9	91	180 Pcs	4.45 kg	1.78%		23	0.23%	
1079335	New White	95% Cotton 5% Spandex jersey	160	3004 Pcs	0.038	22	5	0	0	2	16	45 Pcs	1.71kg	1.55%		22	0.76%	
1079341	New White	95% Cotton 5% Spandex jersey	160	99600 Pcs	0.044	476	627	0	496	233	1183	3015 Pcs	132.7 kg	2.88%		476	0.45%	
1079341	New White	100% Cotton S/I	140	99600 Pcs	0.003	395	541	0	353	215	756	2260 Pcs	6.6 kg	2.28%		395	0.40%	
1085153	Sky Driver	95% Cotton 5% Spandex jersey	160	7050 Pcs	0.094	57	29	0	76	38	1	201 Pcs	18.91 kg	2.85%		57	0.81%	
108515	Jet Black	95% Cotton 5% Spandex jersey	160	7050 Pcs	0.074	61	33	0	51	54	0	197 Pcs	14.44 kg	2.80%		61	0.87%	
1091163	Blue	100% Cotton S/I	140	8880 Pcs	0.026	23	12	0	45	26	0	106 Pcs	2.8 kg	1.24%		23	0.27%	
206	Black	100% Cotton S/I	140	18702 Pcs	0.026	157	131	0	208	89	3	588 Pcs	15 kg	3.19%		157	0.85%	
206	White	100% Cotton S/I	140	12468 Pcs	0.026	84	109	0	9	27	61	290 Pcs	7 kg	2.23%	84	0.65%		
206	Charcoal	60% Cotton 40% Polyester S/I	140	18702 Pcs	0.026	71	84	0	187	45	3	390 Pcs	10 kg	2.12%	71	0.39%		

In regular cutting process total cut panel rejection result is on average 5.07% where only dia short measurement cut panel is 2.55% means almost 50% of total cut panel rejection. On the other hand, following color sticker identified fabric roll cutting, cut panel rejection is on average 1.90% where only dia short

measurement cut panel is 0.45 % means only 23% of total rejection. We can see this color sticker minimize the dia measurement short panel along with minimize the total rejection of cut panel. Overall this color sticker minimize the knit fabric wastage in cutting due to dia measurement short panel from 50% to 23% of total

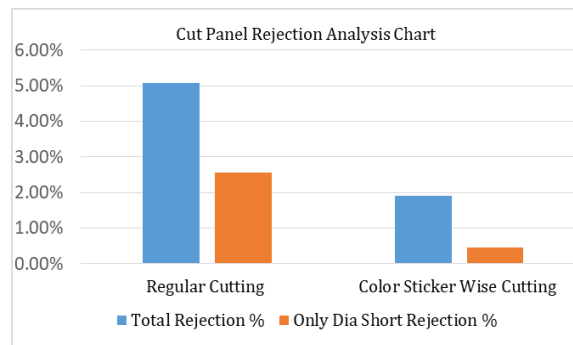
rejection ultimately 27% fabric saving from total cut panel rejection.

Result and Discussion

From the above requisition sheet, data analysis table, we can see the minimization of fabric wastage in cutting by following color sticker due to measurement short and excess width where a small amount of fabric cost savings can add millions of dollars to the manufacturer. In regular cutting process, normally need 5% additional fabric which is time and cost consuming. Also, the sewing production team not receive full quantity of cut panel at a time to complete the target shipment which may happen line break or causes short shipment in terms of material re-arrangement time. Regular cutting process need 2.55% extra fabric for roll to roll width variation among 5% of total rejection. This additional color sticker ensure the every roll fabric actual width which gives advance awareness to cutting spreading ultimately savings the fabric wastage. In case of width variation, excess or less width can be cut separately by revised marker to minimize the wastage. Color sticker process helps to control this measurement short cut panel rejection wastage within 0.45% from 2.55% in cutting re-cut requisition sheet means we can save here 2.10%. Ultimately it's added a large profit margin in the organization.

Table 3: Comparison Data Table

	Total Cut Panel Rejection	Dia Short Cut Panel Rejection	Wsatage Control
Regular Cutting	5.07%	2.55%	50.29%
Color Sticker Wise Cutting	1.90%	0.45%	23.68%



Conclusion

Fabric is the major materials which contain the maximum value of the garment cost. Organizational existing team can control this full process with regular team. Just need proper documentation and monitoring point to control this process though there is a more possibility to revise the marker but in term of fabric cost we can save a lot of money. From the data analysis we can see the total cut panel rejection percentage minimization along with measurement short panel percentage which gives more than 2% saving for the company. Minimized the fabric wastage in cutting by controlling the required marker width is a positive sign for our RMG sector in Bangladesh. This additional color sticker will save the extra re-cut fabric cost and lead time with smooth cutting and sewing production. Besides minimize the short shipment risk and helps on-time delivery to achieve customer satisfaction.

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