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# Fabric waste minimization in knitwear garment sector of Bangladesh

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## Abstract:
This study focuses on waste minimization of knitwear fabric in the garment sector of Bangladesh. There are different types of waste in the garment sector in the disclosing countries like Bangladesh. The generation of the waste minimization process effects product value, production efficiency and financial function. Therefore, prevention of waste minimization process is declining the garment factory and fashion world. This concept will help to avoid the waste before processing the essential job. In this reason, fabric waste management impression is the strategy that can be used to prevent generation of waste. This article delineates the introduction and the background study of fabric waste minimization. To get the achievement of this study, literature review was conveyed to identify fabric waste management concept and strategies. This paper also discusses research methodology as well as recommendation. In this study, fabric waste minimization is essential task as fabric is the main usage and valuable part of the garment.

## 1] Introduction:
Waste minimization is the process and the system generation of reducing the product cost amount as well as maximize value by the industry or the society.

Waste minimization contains exertion to reduce resource and energy use during production. Similarly commercial outcome, generally the diminish material are used, the poor waste is produced in a factory. Waste minimization generally demands and claims the knowledge of the production process as their sincere systems, for one product into cradle-to-grave analysis and outward knowledge of the composition of the waste.

The main sources of waste differ from country to country. Household waste constitutes a relatively small proportion of all waste. That's why the creation of waste sometimes involves some requirements in their supply chain. Such as one company handling a product manufacturing may firm that packaging should use relevant packing because it is fit for packaging equipment.

Clothing fashion is the most passionate in world, diplomacy, challenging and prevalent growing sectors and therefore, it influences environmental, economics and social system in many different ways. Now fashion design practice is criticize for its worthless and uneconomical consumption of resources, which is the main reason of moderate increase in textile and fabric manufacturing waste. The sustainability repose is enormous and affecting numerous of consumer's daily life. Designing fashion sustainable stands taking into the account more than just style, quality and cost. Production has moved mass-market but the way of consumers consuming cloth has changed more over the past 33 years too. At present assent of punctual modern collection and fast fashion in apparel industry has been one noteworthy sense for augment in production and promoting clothing waste volumes.

Now a day our consumers spend their money less than a fifteen percent taking foods and clothe from their total earning. But 100 years ago consumer spent more than 50 percent on taking foods and clothes. In fact fast fashion items are made in extremely efficient production systems with low quality, which leads to low prices. As Niinimäki [2011] reported that low prices lead to an increase in consumption volumes; moreover, low quality leads to a shortening of the lifetime of clothing items). Currently, when the value of the fabric is low, industrial large-scale fashion production has material wastage rates ranging from 3 to 20 percent. Accordingly more pre-consumer textile waste is created.

Claudio, [2007] reported that post-consumer, textiles are often resold by primary consumer to other consumers at lower price, exporting in bulk for sale in other countries or recycling back to raw material for manufacture of apparel and non apparel products or given away in charity but in India, options available include handing on treasured pieces to family members, recycling within the home, giving to servants, bartering them for new stainless steel pots or burning them for their silver and gold content.

Hendrickx and Boardman [1995] mentioned that the textile industry includes a variety of processes ranging from the manufacture of fabric production. The first step in the production of a textile product is the manufacture of fibers afterward; the fibers are turned into yarn then preparation, dyeing. The last step is the fabrication of a finished product. According to the United States Pollution Prevention Work Group [4] finished cloth or fabric is fabricated into a wide variety of apparel, household, and industrial products by cutting and sewing process. According to Kazakeviciute, Ramanauskiene and Abraitiene [2008] waste less technologies of manufacturing are not prevailing throughout the textile industry and its related sectors, development of new uses of textile waste presents the main concept of waste management. Curran et al. [2011] stated that there are many approaches, methods, tools and principles that have been used to tackle different problems in the field of business waste and resource efficiency. Zaman and Lehmann [2011] mentioned that the zero waste is the sixth wave in waste management and the most holistic innovation of twenty first century for waste management systems for achieving a true sense of sustainable waste management systems.

Accordingly, Fabric is the main part of the garment products which containing the value turns on 70% to 80% of total cost. Therefore, fabric waste minimization is most important in garment factory. Once a factory practices the fabric waste minimization and then they can achieve the cost efficiency and maximum margin. In my qualitative and conceptual observation is in fabric, pattern design, cutting, bundling, supply chain, inspection, merchandising and quality control. Fabric production, pattern making, production marker making, quality and cutting controlling are the related to minimize waste of fabric and should be cooperated to each other. Without cooperation in their process it cannot manage and minimize the waste of fabric as well as ensure the quality assurance.

## 2] Research Background:

When I was working in knitwear garment factory qualitative analysis and conceptual observation was on fabric waste management in related every department of unexpected waste. According to overview some case study they can use effective technique of waste minimization.

According to observation we can state the purpose of this operation is to develop and provide fabric waste reduction resources and practices for our textile and apparel industry. The targeted and related section consists of textile knitting, dyeing, finishing, pattern designing, marker making, apparel production, cut-and-sew operations, washing, peach dyeing, textile bleaching, textile recycling, and printing. This conductor will help educate representatives from garment industry in the following areas of interest:

i. Maximize the profit from waste minimization practice
ii. Organized to decrease waste
iii. Adept source-reduction and recycling techniques
iv. Raw material controlling Strategies
v. Waste recovery & reuse opportunities
vi. Accomplish case study examples
vii. Housekeeping and maintenance procedures

viii. Process and equipment modification
ix. Develop employee behavior, efficiency and hypocrisy

**2.1] Research Objective:** Waste Minimization of garment factory is generally considered as being applicable only to manufacturing concerns.

The main object of waste minimization is to record and analyze the expenses and process of utilizations with a view to know the reducing of a unit of waste, of a job, of a process of an operation. It involves, therefore, allocation of decline.

The next equally important object is to exercise control over waste. Idle time of machine and labor are controlled, materials are controlled that's why wastage is minimized and expenses are also controlled so that they can't unreasonably wastage. Standards are set and accruals are compared with the standards. Fabric waste exerts control over all elements of cost in detail, in order to minimize waste and maximize profit.

The third object of waste minimization is to help formulating policies and system of operations. Waste minimization helps management by supplying necessary information so that management adopts a sound policy on any matter and effort to maximize output as well as profit.

The forth object of waste minimization is to help management in challenging the selling price of products and to help cost negotiation and facing depression.

The fifth object is the planning of materials expenditure, proper utilizations and structures. It helps diverting to new lines of activities, discriminating minimization policy and searching for new solving policy or areas. Without assistance from a good analyzing system the management shall not be able to decide as to which steps should be appropriate for next steps. The sixth of exploring the waste minimization is the planning to reduce all expenditures.

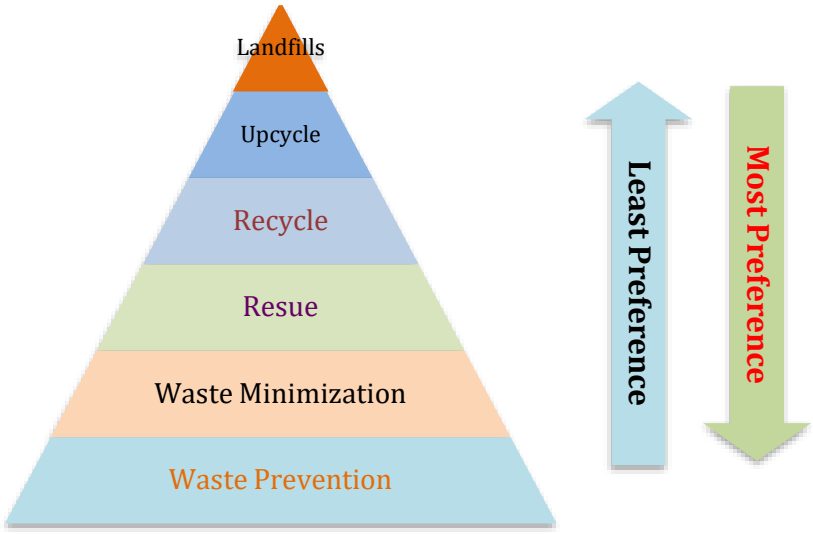
The last (but not the least) object of waste minimization is to help increasing production, employee efficiency and over all reducing the cost of products.

## 2.2] Literature Review:

Reviewing of these the process of reading, calculating, analyzing, evaluating and summarizing the specific topic of waste minimization.

Polat and Ballard (2004) stated on waste reduction as "that which can be eliminated without reducing customer value". Waste in construction is also defined as "the difference between the value of those materials delivered and accepted on site and those used properly as specified and accurately measured in the work, after deducting cost saving of substituted materials and those transferred elsewhere" (Polat and Ballard, 2004; Pheng and Tan, 1998).

In the literature review researchers is to consider the critical points of current knowledge including simulated findings as well as theoretical and methodological contribution and cooperation to the particular topic. That's why in the present study, the literature is compiled on the basis of a range of variables data, including this study such as value impact of fabric waste, good cooperation design in each stage, reduce process loss, reusing, recycling, up-cycling of clothing and other sustainability techniques.




**Waste Management Hierarchy [Figure: 1]**

## 2.3] Theoretical Framework:

According to state of Black, S., 2008 the fashion industry, namely the textile and clothing industry, is an economic potential that employs mil- lions of people around the world, in spite of being also one of the most polluting to the environment.

The fabric waste management focuses of this research because the amount of fabric waste in the Bangladesh garment industry is enormous in a more sustainable way. This is the mainly briefing of the life cycle of fashion products leading to the production and uncontrolled consumption of products with a schedule date of obsolescence every six months. Todays garment factory begin to raise awareness on waste management namely fabric wastage in Bangladesh.

The development process of these garment products creates a lot of waste particularly in the process loss of fabric and cutting section of every garment industry. Yarn selection, Knitting and dyeing formula, quality inspection, employee proficiency in operating, designing, cutting, timing and handing of product which is presented and affected the economy of company.

Waste Genaration

Fabric and Apparel Waste

| Textile/Fabric | | | Pre-production Waste | | | Production Waste | | | | Post Production Waste | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Process Loss | | | | | | | | | | | | |
| Selecte Yarn count, Machine Gauge and Fabric width | Yarn & Fabric Consumption according to fabric composition and weight | Dye formual and conform process loss | Pattern Making | Marker Making | Fabric Relaxing & Cutting Plan | Time management & make SMV (standard minute value) | Sewing production Line Layout | Waste products for fault | Merchandising & cooperation | Recycling | Up-cycling | Landfills |

Waste Generation Table [Figure-2]

Sustainable development is founded by the way companies pace themselves to the economy, environment and society, taking actions to minimize the problems caused to nature. This development that's mean taking action to minimize fabric waste must be part of the business vision of the company. The creating of sustainable products, using basic strategies and new technologies can assist in the waste management. Most companies in Bangladesh still are not sincere about these waste reduction and they do not consider the concepts of waste management and sustainability.

## 2.4] Problem Statement:

There is following work out line of waste minimize on merchandising, fabric, Cutting, Sewing, Quality Assurance and Pattern design/CAD (Computer Aided Design) room. Waste management in generally depends on monitoring of merchandiser and their management culture. In fact less efficiency and awareness make more wastage in garment factory of Bangladesh. Once any one related department don't make proper cooperation each with other it can make a mistake and generate waste. Therefore, cooperation to each other related department is the most important to reduce waste. There is below some field to generate the waste but sometime factory make mistake following operations.

i. Garment Styling

ii. Fabric Construction

iii. Specifications of Size

iv. Fabric Shading/Fault/Shrinkage

v. Quality Protection &

vi. Overall computer assisted design & Marker application

In the operations of pattern making, samples and CAD (Computer Aided Design) operating systems are stated below findings that are affected the wastage.

There are pre-production processes that can affect utilization from cut planning to marker making. Production pattern engineering for fit, fullness, seam allowance, shape, seam location and trim parts are all related to waste reduction.

- Engineering repeats and adapting pattern placement to the repeat
- Repeats height measurement set as required
- Size distribution that's mean size ratio and balance need for cut-downs
- Fabric receiving, relaxation, inspection, defects mapping, storage, and inventory procedures
- Size combinations and sections in the production marker
- Efficiency of marker making by Gerber or Lectra software and use of computers
- Computer controlled cutting vs. hand cutting
- Targeting marker length and controlling the marker width to fabric width
- Splice line placement and lap-loss control splice spreading
- Fabric compulsions and preferences related to grain-line maintenance and preference cross-grain possibilities and fabric bias and preconception
- Adapt of remnants and competency of remnant lays
- Optimum regulate of width with minimum "edge" loss
- Universal assembling and spreading
- To easy production

- To reduce all type of related process

In factory cutting section management is most fundamental working process of operations to minimize the fabric waste. Therefore, in cutting section operations are affected the utilization and management of waste from spreading to bundling include as well their supply chain management:

- Controlling the front edge of a spread to prevent waste
- Controlling the amount of overlap on splicing
- Controlling the loss at turn back or cut-off at each end of the marker
- Locating of defects in fabric and decisions in cutting out defects
- Care in handling and moving bundles
- Effective and maximum efficient computerized marker and/or hand cutting
- Controlling the marker length & fabric relaxation
- Ensure repeat height between booking marker (making the marker before starting the fabric production) & received fabric
- Evaluating cutting gain and loss reports
- Evaluating efficiencies of centralized cutting practices where applicable, including disposal of remnants
- Employee waste management training

## 3] Methodology:

The goal of this analysis was to investigate and observation the possible concentration of waste management process for garment factory in Bangladesh. This study was carried out by different section of garment factory, journal articles and web pages expressing the waste minimization conceptual idea and strategies. Case study and observation based conceptual method was conform to identify the existing waste management strategies in broad. According to Yin [2009] case study method can be used to understand a real life phenomenon in depth and it contributes to get true data by individual and organizations.

The analysis was designed as different case study in order to increase the precise of research findings. Garment factory was taken some case and fabric waste management process considered as unit of analysis within different cases in related section.

Observation waste management was selected as the data collection method of this research. Because of the lacking of experts on waste management was selected from one from this organization to monitoring, implementing and improving the waste.

This is the calculating and science of the studying problem to carry out scientific response. In any research action plan needs to formulate as like carbon copy that's known as research design. As Liehr & Smith [2003] reported that the investigator understands plans and explores the best practice which may be appropriate to the specific problem.

This study will be an exploratory cum experimental conceptual study. Fabric process and pattern making is the main tool of the present study. In this study fabric waste minimization techniques is explored and adopted to create a range of garments. Different methods are experimented to reduce, recycle, reuse and up-cycle the fabric waste.

The present research has been planned to gain the objective of minimization of fabric waste at different stages of garment production. After all, the first attempt and workout is to collect data and information regarding the quantity

and quality and stages of waste generation in related department of garment production. The researcher is used CAD (Computer Aided Design) to make patterns, fabric preproduction marker and final production marker for a garment that is incorporated minimum wastage of fabric. Once making patterns and markers the researcher should be included the suggestions the designing of garment and textile fabric experts that is helped for improving the design and waste.

The researcher should be following up from designing the pattern and making fabric up to garment disposal. In this research many more sincere work and calculating should be continue process to minimize the fabric waste effectively. In different process is to remain losing process that should be minimized the process loss in fabric and garment production.

# 4] Research Findings:

In this research findings are to state to observation and analyzing in the relevant field that's consider to improvement the fabric waste management and minimization practices. There is total one year findings and data analysis data on conceptual data collection and qualitative analysis. Analysis is compared on 6 month with their improvement of the fabric waste minimization practices.

## 4.1] Fabric Inventory Summery (Nov-2010 to Oct-2011):

This analysis having hold of one year data against number of article, buyer, placing order quantity, type of fabric and product finish. According to the order quantity they have utilized the total grey and finished fabric on the making consumption of preproduction working process.

# Total Number of Article: 412
# Total Number of Buyer: 18
# Total Order Quantity: 4.74 Million
# Total Grey Fabric Utilize: 1662.17 Ton
# Total Finish Fabric Utilize: 1476.08 Ton
# Total Extra Finish Fabric Utilize: 20.16 Ton
# Total Excess Finish Fabric: 4.76 Ton
# Total Article for Extra Fabric: 90
# Extra Fabric Utilize in Percent: 1.37%

Name of Buyer:

- s.Oliver,
- Lerros
- Street One
- Wall Mart
- George UK
- Gerry Weber
- Innovations Club
- Mustang
- Police
- Desigual
- OVS
- LPP
- Mad-Engine
- Sinosky
- Target
- Aydinly
- Katag
- Alpha

Utilized Type of Fabric: There is given below some type of utilized solid fabric & yarn dyed in the garment factory.

- Cotton S/Jersey
- Cotton Heavy Jersey
- Cotton Slub Jersey
- Lycra S/Jersey
- Cotton Pique
- Lycra Pique
- Jacquard Pique
- Cotton Rib 1x1, 2x2
- Lycra Rib 1x1, 2x2
- Cotton Felpa
- Cotton/Polyester Felpa
- Cotton/Viscose/Melange

Type of Product Finished: Normally when we proceed to wash or peach dyed then fabric length, width & GSM as well as process loss depend on their category and character. Peach finished & brush process loss is depended on light or heavy process.

# Garment Wash
# Garment Dyed
# Peach Finished
# Brush/ non brush
# AOP (All Over Print)

**4.2] Comparison to Improvement:** According to this analysis, the wastage minimization efficiency improves from 1.65% to 0 .76%. So wastage of the first six months is more than the second six months of this very year. The main reason is due to conceptual observation and analysis.

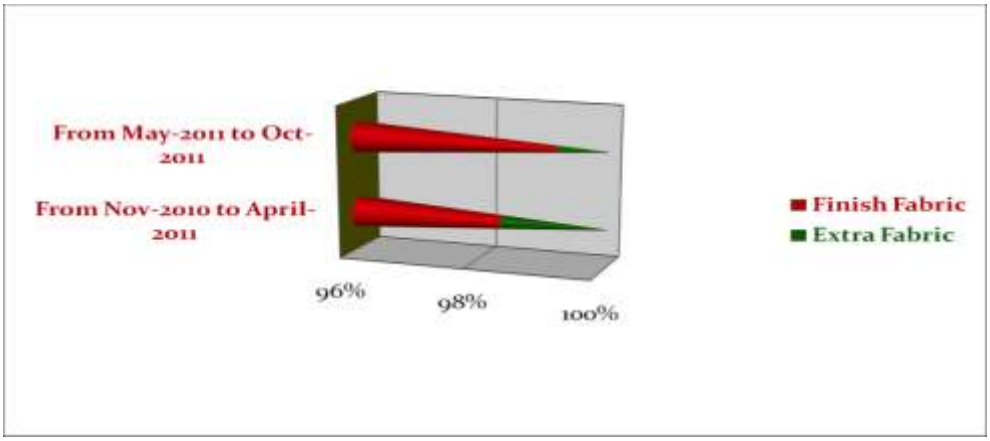
**Inventory for Six Month** (From November-2010 to April-2011):

- Total Number of Article: 247
- Total Order Quantity: 2.83 Million
- Total Grey Quantity: 1135.63 ton
- Total Finish Quantity: 1010.12 ton
- Total Extra Fabric: 16.63 ton
- Extra Fabric in Percent: 1.65%
- Number of Article for Extra: 62
- Percentage in Article: 25.10%

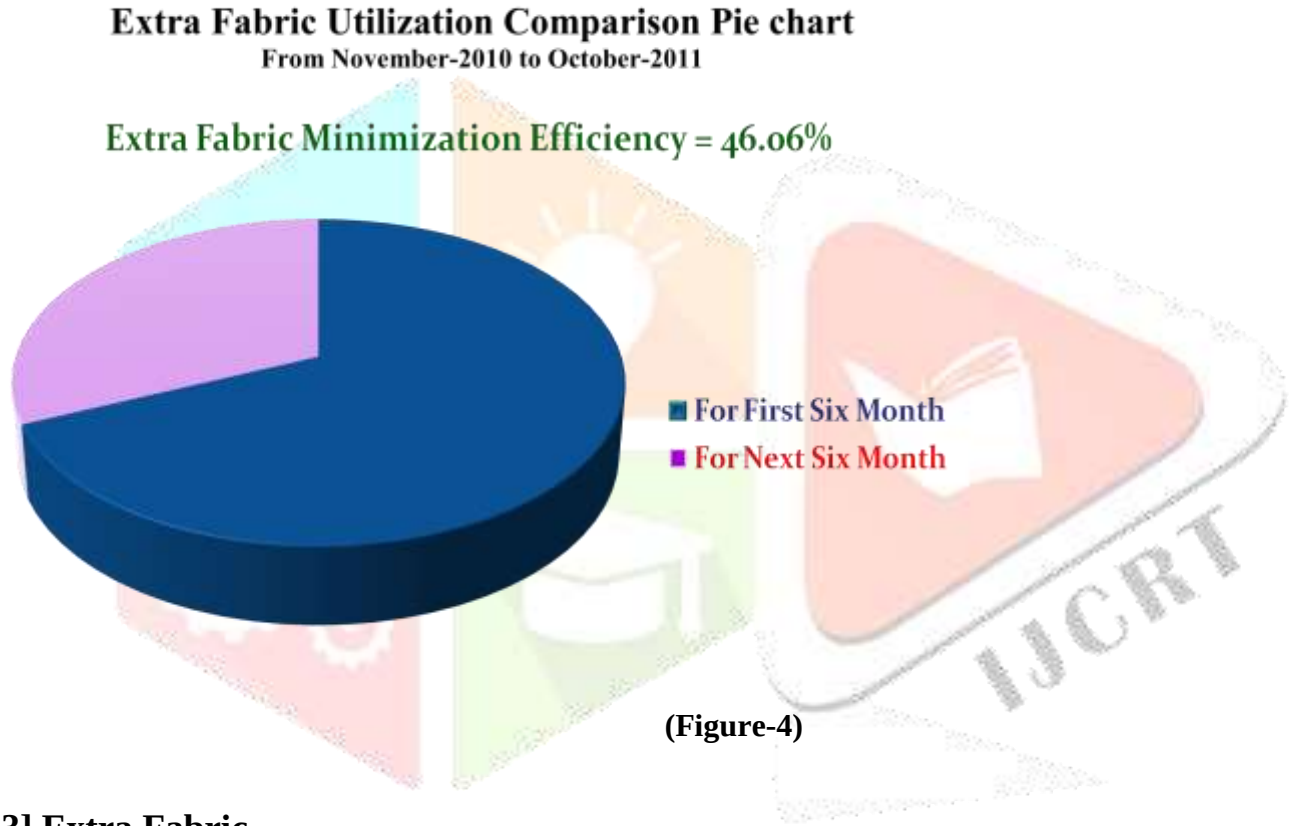
**Inventory for Six Month** (From May-2011 to October-2011):

- Total Number of Article: 165
- Total Order Quantity: 1.91 Million
- Total Grey Quantity: 526.54 ton
- Total Finish Quantity: 465.97 ton
- Total Extra Fabric: 3.53 ton
- Extra Fabric in Percent: 0.76%
- Number of Article for Extra: 28
- Percentage in Article: 16.97%

Comparison to Improvement Chart




**(Figure-3)**




**(Figure-4)**

## 4.3] Extra Fabric Inventory:

Buyer: s. Oliver

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| 13.112.43.6211 | Felpa-330 | Inside Brush | 6374 | 7 | 0.11% | High GSM | Fabric |
| 49.111.32.2990 | CTN Single Jersey-120 GSM | Ball Wash | 548 | 10 | 1.82% | Sewing Process | Production |
| 79.112.31.3326 | CTN Single Jersey-210 GSM | GMT. Wash | 3418 | 135 | 3.95% | Wash Test Fail | Fabric |
| 41.111.31.2559 | CTN Single Jersey-140 GSM | Ball Wash | 1921 | 155 | 8.07% | Print & Wash Rejection | Print & Wash |
| 41.105.32.3195 | CTN Single Jersey-140 GSM | N/A | 624 | 55 | 8.81% | Crease Mark | Fabric |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 66.109.31.31 22 | CTN Single Jersey-160 GSM | GMT. Wash | 399 | 22 | 5.51% | Revise Buyer Requirement | Merchandiser |
| 08.107.32.59 52 | CTN Single Jersey-180 GSM | N/A | 1567 | 52 | 3.32% | Fabric Hole | Fabric |
| 13.112.43.62 11 | Felpa-330 GSM | Inside Brush | 6374 | 7 | 0.11% | High GSM | Fabric |
| 49.111.32.29 90 | CTN Single Jersey-120 GSM | Ball Wash | 548 | 10 | 1.82% | Sewing Process | Production |
| 79.112.31.33 26 | CTN Single Jersey-210 GSM | GMT. Wash | 3418 | 135 | 3.95% | Wash Test Fail | Fabric |
| 41.111.31.25 59 | CTN Single Jersey-140 GSM | Ball Wash | 1921 | 155 | 8.07% | Print & Wash Rejection | Print & Wash |
| 41.105.32.31 95 | CTN Single Jersey-140 GSM | N/A | 624 | 55 | 8.81% | Crease Mark | Fabric |
| 66.109.31.31 22 | CTN Single Jersey-160 GSM | GMT. Wash | 399 | 22 | 5.51% | Revise Buyer Requirement | Merchandiser |
| 08.107.32.59 52 | CTN Single Jersey-180 GSM | N/A | 1567 | 52 | 3.32% | Fabric Hole | Fabric |
| 40.108.32.32 70 | CTN Single Jersey-160 GSM | GMT Ball Wash | 946 | 120 | 12.61 % | High GSM | Fabric |
| 13.107.32.53 55 | CTN Single Jersey-140 GSM | N/A | 2426 | 96 | 3.96% | High GSM | Fabric |
| 61.107.32.34 66 | Lycra Rib-245 GSM | Peach Finished | 86 | 5 | 5.81% | Sewing wastage | Sewing |
| 13.107.43.52 58 | Felpa-330 GSM | N/A | 3120 | 439 | 14.07 % | Dyeing Marks | Fabric |
| 66.103.41.33 52 | Felpa-265 GSM | N/A | 2043 | 691 | 33.81 % | Revised GMT MST. | Merchandiser |
| 13.105.32.51 10 | CTN Single Jersey-140 GSM | N/A | 3100 | 30 | 0.97% | QTY. Increased | Merchandiser |
| 08.107.32.55 51 | CTN Single Jersey-160 GSM | N/A | 2450 | 55 | 2.24% | High GSM | Fabric |
| 13.104.32.49 41 | CTN Single Jersey-160 GSM | N/A | 9375 | 110 | 1.17% | Fabric Reject | Fabric |
| 13.102.43.47 27 | Felpa-330 GSM | Brush | 72495 | 508 | 0.70% | Uneven Dia & High GSM | Fabric |
| 61.102.41.33 37 | Felpa-330 GSM | GMT Wash | 4584 | 325 | 7.09% | Uneven Dia & High GSM | Fabric |
| 66.102.41.33 41 | Felpa-265 GSM | GMT Wash | 1053 | 140 | 13.30 % | Uneven Dia & High GSM | Fabric |
| 61.102.32.30 34 | CTN Single Jersey-180 GSM | GMT Wash | 2046 | 102 | 4.99% | Uneven Dia & High GSM | Fabric |
| 13.101.43.29 70 | Felpa-330 GSM | N/A | 4022 | 1011 | 25.14 % | Add Pattern Parts | Pattern & Mer. |
| 41.101.43.32 18 | Felpa-200 GSM | GMT Wash | 1282 | 50 | 3.90% | Revised Req. GSM | Merchandiser |
| 41.101.41.30 25 | Felpa-200 GSM | GMT Wash | 8050 | 1147 | 14.25 % | GSM High & Revised Req. | Fabric & Mer. |
| 14.101.39.25 93 | CTN 1x1 Rib- 230 GSM | N/A | 7841 | 469 | 5.98% | Dye Mark & Embo. Prob. | Fabric & Embo |
| 14.101.31.28 81 | CTN Single Jersey-140 GSM | N/A | 1032 | 30 | 2.91% | Fabric Rejection | Fabric |
| 14.101.39.25 93 | CTN 1x1 Rib-230 GSM | N/A | 7364 | 177 | 2.40% | High GSM | Fabric |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 61.101.32.3117 | CTN Single Jersey-160 GSM | N/A | 2370 | 63 | 2.66% | Crease Mark & Shade | Fabric |
| 61.012.41.3240 | Felpa-330 GSM | N/A | 3770 | 170 | 4.51% | Dia Marks | Fabric |
| 03.899.32.1230 (NOOS) | CTN Single Jersey-180 GSM | N/A | 158261 | 408 | 0.26% | Crease Marks | Fabric |
| 45.899.31.0219 (NOOS) | CTN 2x2 Rib-230 GSM | N/A | 8858 | 205 | 2.31% | Short Dia & High GSM | Fabric |

## Buyer: Innovations Club

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| 12-TS-1708-212 | CTN Single Jersey-160 GSM | N/A | 2036 | 55 | 2.70% | Softener Marks | Fabric |
| 12-TS-1659-112 | CTN Single Jersey Yarn Dyed-160 GSM | N/A | 686 | 15 | 2.19% | High GSM & Short Dia | Fabric |
| 12-TS-1509-911 | CTN 2x2 Rib-220 GSM | N/A | 2487 | 130 | 5.23% | Size Ratio Mistake | Merchandiser |
| 12-TS-1509 | CTN Single Jersey-145 GSM | N/A | 200 | 39 | 19.50% | Revised Buyer Req. | Merchandiser |
| 12TS-1430-611 | CTN Single Jersey-145 GSM | N/A | 238 | 33 | 13.87% | Sewing Wastage | Garments |
| 12-TS-1510-911 | CTN 2x2 Rib-220 GSM | N/A | 1788 | 20 | 1.12% | Revised Buyer Req. | Merchandiser |
| 12.PO.1369.511 | Lycra Single Jersey Yarn Dyed-190 GSM | N/A | 1090 | 48 | 4.40% | Lycra Missing | Fabric |
| 12.PO.1326.411 | CTN Pique-180 GSM | N/A | 998 | 14 | 1.40% | Crease Marks | Fabric |
| 12.TO.1315.311 | Lycra Rib- 180 GSM | N/A | 1625 | 50 | 3.08% | Too Plus Dia | Fabric |

## Buyer: Gerry Weber

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| 270069 | Lycra Single Jersey-150 GSM | N/A | 887 | 100 | 11.27% | High GSM & Reject Fabric | Fabric |
| 670049 | CTN 1x1 Rib- 200 GSM | N/A | 6670 | 800 | 12.00% | High GSM & Fabric Hole | Fabric |
| 670049 | CTN 1x1 Rib-200 GSM | N/A | 6670 | 495 | 7.42% | Sewing Wastage | Garments |
| 12-TS-1509 | CTN Single Jersey-145 GSM | N/A | 200 | 39 | 19.50% | Revised Buyer Req. | Merchandiser |
| 12TS-1430-611 | CTN Single Jersey-145 GSM | N/A | 238 | 33 | 13.87% | Sewing Wastage | Garments |
| 12-TS-1510-911 | CTN 2x2 Rib-220 GSM | N/A | 1788 | 20 | 1.12% | Revised Buyer Req. | Merchandiser |
| 12.PO.1369.511 | Lycra Single Jersey Yarn Dyed-190 GSM | N/A | 1090 | 48 | 4.40% | Lycra Missing | Fabric |

**Buyer: George UK**

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| PGCL-210 | CTN Single Jersey-160 GSM | N/A | 13065 | 1647 | 12.61% | Fabric Hole & Shade | Fabric |
| PGCL-210 | Lycra 1x1 Rib-240 GSM | N/A | 552 | 43 | 7.79% | Shade Match with body fab. | Fabric |
| PGCL-210 | CTN Single Jersey-140 GSM | N/A | 300 | 23 | 7.67% | Shade Match with body fab. | Fabric |
| PGCL-192 | CTN Single Jersey-160 GSM | N/A | 9552 | 150 | 1.57% | Fabric Hole | Fabric |
| PGCL-179 | CTN Single Jersey-160 GSM | N/A | 7354 | 30 | 0.41% | High GSM | Fabric |
| PGCL-172 | CTN Single Jersey-160 GSM | N/A | 8599 | 255 | 2.97% | Fabric Hole & Shrinkage | Fabric |

**Buyer: Lerros**

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| 3193749 | CTN Single Jersey-160 GSM | GMT Wash | 286 | 139 | 48.60% | Fabric Hole & High GSM | Fabric |
| 2153260 | CTN Pique-240 GSM | GMT Wash | 1020 | 135 | 13.24% | Fabric Hole & High GSM | Fabric |
| 2143261 | CTN Pique-240 GSM | GMT Wash | 4407 | 520 | 11.80% | Fabric Hole & High GSM | Fabric |
| 2143262 | CTN Pique-240 GSM | GMT Wash | 6287 | 545 | 8.67% | Fabric Hole & High GSM | Fabric |
| 2153209 | CTN Pique-220 GSM | N/A | 1756 | 30 | 1.71% | High GSM | Fabric |
| 2133231 | CTN Pique-240 GSM | GMT Wash | 5913 | 220 | 3.72% | Fabric Hole & High GSM | Fabric |
| 2124040 | CTN Single Jersey-180 GSM | Peach Finished | 1290 | 33 | 2.56% | Uneven & Short Dia | Fabric |
| 2114036 | CTN Single Jersey-180 GSM | Wash & Peached | 640 | 35 | 5.47% | Print Mistake | Print |

**Buyer: OVS**

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| FIT | CTN Single Jersey-145 GSM | N/A | 6020 | 175 | 2.91% | Short Dia | Fabric |
| FIT | CTN Single Jersey-145 GSM | N/A | 6020 | 474 | 7.87% | High GSM & Fail Cons. | Fabric & Merchandiser |
| CLIENTA | CTN Pique-220 GSM | N/A | 4364 | 60 | 1.37% | Fabric Hole & Reject Panel | Fabric |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CONFORT | CTN 1x1 RIB-170 GSM | N/A | 7809 | 2366 | 30.30% | Dia Factor & High GSM | Fabric & Merchandiser |
| GUSSESS | CTN Single Jersey-160 GSM | GMT Wash | 1127 | 47 | 4.17% | High GSM | Fabric |
| LICATA | CTN Pique Yarn Dyed-180 GSM | N/A | 4480 | 306 | 6.83% | Short Dia | Fabric |
| VISANO | CTN Pique-180 GSM | N/A | 8281 | 131 | 1.58% | Fabric Hole | Fabric |
| TOURS | CTN Pique-180 GSM | N/A | 15204 | 32 | 0.21% | Fabric Hole | Fabric |

**Buyer:Aydinly**

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| 90817P26 SD-01 | Lycra Pique -200 GSM | N/A | 1710 | 20 | 2.91% | Embroidery Part Reject | Embroidery |
| 50819P26 SB-01 | Lycra Pique -220 GSM | N/A | 4409 | 33 | 0.75% | Uneven Dia & Shade | Fabric |
| 70811P23 SD-01 | CTN Pique-200 GSM | N/A | 3620 | 93 | 2.57% | Uneven Dia | Fabric |
| 90819P26 SD-01 | Lycra Pique-200 GSM | N/A | 2257 | 5 | 0.22% | Uneven Dia | Fabric |
| 70882P23 SD-01 | CTN Pique-200 GSM | N/A | 1554 | 43 | 2.77% | High GSM | Fabric |

**Buyer: Wall-Mart, Target & Teba**

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| TDL-23-106 | CTN Pique -200 GSM | N/A | 1902 | 150 | 7.87% | Shrinkage | Fabric |
| TDL-SB-886 | CTN Pique-180 GSM | N/A | 1063 | 79 | 7.43% | Shrinkage & High GSM | Fabric |
| IS-002 | CTN Pique-220 GSM | N/A | 5788 | 160 | 2.76% | Fabric Hole & Rejection | Fabric |
| IS-002 | CTN Pique-220 GSM | N/A | 5788 | 343 | 5.93% | Shrinkage | Fabric |
| 7103-(Target) | CTN Single Jersey-145 GSM | N/A | 9656 | 234 | 2.42% | Panel Reject for Hole | Fabric |
| A4-1155 (Teba) | CTN Single Jersey-190 GSM | N/A | 110 | 18 | 16.36% | Mer. Took for stick off | Merchandiser |

**Buyer: Street One, Police & Sinosky**

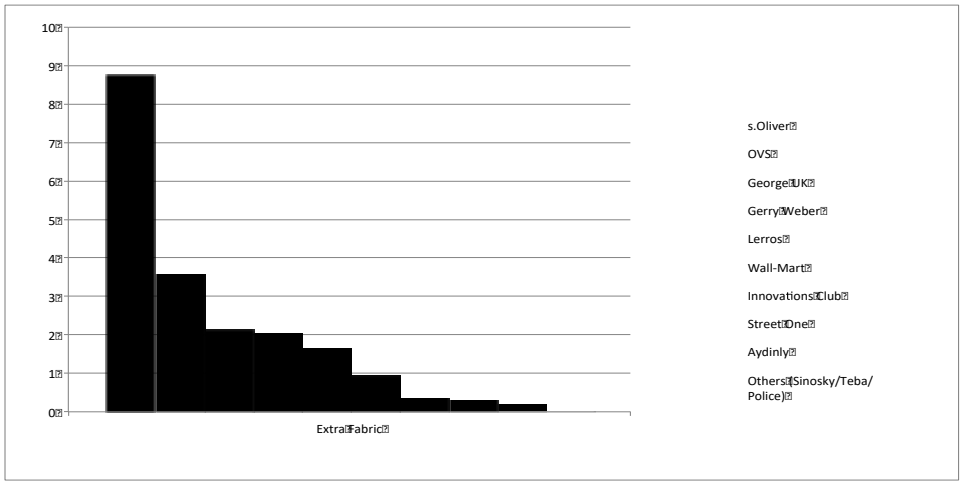
| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Extra in % | Reason | Liable |
|---|---|---|---|---|---|---|---|
| 152036 (03-24783-A) | Lycra Single Jersey-150 GSM | N/A | 6441 | 88 | 1.37% | Color Spot & Crease Mark | Fabric |
| 152036 (03-24783-A) | Lycra Single Jersey-150 GSM | N/A | 6441 | 20 | 0.31% | Lycra Missing & High GSM | Fabric |
| 152036 (03-24783-A) | Lycra Single Jersey-150 GSM | N/A | 6441 | 35 | 0.54% | Softener Mark & High GSM | Fabric |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 151866 (03-22572-A) | CTN Single Jersey-150 GSM | GMT Wash | 5040 | 150 | 2.98% | High GSM | Fabric |
| W02-2408u-Sin. | Lycra Single Jersey-165 GSM | N/A | 680 | 39 | 5.74% | Process loss & Fail Cons. | Merchandiser |
| TOPEKA (Police) | CTN Single Jersey-180 GSM | N/A | 475 | 18 | 3.79% | Include Half Moon | Merchandiser |

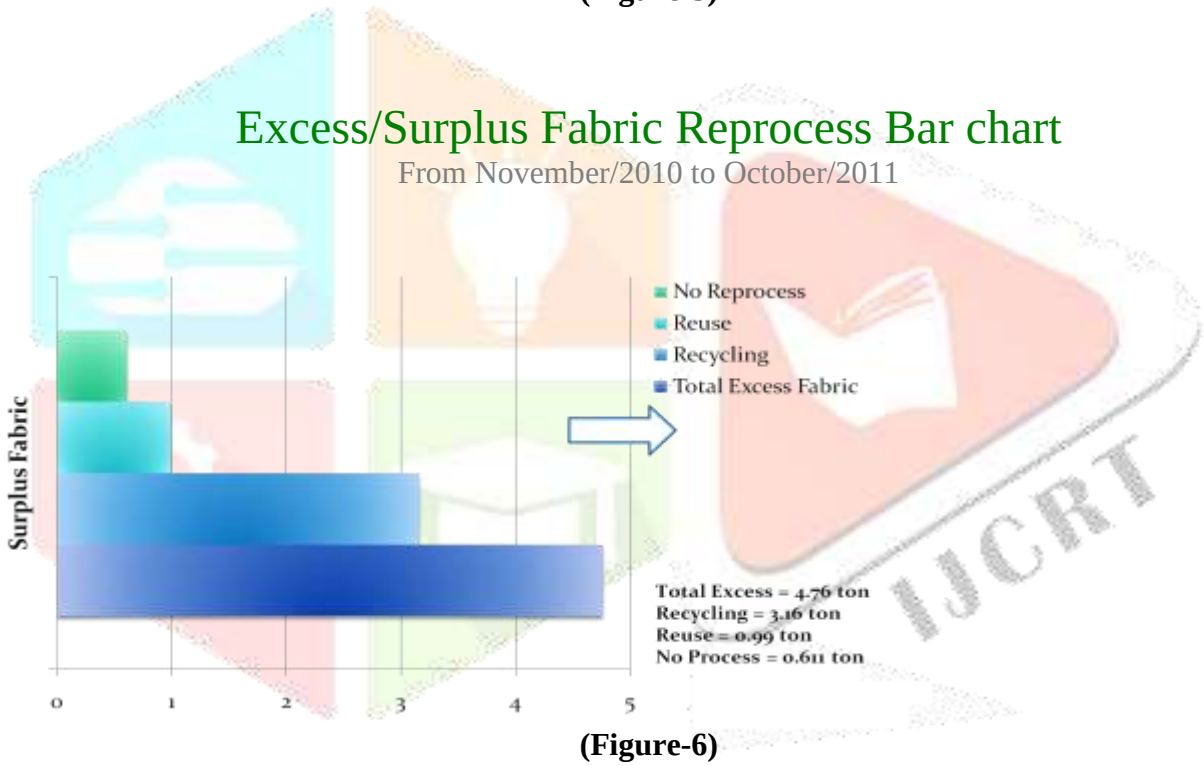
## 4.4] Excess and Surplus Fabric Inventory:

**Buyer: s. Oliver, Street One, Katag**

| Article | Fabric | Product Finish | Finish QTY. | Extra QTY. | Reason | Reprocess |
|---|---|---|---|---|---|---|
| 03.899.32.1230 (NOOS) | CTN Single Jersey-180 GSM | N/A | 158261 | 1418 | Less Process of Fabric | Recycling |
| 14.110.31.3212 | CTN Rib 1x1-210 GSM | N/A | 15660 | 1088 | Less Process of Fabric | Recycling & Reuse |
| 14.110.31.2593 | CTN Rib 1x1-230 GSM | N/A | 6847 | 50 | Less GSM of Fabric | Reuse |
| 14.101.39.2539 | CTN Rib 1x1-230 GSM | N/A | 7364 | 622 | Color Code Mistake | Recycling into In-Club |
| 152032(St.One) | CTN Rib 1x1-205 GSM | N/A | 4271 | 251 | Less Process of Production | Reuse |
| 151578(St.One) | CTN Slub Single Jersey Yarn Dyed-150 GSM | N/A | 10324 | 611 | Less Process of Fabric | No Reprocess |
| 1510-19w/17w (Katag) | CTN Interlock-200 GSM | N/A | 4295 | 718 | Less GSM of Fabric & Less Process of Production | Recycling & Reuse |

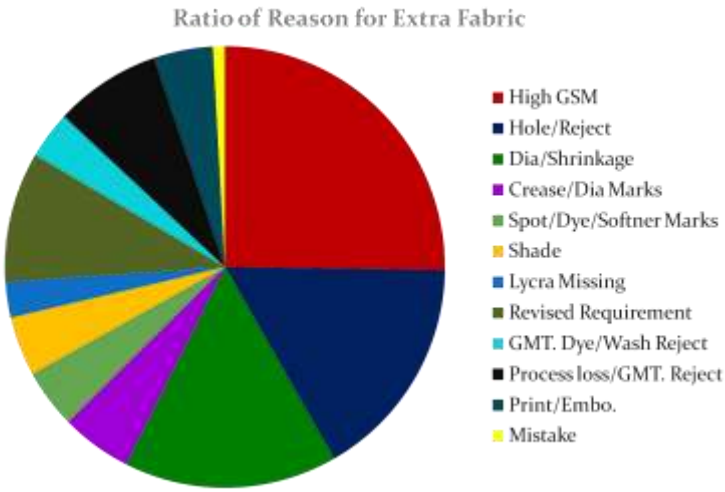



**(Figure-5)**




**(Figure-6)**

## Reason for Extra Fabric Pie chart




**(Figure-7)**

## 5] Recommendation:

There is given below of Successful Apparel and Garment Waste Reduction Practices in fabric sections. But in our Bangladesh most of the composite garment factory in fabric manufacturing department does not follow their proper effected process of wastage prevention.

- Set up a comprehensive fabric inspection system to monitor and limit width and shade utilization, spreading losses, and re-cut controls
- Tighten up edges to reduce waste in cutting fabric during layout
- Improve front edging of plies on front of the spread
- Identify minimum widths through manual, mechanical, or electronic devices
- Establish economic width-sorting guidelines
- Establish/control shade classifications, tolerances, and examination procedures
- Analyze the effects of shade segregation, bundle size, remnant losses, re-cuts and seconds
- Establish width/ shade labor and material break-even charts
- Analyze pattern sets and marking rules to effect fabric economies
- Maintain high inventory to insure those larger cuts can be issued
- Plan piece good deliveries to insure that fabrics that can be cut together are received within the same cut-planning period
- Make changes in packaging of fabric to reduce waste
- Recycle unused fabric and remnants

- Utilize better sewing techniques when joining rolls

**5.1] Develop Comprehensive Waste Management Systems**:

5.1.1] Create a Corporate Waste Committee:

i. Gather a representative from each process area

ii. Hold monthly meetings and reviews

5.1.2] Create One Central Area Collection Point:

i. Gather all cut/ sew waste

ii. Separate and classify waste for sale/ shipment to specific vendors

5.1.3] Perform A Corporate Waste Report (Analysis) By: Preparing monthly documentation of waste levels compared with standards.

i. Assign Staff (One or More People Depending on Quantity of Waste Streams)

ii. To monitor waste for all process areas (Fabric & Garment)

iii. To obtain feedback to each area for possible improvement or recognition of improvement (Communications)

5.1.4] Design Internal Adjustment and Development of Equipment/Machinery:

i. Make pattern modifications to maximize raw materials usage and minimize waste

ii. Investigate, experiment, and monitor the effects of these modifications

5.1.5] Create Training Documents: Prepare a corporate waste procedure handling manual and an awareness video for use in training for all apparel plants.

5.1.6] Develop A Computer System: To track/ record all fiber/ fabric waste information and inventory

**5.2] To reduce fabric wastage control in below sewing operation:**

i. Proper bundling of parts and finished goods handling to avoid dirt, cuts, etc. that result in fewer re-cuts

ii. Controlling use and waste of thread and trims, including ends of spools

iii. Reducing seam-off cut waste

**5.3] To reduce fabric wastage control in below merchandising operation:**

i. Confirm Right Pattern & Marker Processing

ii. Find Out How Many Process/Parts In Style

iii. Apply Process Loss According To Quantity, Fabrication, Fabric Weight & Color, Marker Length & Product Finished

iv. Product Finished, Length & Shrinkage Wise Apply Marker Length & Width to Make Fabric Consumption

Using all raw materials inventory is not proper systematic way and accounting because of lacking efficient

employment.

All composite factories are an essential to use the ETP plant to reduce water utilization that is performed the green environment and financial function. Most of the factory has the ETP plant but they don't use the plantation.

## 6] Conclusion:

Waste minimization can be reduced if it is possible to continue the observation and co-operation with every department of the garment industry. Then the manufacturers will be able to gain maximum profit as well as production will increase so fast with good quality products. If discipline and co-operation are maintained, waste minimization process is followed. The manufacturers should be aware of fabric waste and consumption.

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