FEASIBILITY OF DOUBLE SHIFTING IN APPAREL INDUSTRY

BY

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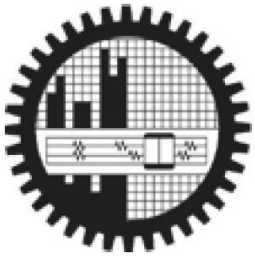
A thesis submitted to the Department of Industrial & Production Engineering, Bangladesh University of Engineering and Technology, Dhaka in partial fulfillment of the requirement for the degree of Master of Engineering in Advanced Engineering Management



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_____

Md. Imranul Islam

Dedicated to

My Mother
&
My Beloved Wife

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ABSTRACT

Bangladesh's apparel industry has been at the heart of the country's export boom ever since the first factory opened in 1976. The industry has grown dramatically over the past 37 years, and in 2012 it accounts for 78.60% of Bangladesh's total exports. There are now 5,400 garment factories in Bangladesh employing over four million people. As an individual country, now Bangladesh is the 2nd largest apparel exporters in the world with 5.40% share only. According to a 2011 report by international consulting giant McKinsey & Company, Bangladesh's RMG exports will strengthen the country's position and are likely to grow-double by 2015 and nearly triple by 2020 (reach up to US $ 41 billion). Though day by day, garments orders are increasing but production are not increasing simultaneously. To cope with this increasing order, it is high time to increase production without hampering the compliance issues. If the double shift is practiced in the apparel industry, not only it increases the production but also it reduces the production cost and less production cost ensures profit maximization. Again, double shift is a means of reducing overtime as well as working stress for a long time that has correlation with quality products, low production cost & buyer satisfaction. That's why double shifting is so important for our RMG sector to compete with world RMG market.

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

ACRONYMS

RMG: Ready Made Garments
NPV: Net Present Value
IRR: Internal Rate of Return
AQL: Acceptable Quality Label
ISO: International Organization of Standardization
ASTM: American Society for Testing and Materials
BS: British Standard
HRD: Human Resource Development
PBS: Progressive Bundle System
UPS: Unit Production System
WIP: Work in Process
EN: European Standards (Norms)
BSEN: British Standard European Norm
DIN: Deutsches Institut für Normung German Institute for Standardization)
AATCC: American Association of Textile Chemists & Colorists
ST: Standard Time
SAM: Standard Allocated Minute
SMV: Standard Minute Value
GSD: General Sewing Data
MFA: Multi Fibre Agreement
EPZ: Export Processing Zone
BGMEA: Bangladesh Garments Manufacturers & Exporters Association
GDP: Gross Domestic Product
BBS: Bangladesh Bureau of Statistic
PTS: Primary Textile Sector
SN: Single Needle
BB: Below Band
BK: Back
DN: Double Needle
MAN: Manual
BT: Bar Tack
FL: Flat Lock
LS: Lock Stitch
OL: Over Lock
KAN: Kansai
CS: Chain Stitch
OTS: On Time Shipment
CFDL: Crescent Fashion & Design Limited
IE: Industrial Engineering
CAD: Computer Aided Design
GM: General Manager
QA: Quality Assurance
QI: Quality Inspector
OT: Overtime

CHAPTER 1

INTRODUCTION

1.1 Background and present state of the problem

In Bangladesh, garment industry has been playing a vital role for the emancipation of socio-economic condition through employment and foreign earnings and acting as driving force in the economic development. The garment industry also particularly has played a pioneering role in the development of industrial sector of Bangladesh [1]. In some categories of apparel products, Bangladesh secured top position in terms of export in volume & value. The country has accumulated export earnings from few millions to billion US dollars over a period of one and half decade time [2]. Though the sector faces different obstacles, it is believed that the sector will play more significant role in future. As such, there is a necessity to identify possible hurdles and ways to eliminate those. Several issues affect productivity, cost and other areas of competitiveness of apparel sector, some of these being – production techniques, production planning and control, availability of skilled labors, labor cost along with payment schemes, social and other compliance issues, government rules & regulation, etc [3]. The RMG sector opened up employment opportunities for many more individuals through direct & indirect economic activities, which eventually helps the country's social development, woman empowerment and poverty alleviation. In such a way the economy of Bangladesh is getting favorably contribution from this industry [1]. In 2012, the textile industry accounts for 45% of all industrial employment in the country and contributes 5% of the total national income [4]. For further growth of apparel sector, its major input Textile clothing needs inline growth also. Bangladesh is also ahead in this area in comparison to Vietnam, China and Pakistan, when cheaper labor force is concerned.

The apparel sector of the industry has spent the last few years considering how it can organize its production so that garments are made efficiently with satisfactory quality standard. This has generated an increasing requirement for flexible machinery, multi-skilled operators and lateral thinking about the actual methods of assembly that are used for garments [5]. The key to optimizing the conflict of interests between the market and producers requirements lies in the ability of management to maximize the productivity of available resources, and to decrease

response time [6]. The basic needs of the garments market are competitive prices, acceptable quality standards, quick response and short delivery times. Although different factories operate several shifts in a day, practically double shifting is still absent considering increase in labor cost. The entrepreneurs are in dilemma regarding financial feasibility of double shifts. Though most of industries of Bangladesh practices single shift, there are some advantages for double shift than single shift like reducing in payment scheme, overtime work etc. [7]. There is a necessity to financially analyze the idea of double shift taking into account several cost elements, as well as overtime payment scheme and incentive. However, this will have some negative impact also. This research work concentrates on financial feasibility of introducing double shift in an apparel factory.

1.2 Objectives with Specific Aims and Possible Outcomes

1) To justify double shift in apparel industry in terms of quality, production, absenteeism percentage.
2) To justify double shift in terms of financial feasibility and means of profit maximization.
3) To study the social aspects of double shift.

1.3 Outline of Methodology

The following step-by-step methodology will be applied to this research project:

a) Collect data on cost and defect rate (quality)
b) Assess day shift & night shift production strategy in garment industry.
c) Study the current financial indices (NPV, IRR, Breakeven analysis or anything suitable) & quality impact (AQL index) for single shift production.
d) Study the financial (NPV, IRR, Breakeven analysis or anything suitable) & quality impact (AQL index) for double shift production after experimental double shift implementation.
e) Justification of double shift in terms quality and financial feasibility
f) Study the physiological & psychological behavior of night shift worker & their acceptability towards double shift.
g) Optimize the double shifting through reducing limitations.

CHAPTER 2

LITERATURE REVIEW

2.1 The Textile-Apparel pipeline

The textile-apparel pipeline is a series of interrelated activities which originates with the manufacture of fibre and culminates in the delivery of a product into the hands of the consumer.

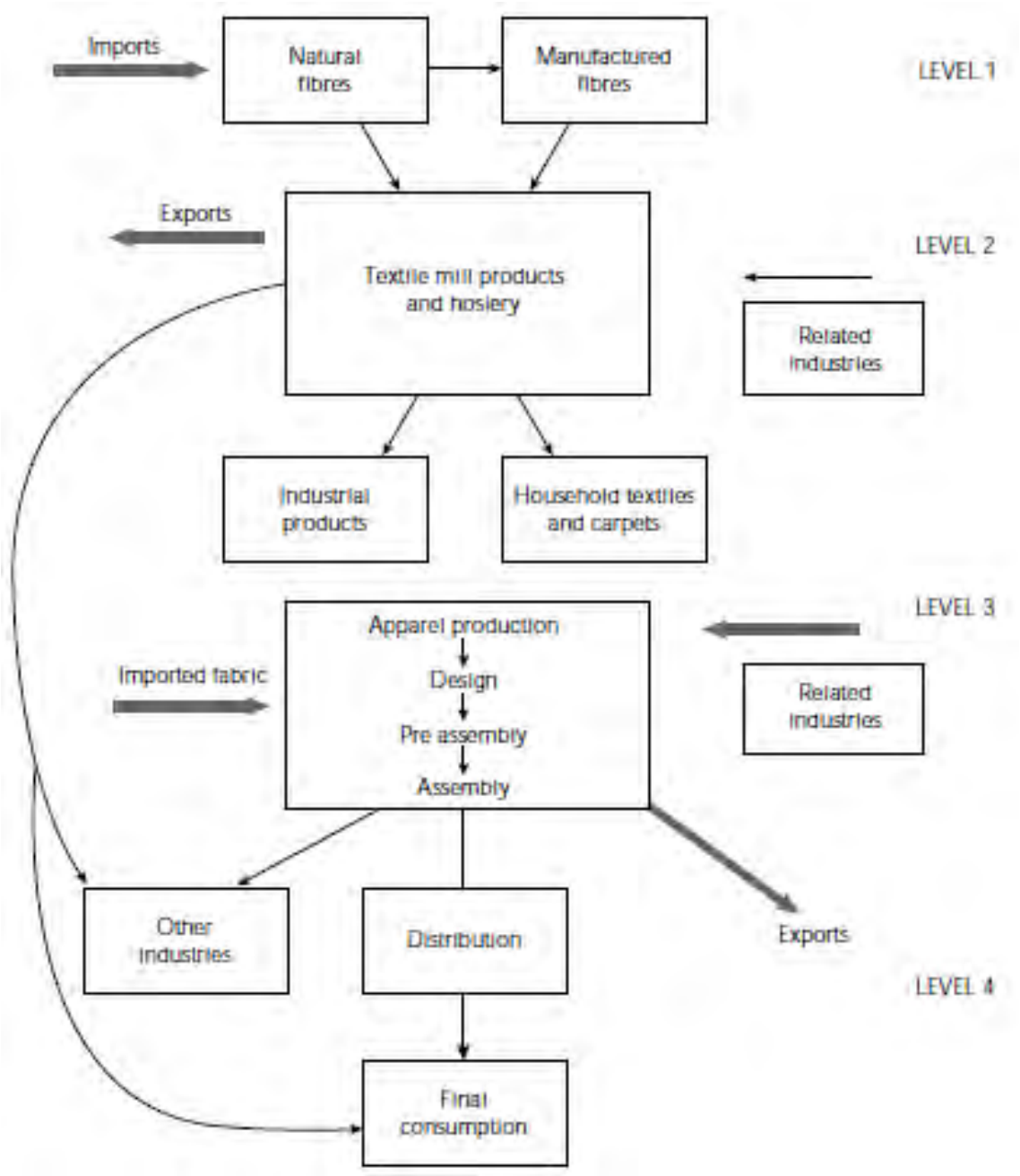

Figure 2.1: The Textile-Apparel Pipeline [8]

2.2 Flowchart of garment manufacturing

The manufacturing sequence of apparel production is varied from style to style. The most common flowchart is given below-

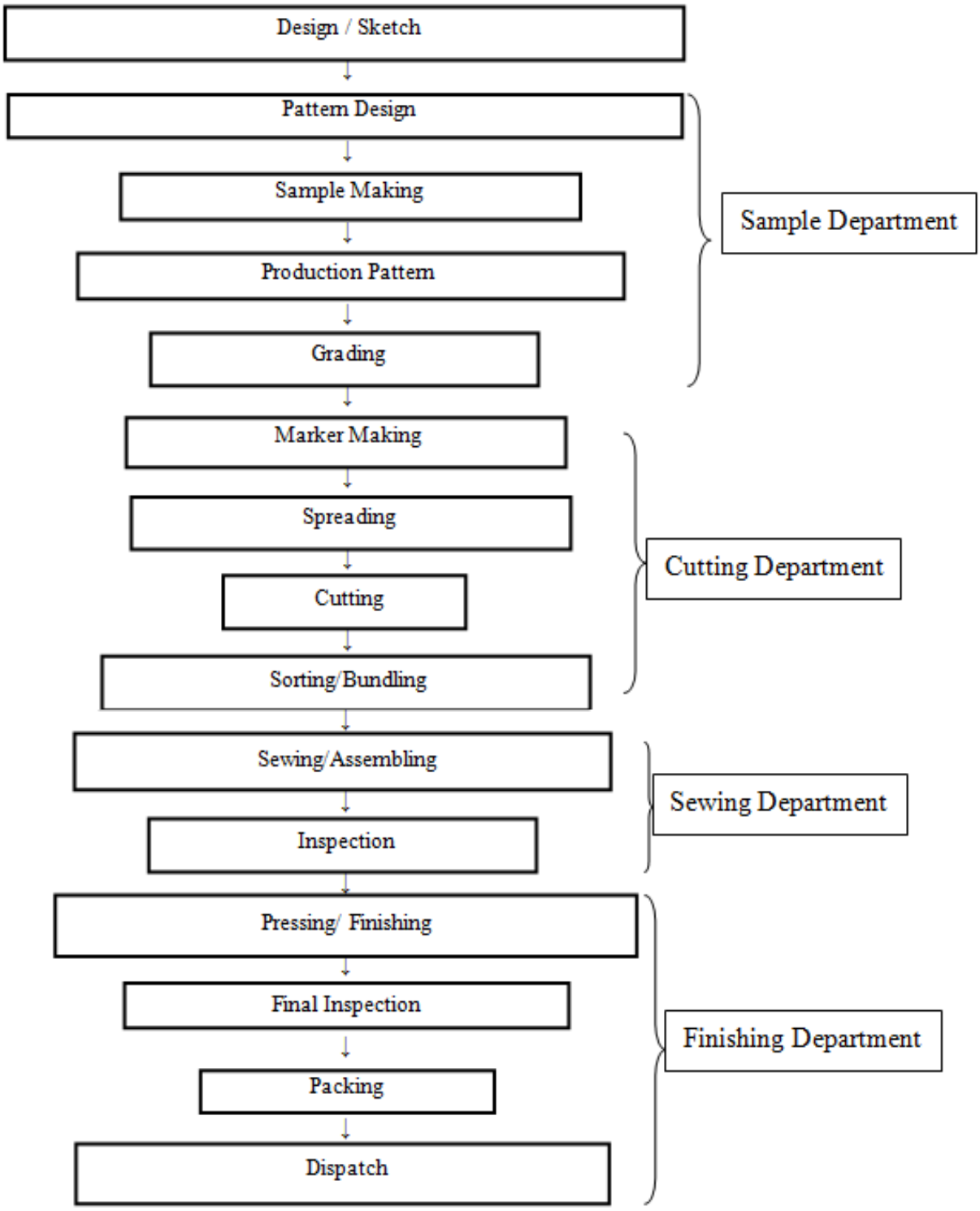

Figure 2.2: Process flow chart of garment manufacturing [9]

2.3 Stitch

A stitch is a loop structure of threads. Stitching is a series of stitches [10]. The term stitch is defined as one unit conformation resulting from one or more strands or loops of thread intralooping, interlooping or passing into or through material. A stitch may be formed without material, inside material, through material or on material (ISO, 1991 a). According to the American Society for Testing and Materials (ASTM) D 6193-97, stitch is defined as, "in sewing, the configuration of the interlacing of sewing thread in a specific repeated unit" [11]. According to BS 3870-1: 1991 and ISO 4915:1991, Stitch is defined as, "one unit of conformation resulting from one or more strands or loops of thread intralooping, interlooping or passing into or through the material". Stitch may be formed

- ✓ Without material;
- ✓ Inside material;
- ✓ through material;
- ✓ On material. [12]

2.3.1 Stitch types

Every category of sewing machine produces a specific type of stitch formation depending on the number of needles, loopers and threads which combine to construct the stitch. Each of these configurations is known as a stitch type and they are classified according to their main characteristics. There are various national and international standards for stitch types and they all use a similar taxonomy for classifying the main and sub-classes of stitch types. The following is an example of the system used by the British and USA standards, both of which contain the specifications for over 70 different stitch types. The six classes of stitch included in the British Standard are as follows:

a) Class 100 chain stitches
b) Class 200 stitches originating as hand stitches
c) Class 300 lockstitches
d) Class 400 multi-thread chain stitches
e) Class 500 overedge chain stitches
f) Class 600 covering chain stitches [6]

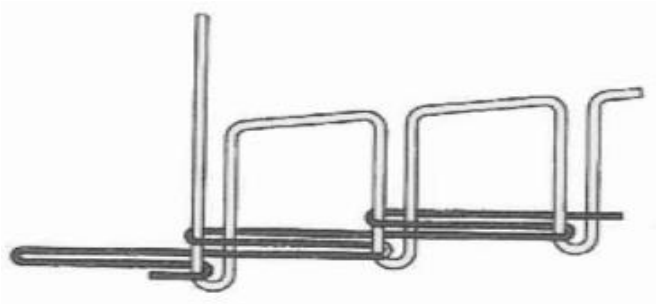

Figure 2.3 : Stitch type 401

2.3.2 Common Trade Names for Federal Stitch Types

The six main classes are identified by the first of the three digits [6]. The three digits number & associated common trade names for federal stitch types are given below [10]-

Table 2.1: Stitch number & Trade name

Stitch	Trade Terms
101, 203	Chain stitch, single thread chain stitch (under side, loop side)
202	Back Stitch.
204	Cross stitch.
301	Plain stitch, single needle lockstitch.
302, 309	Air tick stitch.
304, 404	Zig-zag (404 also bobbinless zig-zag)
401	Two thread chain stitch, double locked chain stitch, locked chain stitch.
402, 406	Covering stitch.
501, 505	Overedge, overlock, serging, overseam, overcast, “Merrow” stitch.
506 to 521	Safety stitch.
602, 603	Cover stitch.
604, 605	Thre-needle cover stitch stitch
606	Flatlock stitch
607	Four-needle interlocking stitch, four needle cover stitch.

2.3.3. Stitching Quality Measurement

Stitching quality is measured with the following parameters:

- Stitch size
- Stitch tension
- Stitch sequence
- Elongation
- Elasticity
- Resilience
- Yarn serverance
- Fabric distortion
- Strength, ensile, abrasive [10]

2.3.4 Sewing Machine

A sewing machine is a mechanical (or electromechanical) device that joins fabric using thread. Sewing machines make a stitch, called a sewing-machine stitch, usually using two threads although machines exist that stitch using one, three, four or more threads. It's hard to imagine now how revolutionary the sewing machine is. Before its invention, everything was

sewn by hand. For the clothing industry there is a great diversity of regular and special machines for sewing every conceivable type of garment and it is this variety which enables clothing manufacturers to employ specialized equipment for their own particular requirements. While there is a vast range, some machines are basic items of equipment in nearly every sewing room [6]. The different types of sewing machines are:

- Lock stitch machine
- Chain stitch machine
- Button holing machine
- Button attaching machine
- Blind stitch machine
- Bar-tacking machine
- Flatlock machine
- Zigzag Stitching machine
- Overlock machine

2.4 Work Aids

The additions that can be made to basic sewing machines are many and they come under the general term *work aids*. Work aids are devices built into machines, added to them afterwards, attached alongside or made use of in whatever ways a resourceful engineer can devise to improve productivity, improve or maintain quality standards, reduce training time and minimise fatigue for the operator [5]. Although the term work aids generally refers to apparatus fitted on sewing machines, the subject itself is far more extensive. All work aids are irrespective of type, have the same primary objective, to increase the operator time speeds sewing [13].

2.4.1 Types of work aids

The work aids that are used during sewing operations can be categorized in a number of different ways and they vary in the aspects of their overall purpose that they emphasize. The commonest ones are used for guiding or folding materials for trimming threads and other components from garments, for stacking the work after sewing. Least common are those that assist the initial picking up of the parts to be sewn. The different types of work aids are:

1. Guides
2. Compensating foot
3. Special presser foot
4. Stitching zig
5. Rack guide
6. Folders
7. Slack feeder
8. Thread cutter
9. Latch-back device
10. Compressed air
11. Stacker
12. Hemmers
13. The Binder
14. Tucker
15. Stretcher
16. Angolar
17. Light

Figure 2.4: Stretcher

Figure 2.5: Angolar

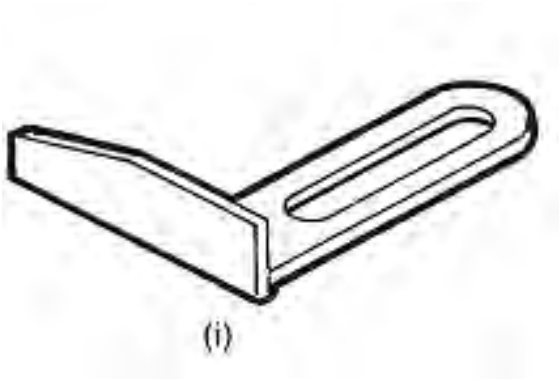

Figure 2.6: L guide (Edge guide)

2.5 Apparel Production

Production is concerned with the activity of producing goods [14]. The essence of production is the creation of goods, may be by the transformation of raw material or by assembling so many small parts. Production in everyday life can be noticed in factories, hospitals, offices, etc. Production is defined as the process or procedure to transform a set of input into output having the desired utility and quality. Production system is an organized process of conversion of raw materials into useful finished products [15]. Apparel production involves the conversion of materials (input) into completed, salable garments (output). Flat piece goods are cut, shaped, assembled and trimmed as they are converted into specific styles to meet customer needs. In today's apparel industry, production is market driven. To meet market demands and generate a

profit, firms must fully utilized their resources (inventory, people and equipment) and successfully expand their productivity [16]. As apparel companies consider a return to domestic production, they will be making a choice in production facilities, including production systems. These companies must hire or acquire production systems that will accommodate variation in styles, frequency in style changes, shorter lead times & smaller lot sizes. In other words, companies need production systems that will provide flexibilities, speed & cost reduction. Selection of the right production system is considered critical to market success [17].

2.5.1 Production and productivity

The concept of production and productivity are totally different. Production refers to absolute output where as productivity is a relative term where in the output is always expressed in term of inputs. Increase in production may or may not be an indicator of increase in productivity. If the production is increased for the same input, then there is an increase in productivity [15]. If viewed in quantitative terms, production is the quantity of output produced, while productivity is the ratio of the output produced to the input(s) used [14].

Productivity = Production/ Resources employed.

Productivity is said to be increased, when

1. The production increases without increase in inputs.
2. The production remains same with decrease in inputs.
3. The output increases more as compared to input. [15]

2.5.2 Production Efficiency

Efficiency is the ratio of actual output attained to standard output expected [14]. Efficiency is the ratio of actual output to effective capacity.

Efficiency = Actual output/ Effective capacity [18]

Efficiency is another way of expressing productivity, although efficiency figures are more useful and meaningful. Efficiency figures tell how it is performed against a target which has been set by scientific means. As the target is expressed as a time per garment or a required level of production, the efficiency is quite easy to calculate.

2.5.3 Suggestion of the Industry for Productivity Improvement

The manufacturers provided suggestions on how to achieve the potential in productivity improvement. Sixty nine percent of total sixty two respondents provided 117 suggestions. These suggestions, in order of their popularity, were mentioned below:

- ✓ Machinery Up-gradation
- ✓ Methods Improvement
- ✓ Training for Supervisor and Managers
- ✓ Incentive Scheme for Operators
- ✓ Quality System Implementation
- ✓ Strength Production Planning and Control
- ✓ HRD Initiatives
- ✓ Use of work-aids and Attachments
- ✓ Research and Development
- ✓ Use of Better Quality Fabric
- ✓ Improvement in Cutting Quality
- ✓ Productivity Monitoring [19]

2.5.4 Apparel Production System

An apparel production system is an integration of materials handling, production processes, personnel, and equipments that direct workflow and generate finished products [16]. There are different types of apparel production system, they are-

1. Individual system/make through system
2. Whole garment production system
3. Group system
4. Progressive bundle system (PBS) / synchro straight line system/ batch system
5. Unit production system (UPS)
6. Quick response sewing system/ Modular production system. [15]

Table 2.2: Predicted Attributes of the Three Commonly Adopted Production Systems [17]

System Attributes	Production Systems		
	Bundle	Progressive bundle	Modular
Workflow	Push	Push	Pull
Methods of retrieval to workstations	Brought to operator or self-retrieved from general storage	Brought to operator from operator by cart or conveyor	Hand off
Work-in-process (WIP) inventory	High levels (racks or carts of bundle)	Moderate levels (enough to balance the lines)	Zero to terminal
Number of tasks per operator	Single task or whole garment	Single task	Single to multiple tasks
Interaction between operators	No teamwork	No teamwork	Teamwork

In the apparel industry, the progressive bundle system is sometimes abbreviated as PBS. It is also called a push system because bundles are pushed between each operator's stations & down the production line (Oliver et al 1994). The progressive bundle system is more sequential in layout of production steps then the conventional bundle system & bundles are retrieved from one operator to the next by carts or conveyor, instead of an intermittent return trip to storage. Individual operator perform only one or a few operations on each cut piece within the bundle before the bundle progresses (Glock & Kunz, 2005; Solinger, 1988). WIP is anticipated to be at high levels & interaction between operators is usually low. Solinger (1998) noted that the progressive bundle system is one of the most commonly misused terms in the study of apparel production systems for example the production bundle system is characterize as synchronistic (Babu, 2006), in line (Cashtro, Miron & Martinez, 2004), or batch organized (Lin et al, 1994), with each term giving subtly variance to the systems attributes.

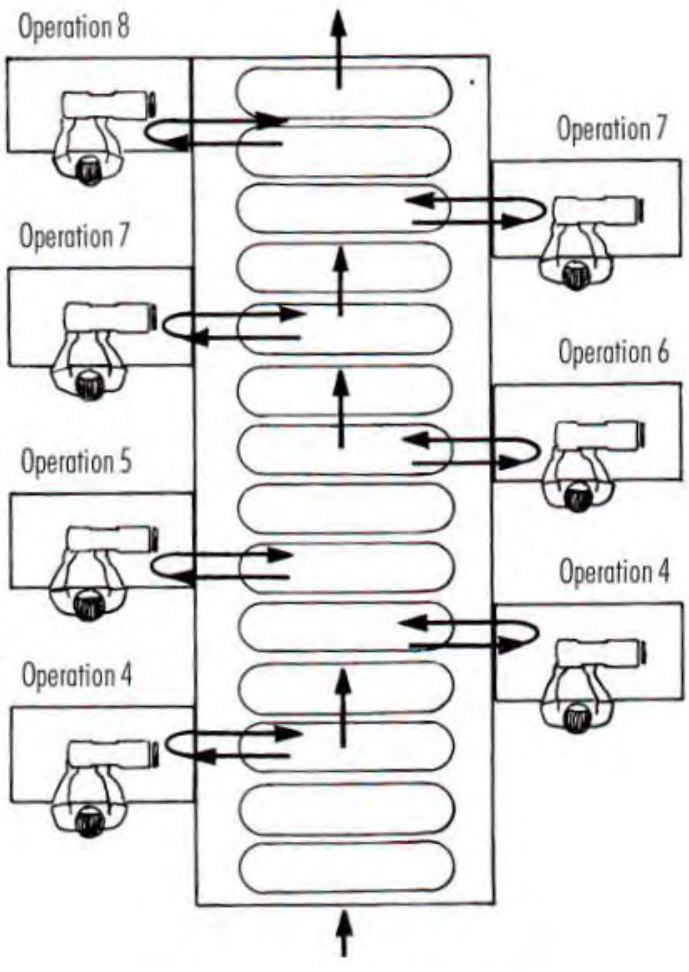

Figure 2.7: Progressive Bundle System

2.6 Layout

Layout refers to the configurations of departments, work centers, and equipment, with particular emphasis on movement of work (customers or materials) through the system. The 3 basic types of layouts are: product, process and fixed-position.

1. Product layout: These are most conductive to repetitive processing.
2. Process layout: These are used for intermittent processing.
3. Fixed-position layout: These are used when projects require layout. [18]

2.6.1 Some typical layouts

Depend on the map of the factory building and the production systems; some typical layouts are given below-

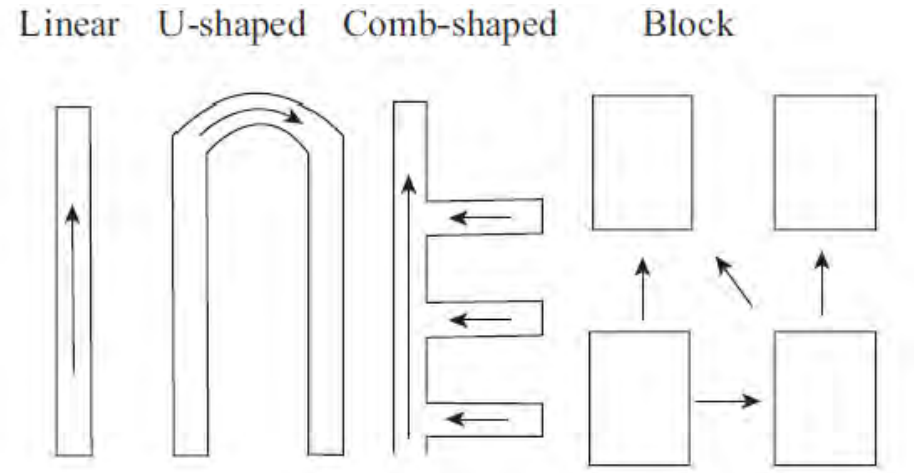

Figure 2.8: Different types of layout [15]

2.7 Types of Apparel Product

Based on the degree of style changes from season to season, products can be described as being basic, semi-basic, various styles or highly varied style. Product lines carrying basic products change little in style (e.g. classic style) while product lines carrying products with great style variety (e.g. fashion forward) have extensive style variation. When considering frequency of style change, product lines can be categorized into staple, semi-staple, fashion or high-fashion, based on degree of variations among them (Jhonson-Hill, 1978). The frequency of style change can range from zero or one change per season to more Than six changes per season. Volume of

production per style per season can range from mass production or high volume per style (Lin et al, 1994). Basic garments styles with long & continuous production runs (at most one styles change/ season).

Table 2.3: Product Line Groups with Attributes Description [17]

Product Line Groups	Product line group description		
	Degree of Style Change	Frequency of Style Change	Volume of production
Staple	Basic	Staple (0-1 change/season)	High Volume (mass production)
Semi-Staple	Semi-basic	Semi-Staple (2-3 changes/season)	Moderate volume
Fashion	Various styles	Fashion (4-5 changes/season)	Moderately low volume
High Fashion	Highly varied style	High fashion (>6 changes/season)	Very low volume per style

2.8 Quality

Quality is complex concept. No single definitions addresses all the dimensions, areas of impact, and concerns related to quality. The way a product or service conforms to specifications, or the ability of a product or service to meet customers' needs and satisfy their demands. Companies and their employees need to understand how quality affects organizations, standard and satisfaction and the competition within the marketplace [20].

In general, quality refers to the characteristics of a product or service that defines its ability to consistently meet or exceed customer expectations. The characteristics are added to the product or service throughout its value chain, right from materials procurement, up to customer use. As such, all the departments of an organization have some roles to play in determining quality of the product or service. Some other have defined quality as "Fitness for use", which typically means its performance, conformance, safety, durability and reliability [21].

2.8.1 Quality Control

Quality control is a procedure or set of procedures intended to ensure that a manufactured product or performed service adheres to a defined set of quality criteria or meets the requirements of the client or customer [22]. In management, control is the next step of planning.

Once the plan is implemented for execution, it needs to be monitored to ensure stipulated outcome. This is where certain degree of control is required. The activities required for meeting the planned or desired quality target, for conformance, is termed quality "control". There are normally four steps in such control:

i. Setting benchmarks
ii. Appraising conformance
iii. Action when necessary
iv. Planning for improvements [21]

2.8.2 Consequences of Poor Quality

The consequences of poor quality are grave and many folds in business term. Poor quality means many things, which are sometimes irrecoverable. Some are worth explaining:

1. Lower Productivity.
2. Loss of productive time.
3. Loss of material.
4. Loss of business.
5. Liability.

Productivity and quality are closely related, thus, inseparable. Since, poor quality means rework and rejection; it adversely affects productivity in manufacturing process. Studies have shown that garments companies in Bangladesh have rework rate as high as 10%, which approximately means 10% loss in productivity. In many cases, the defective products cannot be reworked for further use. This may mean rejection, which not only means loss of material, but also of other resources and useful time spent in producing those products. The most severe problem of bad quality is loss of business. Failure of a product while in use can severely damage the organization's image, which is detrimental for business [21].

2.8.3 Quality Cost Index

The cost of quality or lack of it is underestimated by most people, including quality professionals. Realistic elements range from 10 to 35% of product costs. Quality costs have been broken down in the following manner:

- Inspection: 2 to 15% of labor costs.

- Scrap: 2 to 10% of material costs.
- Excess material made but not used: 0 to 5% of material costs.
- Rework: 0 to 5% of labor and material costs.
- Feed service: 0 to 20% of labor and material costs.
- Customer dissatisfactions: Not estimated, but potentially more expensive than all of the preceding.

As quality increases, fewer defectives are produced and thus production cost decrease. As quality increases the cost of the quality program increases. At break-even, the production of fewer defectives reduces production costs to the point at which the cost of administering the quality management system equals the savings that are generated. As quality improves, the need for quality control is reduced. But the commitment to quality production must remain, or production quality will decrease. Each apparel firm and production plant must strike a balance between costs of the quality program and savings generated by the production of first-quality goods [16].

2.8.4 Apparel quality

In the apparel quality control is practiced right from the initial stage of sourcing raw materials to the stage of finishing garment. Product quality is assured in terms of fibers, yarns, fabric construction and the final finished item. However, quality expectations for export are related to the type of customer segments and the retail outlets. In today's competitive business of apparel export, characterization of quality is an important and indispensable aspect. Global standards in apparel are technology driven, benchmarked by the major buyers that are too rigid and may result in acceptable merchandise being unnecessarily rejected. Thus, quality evaluation of garments as per international standard norms is essential for export. This is not only to ensure a quality product but also to endorse the product safety, reduce returns, minimize customer complaints and promote repeat sales. It is well known that testing protocols are the summaries of applicable requirements, which cover all factors of performance, evaluating safety and quality as well as labeled claims. Testing's protocol changes depending on the fibers and fiber type, weight, style, finish accessories used, country of export and above all the intended end use of product. It is also vital bear in mind that all standards and regulations encapsulated in the protocol have one or both of the following aims: safety and quality. While quality is related more towards general customers satisfactions, safety is an important concern as products not meetings

regulations can jeopardize the health of the purchaser. Thus, characterization of apparels that are earmarked for export is essential to satisfy both the regulation and performance requirements. Any deviation in production with respect to product specification and quality as per required minimum performance standard goes against the interests of customers; the ultimate end users whose expectations are always been regarded as vital in commercial decision-making process of an apparel retailer [23].

2.8.5 Essential elements of quality characterization

Aesthetics in apparel are not desired to be sacrificed for durability and performance. But reverse is the case in various practical situations. Thus, when consumers buy apparels they suspect about the quality and expect some change in shape and color after refurbishing. Inherent properties of apparel are important to the customer according to the application area. They may be highly specialized in nature, or otherwise normal and purely basic. But there is a core series of tests that are applicable to evaluate the product depending on the end use. There exist internationally recognized standards applicable in Europe and United sates and broadly denoted as ISO, BS, EN, BSEN, DIN, ASTM, and AATCC. In addition, many other countries such as India, Australia, Japan, France and Canada regulate the quality evaluation through the standards. Even, some of the very reputed retailers around the world have their own standards and test methods, e.g. Marks & Spencer, J.C. penny, etc. Methodology and equipment may or may not vary but basic objectives remain the same, i.e. appropriate checking of quality to predict the performance of the merchandise and by which one can determine the acceptance of the product or otherwise with reference to the expected minimum tolerance level [23].

2.8.6 AQL

The “Acceptable Quality Level” is defined as the maximum percent defective (or the maximum number of defects per hundred units) that, for purpose of sampling inspection, can be considered satisfactory as a process average. According to ISO 9000:2000, “It is the degree to which a set of inherent characteristics fulfills requirements.” (Mehta *et al.* 1998). The AQL is a designated value of percent defective (or defects per hundred units) that the consumer indicates will be accepted most of the time by the acceptance sampling procedure to be used. The sampling plans provided herein are so arranged that the probability of acceptance at the designated AQL value

depends upon the sample size, being generally higher for large samples than for small ones, for a given AQL. The AQL alone does not describe the protection to the consumer for individual lots or batches but more directly relates to what might be expected from a series of lots or batches. AQL values of 10.0 or less may be expressed either in percent defective or in defects per hundred units; those over 10.0 shall be expressed in defects per hundred units only [24].

This is the poorest quality level of the supplier's process that the consumer would consider to be acceptable as a process average. This can also be considered as a percent defective that is the base line requirement for the quality of the producer's product .The producer's would like to design a sampling plan such that there is high probability of accepting a lot that has defect level less than or equal to the AQL [21].

2.8.7 Types of sampling plan

There are varieties of sampling plans. Selection of a particular type depends on type of product and production process. The following figure shows the classification of different sampling plans [21].

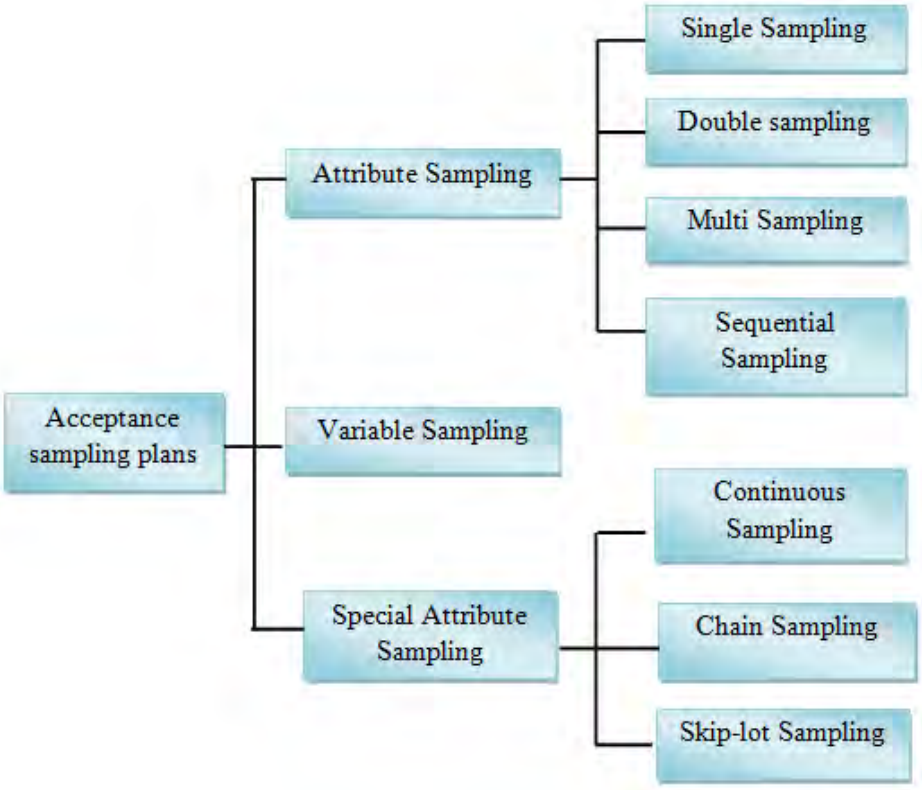

Figure 2.9: Different types of sampling plan

2.8.8 Inspection

Inspection is the process of examining materials, garments components, or finished garments to determine acceptability against a standard and to accumulate information about product quality. According to a study conducted through Bobbin magazine, finished goods inspection remains the most frequent type of quality control in apparel plants, followed by supervisory inspection, random inspection, and statistical quality control. Inspection has three purposes:

- To determine whether products have been made specifications.
- To determine whether products meet standards
- To determine products are acceptable [16]

Some apparel firms still use quality control system that depends on 100% inspection of finished products. Unfortunately, even firms that inspect 100% of the finished goods still ship defective merchandise. Inspection system break down is dependent on human judgment. If the inspector losses concentration or is destructed for some reason, the consistency of the inspector's work may suffer. For these reasons, even with 100% inspection, defective goods may be shipped as first quality. If the defects are corrected, cost of producing defective goods is higher than making first quality goods. Thus, if the production of defective goods is reduced, production cost is less and there is greater opportunity for profitability. The trend is toward a proactive instead of a reactive approach to quality management. Modern quality management programs seek to prevent errors so that products that meet standards are made right the first time. Inspection may take place before materials are shipped supplier, upon receipt of materials, during garments assembly, or after garments are completed. The goal is to assure the quality of input, production processing and output. Some firms keep their second rate as low as 0.5% of production. If the second rate is higher, 2% more, a quality management program is likely to provide cost savings [16].

2.8.9 Various Inspection Systems for Apparel

The products should reach the consumers with right quality depends on the cost. Quality assurance covers all the process within a company that contributes to the production of quality products. The aim of garment inspection is to visually inspect articles at random from a delivery in order to verify their general conformity and appearance with instruction/description and/or

sample received. There are different types of inspection following by inspectors as requirement of consumers.

I. Pre-Production check: This is done before production starts. Where then is a final verification of the material used; style, cut and workmanship of the garment or pre-production sample as per the customer Requirements.

II. Initial production check: This is done at the start of production where a first batch of garments is inspected; to distinguish possible discrepancies/variation and to allow from the necessary corrections to be made bulk production. The inspection is a preliminary stage covering mainly style and general appearance, workmanship, measurements, quality of fabrics, components, weight, colour and/or printing.

III. During production check: This is done during production to ensure initial discrepancies/variations have been rectified. This inspection is in fact the follow -up of the initial production check and is generally carried out a few days after the initial inspection, especially if discrepancies have been detected at that time.

IV. Final Random Inspection: This is carried out when the production of the total quantity of an order or partial delivery is completed. A sample lot will be selected from the order and a percentage of the garments will be inspected, this percentage usually being stipulated by the buyer. The AQL sampling inspection may be applied or another inspection system designed by the buyer.

2.8.10 Method of Classifying Defects and Defectives

A classification of defects is the enumeration of possible defects of the unit of product classified according to their seriousness [24]. A defect is any nonconformance of a product with specific requirements. Thus, a defect describes or refers to some feature or aspect of a product that is less than what was specified or that did not meet standards. A defective is a product with one or more defects. For example a T shirt has a noticeable yarn irregularity by neck band near the center front of the shirt. The irregularity is a defect the shirt is defective. If the company has identified product zones and defined acceptable and unacceptable appearance variation the shirt may be considered a first or second quality product [20]. Defects will normally be grouped into one or more of the following classes; however, defects may be grouped into other classes, or into subclasses within these classes [24].

1. **Critical defect:** A critical defect is a defect that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining, or depending upon the product or prevents performance of a tactical foundation of a major end-use item. Critical defect are not common with textile products, but they may occur with some occupational apparel, such as latex gloves for medical personnel. A critical defect in the glove would be hole or tear that allows the individuals wearing the glove to come in to direct contact with blood and other body fluids, thereby increasing the risk of exposure to fluid-borne pathogen or disease [20]. A critical defective contains one or more critical defects and may also contain major and or minor defects [24].

2. **Major defect**: A major defect is a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose [24]. For example, a raincoat that does not shed water or that shrink significantly the first time it gets wet has a major defect [20]. Major defective contains one or more major defects, and may also contain minor defects but contains no critical defect [24]. Testing product performance would have helped identify this major defect [20].

3. **Minor defect:** A minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit. A minor defective contains one or more minor defects but contains no critical or major [24].

2.9 Standard time (ST)

Standard time is the total time in which a job should be completed at the standard performance. The unit that measures the amount of work to be done by an operator in an operation by the number of minutes it should be completed in (Solinger, 1980). Standard time is the time required for an average operator, fully qualified and trained and working at standard pace, to perform the operation. Normal time needs to be increased from standard time by personal, fatigue, and delay allowances [15].

Standard time = Normal Time + Allowances

= Normal Time + (Normal Time * Allowances)

= Normal Time (1 + Allowances)

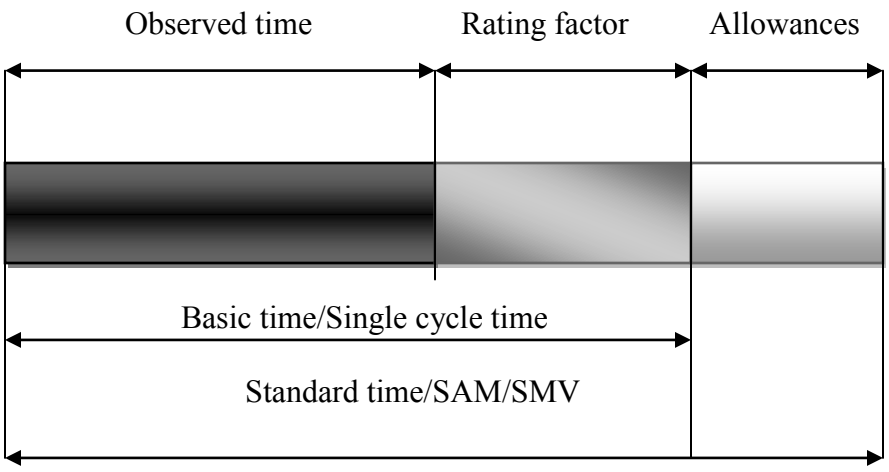

Figure 2.10: How the standard time for a simple manual job is made up

2.9.1 Standard Allowed Minute/Standard Allocated Minute (SAM) or Standard Minute Value (SMV)

In garments production, the terms SMV or SAM used frequently. The unit that measures the amount of work to be done by an operator in an operation by the number of minutes it should be completed in [15].

SMV=Basic time* (1 + Allowances)

SMV should cover the following activities:

- Time of getting pieces together to the foot pressure
- Position and align pieces
- Sewing cycles
- Cutting and disengage
- Bundle handling (if any)
- Data record (if any)
- Sewing machine allowances
- Personal need, fatigue and delays allowances [25]

2.9.2 General Sewing Data (GSD)

General Sewing Data (GSD) was devised by Methods Workshop Limited, and published in 1978, and is subject to a continual development program by General Sewing Data Limited, using an MTM data base. It is a Predetermined Motion Time System designed specifically for the sewn products industries. It is an easy to use and understand technique for Methods Analysis and the

setting of Time Standards for sewn product manufacture. It can be used to evaluate all operations, including Cutting, Sewing, Pressing, Examination and Packing. GSD recognizes commonly occurring human motion sequences encountered in the sewn products environment and describes the motion by means of codes. Each code has a definite time value which takes account of the distances moved and the degree of difficulty of the motions. The weaknesses of Time study system are the accuracy of an individual's performance rating and just what is included in the Timed Work Cycle. These problems lead to inaccuracy and inconsistency in applied standards, adversely affecting morale, output and quality standards. Solutions to this problem were sought through the application of Predetermined Motion Time System, and General Sewing Data (GSD) has become the market leader in the Sewn Products Industry, and has replaced Time Study in many companies throughout the world [26].

2.10 Target Setting/Capacity

Capacity study is similar to time study where the operator will be timed, but the purpose is not to arrive at a time standard, rather to find out the operator's potential/performance level. Here it is measuring the performance and potential that an operator should attain; if he works on the operation continuously at same pace and same method as observed during the study. It means that the operator is capable of achieving the performance measured by the study (Seminar SCT, 2010).

$$\text{Target/Hour} = \frac{No.\ of\ Manpower\ X\ 60\ X\ Efficiency}{SMV}$$

$$\text{Require SMV (R-SMV)} = \frac{No.\ of\ Manpower\ X\ 60}{Target}$$

$$\text{Efficiency} = \frac{SMV}{R-SMV}\ X\ 100$$

$$\text{Required Work Place} = \frac{Line\ Target}{Individual\ Operation\ Target}$$

2.10.1 Benefits of capacity study

- Check targets
- Motivate operators
- Measure section production capability

2.10.2 Check targets

- When the operation bulletin is prepared, the targets are set based on a planned efficiency, say 65%. But it would be impossible to expect all the operators in a line to work at same efficiency.
- Once capacity study is done, the targets of every operator on an operation can be checked with the capacity and proper balancing decisions can be taken to ensure the daily target.

2.11 Feasibility Study

A project is the whole complex of activities involved in using resources to gain benefit. A feasibility study is defined as an evaluation or analysis of the potential impact of a proposed project or program. A feasibility study is conducted to assist decision-makers in determining whether or not to implement a particular project or program. The feasibility study is based on extensive research on both the current practice and the proposed project/program and its impact. Project appraisal or Feasibility study means pre-investment analysis of an investment project with a view to determine its commercial and socio economic feasibility.

2.11.1 Aims of Feasibility

Feasibility studies aim to objectively and rationally uncover the strengths and weaknesses of the existing business or proposed venture, opportunities and threats as presented by the environment, the resources required to carry through, and ultimately the prospects for success. In its simplest term, the two criteria to judge feasibility are cost required and value to be attained. As such, a well-designed feasibility study should provide a historical background of the business or project, description of the product or service, accounting statements, details of the operations and management, marketing research and policies, financial data, legal requirements and tax.

2.11.2 Major Aspects of Feasibility Study

Major Aspects to be looked into appraising or studying feasibility of an investment project are Commercial Appraisal/Feasibility Study and Economic appraisal. Details are outlined below:

i. Commercial Appraisal/Feasibility Study

a. Technical: The technical aspects of an industrial project are appraisal to determine whether the project is sound with regard to very engineering and technological considerations, including project specification, process, size, internal balance, suitability and availability of physical facilities, designs and layouts of equipment, building etc. the main objective of technical appraisal is to look into the appropriateness of technical structure of the project within certain economic and financial constraints.

b. Marketing: Marketing may be defined as "the performance of all business activities involved in the flow of goods and services from the producer to the consumer". Marketing plan is the most critical segment of project feasibility analysis. Thorough this, the company assesses the opportunities and threats in the environment, and develops strategic responses that ultimately lead it to its set objectives. The objective of market analysis is to see how much of these goods or services the community is disposed to acquire and at what prices. The market analysis is concerned initially with the study of demand for project's output. Market analysis covers the following aspects:

c. Financial: The main purpose of financial appraisal is to assess if the proposed project is viable in terms of its operation in the future years and its financial soundness, to see whether the project will be able to generate sufficient surplus after meeting all operation costs and other day to day transactions to meet its long-term debt obligations. The relevant information collected through technical, marketing, management and economic appraisal of the project have direct bearing upon its financial appraisal.

d. Managerial: Management feasibility study refers to the assessment of the ability of a management in relation to function, which they have to perform. The evaluation of management rests, apart from environmental factors, on the resourcefulness, competence and integrity of its management. As a project which is viable from economic, marketing, technical and financial aspects may fail if wrong persons are chosen to execute and run the project. Even a project with

an excellent market prospect, outstanding engineering design and full proof financial arrangements may end in failure if its management is not efficient, honest and dynamic. In other words, the ultimate success or failure of a project depends mainly on its management ability and sincerity.

e. Organizational

- ✓ Has the organizational structure been devised in a way that inter departmental coordination becomes easy?
- ✓ Are the documents in respect of the organizational set up of the project proper?

ii. Economic appraisal

In the economic appraisal, the project is looked at from the national or social point of view and the economic cash flow is calculated on the basis of "true or real prices", commonly known as accounting or shadow prices. While in the financial appraisal, the project is looked at from the sponsor's point of view and cash flow is determined on the basis of actual receipts and expenditures. The economic analysis starts from the point at which the market price mechanism fails. Economic analysis eliminates the difference between "Social" and "Private" costs by valuing all goods and services in terms of the real costs and benefits, which their production imposes on the economy. Economic Appraisal covers the following aspects:

2.12 Shifting

Shifting is an employment practice designed to make use of the 24 hours of the clock. The term "shifting" includes both long-term night shifts and work schedules in which employees change or rotate shifts. A related yet different concept, the work shift, is the time period during which a person is at work. Shift workers normally work in crews, which are groups of workers who make up a separate shift team. In some shift systems, each crew will regularly change its hours of work and rotate morning, afternoon, and night shifts.

"Shift work refers to a job schedule in which employees work hours other than the standard hours of 8 a.m. to 5 p.m. or a schedule other than the standard workweek - Monday through Friday in the United States" (Grosswald, 2004, p. 414). "In general, the term 'shift work' is quite

vague and includes any organization of working hours that differ from the traditional diurnal work period; sometimes it is a (sic) synonymous of irregular or odd working hours" (Costa, 2003, p. 264). "…most studies on shift work classify shift workers as anyone working outside regular daytime hours (i.e. between approximately 7 a.m. and 6 p.m., Monday through Friday). Under these definitions, shift workers include all people working evening shift, night shift, rotating shifts, split shifts, or irregular or on-call schedules both during the week and on weekends" (Institute for Work & Health). "The standard workday unfolds during an 8-5 timeframe. It can be considered that shift workers to be individuals who work nonstandard hours." (Root, 2004)

2.12.1 Why does shift work increase?

Shift work is widespread throughout Europe. It is essential in some industries in which equipment, services or manufacturing processes must continue on a 24-hour cycle. Examples of this type of industry range from newspaper production and public utilities to hospital and emergency services. A development in more recent years has been the spread of shift working to industries such as telephone sales and banking. Other reasons for using shift work are:

- Economic reasons - the pace of change has quickened and so has the rate at which plant and equipment become out of date: shift work enables employers to make maximum use of plant, which can reduce production costs and increase output
- Social reasons - changes in living and working patterns have created a demand for goods and services outside traditional working hours: for example, retail outlets are commonly open 7 days a week and in some cases for 24-hour periods. [27]

2.12.2 What are the advantages and disadvantages of shift work?

Shift work can reduce unit costs because capital equipment is operated more intensively and cheaper off-peak electricity can be used. Rotation in some shift systems can enable a more flexible response to peaks and troughs of demand. Shift work can provide higher earnings for employees and allows them to use shops and social facilities at times when they are less crowded. On the debit side, shift working increases wage and labor costs and can disrupt

employees' social and domestic lives. It can also upset employees' body rhythms and cause them to lose sleep [27].

2.12.3 Available shifting in the world

Fixed shifts are when a worker comes to work at the same time every day, rotating shifts are when the shift time changes through the course of the management plan and each worker enjoys all available shifts prevailing in the production plan [28]. Available shifts are-

- Traditional 8 hours, 5 days work schedule
- Traditional two shift schedule
- Two shift rotating schedule
- Day and nights
- Traditional three shift fixed schedule
- Three shift discontinuous system
- 12-hour continuous shift systems
- 12-Hour rotating shift
- DuPont 12-Hour rotating shift
- Continental shift
- Split shift
- Earlies & Lates
- Traditional four crew shift continuous systems
- Four crew 'continental' continuous shift systems
- Five crew continuous shift system [27, 28]

2.13 Depreciation

Depreciation is the process of allocating to expense the cost of a plant asset over its useful (service) life in a rational and systematic manner. Depreciation is the allocation of the cost of a plant asset to expense over its useful (service) life in a rational and systematic manner. Depreciation is a process of cost allocation, not a process of asset valuation [29].

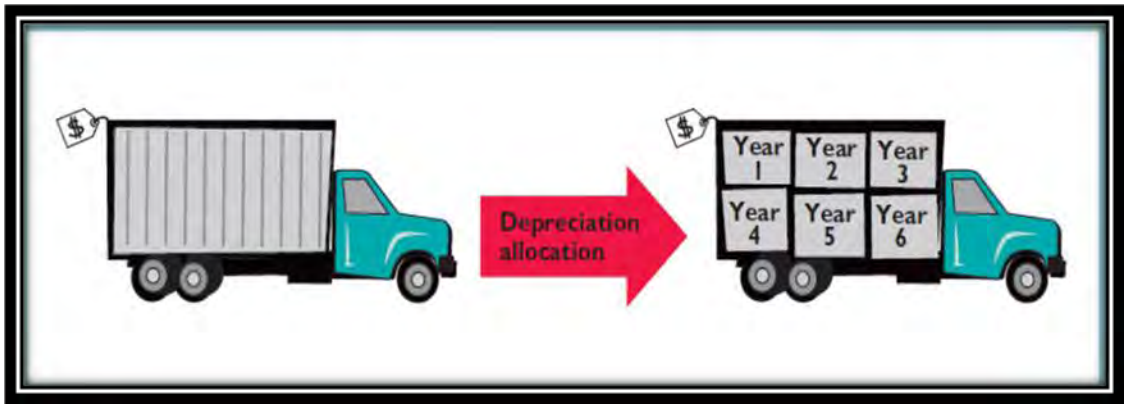

Figure 2.11: Depreciation

2.13.1 Factors in Computing Depreciation

Three factors affect the computation of depreciation:

i. Cost
ii. Useful life
iii. Salvage value

i. **Cost:** Companies record plant assets at cost, in accordance with the cost principle.

ii. Useful life: Useful life is an estimate of the expected productive life, also called service life, of the asset. Useful life may be expressed in terms of time, units of activity (such as machine hours), or units of output. Useful life is an estimate. In making the estimate, management considers such factors as the intended use of the asset, its expected repair and maintenance, and its vulnerability to obsolescence. Past experience with similar assets is often helpful in deciding on expected useful life.

iii. Salvage value: Salvage value is an estimate of the asset's value at the end of its useful life. This value may be based on the asset's worth as scrap or on its expected trade-in value. Like useful life, salvage value is an estimate. In making the estimate, management considers how it plans to dispose of the asset and its experience with similar assets [29].

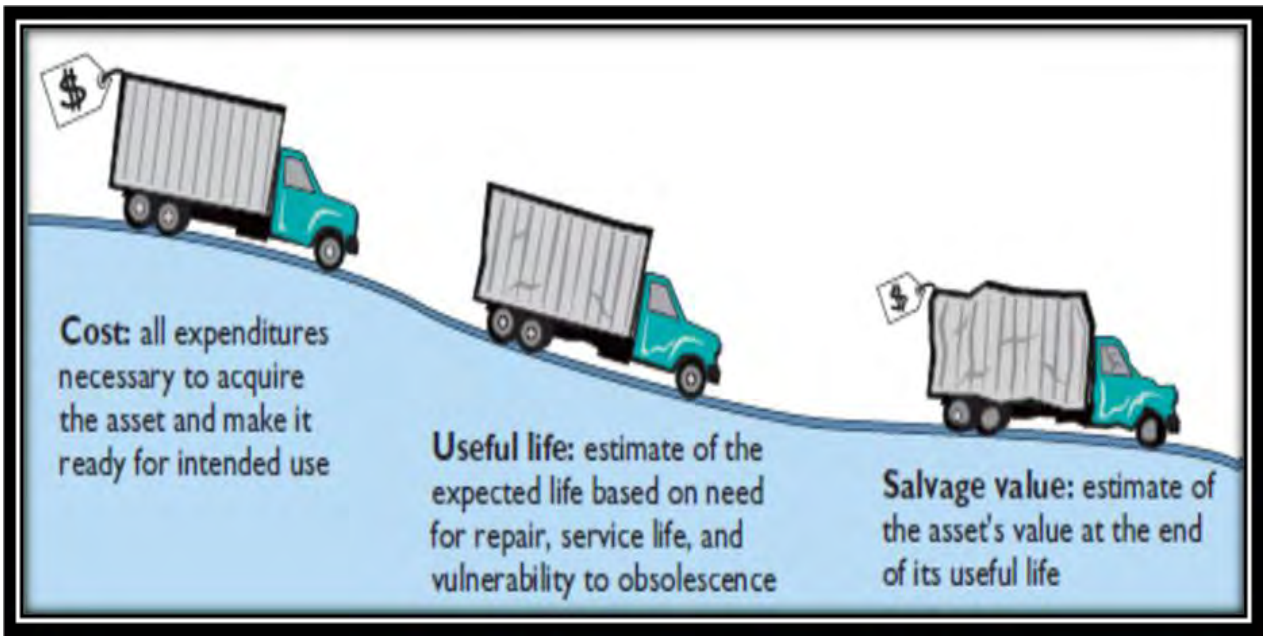

Figure 2.12: Cost, Useful Life & Salvage Value

2.13.2 Depreciation Methods

Depreciation is generally computed using one of the following methods:

1. Straight-line
2. Units-of-activity
3. Declining-balance

Straight-Line: Under the straight-line method, companies expense the same amount of depreciation for each year of the asset's useful life. It is measured solely by the passage of time. In order to compute depreciation expense under this method, companies need to determine depreciable cost. Depreciable cost is the cost of the asset less its salvage value. It represents the total amount subject to depreciation. Under the straight-line method, to determine annual depreciation expense, depreciable cost is divided by the asset's useful life [29].

Figure 2.13: Straight Line Depreciation

2.14 Net present value (NPV)

The net present value (NPV) method involves discounting net cash flows to their present value and then comparing that present value with the capital outlay required by the investment. The difference between these two amounts is referred to as NPV. Company management determines what interest rate to use in discounting the future net cash flows [29]. Each cash inflow/outflow is discounted back to its present value (PV). Then they are summed. Therefore NPV is the sum of all terms [30, 31].

$$\frac{R_t}{(1+i)^t}$$

Where, t- The time of the cash flow

i- The discount rate (the rate of return that could be earned on an investment in the financial markets with similar risk.); the opportunity cost of capital

R_t- The net cash flow i.e. cash inflow – cash outflow, at time *t*.

2.15 Women Worker

Garment employers prefer unmarried or widowed/separated/abandoned female workers because it is believed that currently-married women go on leave frequently due to childbirth, childcare, or household chores. It is also believed that, due to the burden of childcare and household chores, married women are not able to provide overtime work, which is almost mandatory for export-oriented manufacturing of garments. However, maternity leave and maternity allowances, which the garment employers are reluctant to provide, is the most important reason behind their preference for unmarried women [7].

2.15.1 Women employment

Export-based industries, particularly garment industries, have provided unprecedented wage employment opportunities for young women because their labor is comparatively cheap. Women are employed in this industry mainly to exploit the comparative advantages of their disadvantages, like the low price of their labor, their lower bargaining power, and their docility. The assembly-line nature of garment manufacturing is one of the main reasons for higher employment of women in this industry. The comparatively lower wage of female workers is another important factor encouraging large-scale women's participation in the garment industry.

(a) Women are more patient and nimble;
(b) Women are more controllable than men;
(c) Women are less mobile and less likely to join a trade union; and
(d) Women can do better in sewing because this job coincides with their traditional jobs.

However, the most important reason behind garment worker's young age is that most female garment workers envisage working in the garment industry only for four years, on average (Paul-Majumder 1998). The sewing and finishing sections are over-represented by women, whereas the cutting section, which has the highest monthly pay, is highly under-represented by women. The sewing section, the job of supervisor is highly remunerative and in the finishing section, the job of quality controller is highly remunerative.

Female workers suffer from chronic energy deficiency and occupational hazards that adversely affect their health. Female garment workers can spend some of their income on medical care, whereas 80 percent of poor women cannot afford any treatment for illness

(Paul- Majumder et al.1996). Women's employment in the export-oriented garment industry has affected self-esteem and self-confidence, conjugal life, matrimonial relationship, fertility, age at marriage, sharing of domestic chores, and decision making (Paul-Majumder and Zohir 1995). Female garment workers face an uncongenial work environment, unsafe transportation, and housing. These factors do not affect male workers. The surveys of 1990 and 1997 collected information from the workers regarding sexual harassment ranging from insults directed at a person's gender, suggestive comments, and demeaning remarks, to unwelcome touching and grabbing and other physical assaults, including raping. But these types of sexual harassment are highly under reported because female workers are reluctant to disclose information on this subject [7].

2.15.2 Women Worker for Night Shift

Many female workers suffer from various illnesses after starting work in the garment industry. This is mainly due to overwork, uncongenial working conditions, and wide-ranging labor law violations. They have to continuously inhale toxic substances emitted from dye used in colored fabric as well as dust and small particles of fiber. Sewing helpers, who are mostly women, have to either keep standing or moving from one operator to another for 10-12 hours. Due to long working hours, female workers are obliged to shorten their time for leisure and sleep because traditionally they are required to take care of all domestic chores. Besides, occupational hazards, the absence of adequate treatment facilities adversely affects the health of female garment workers. Few garment factories have a regular doctor. As a result garment workers, particularly female garment workers, whose physical mobility is restricted, have minimal access to treatment.

Tension and ambivalence are more prevalent among female workers than among male workers. Women suffer the worst from adverse working conditions because they hold low-skilled jobs where occupational hazards are greater. Most of the garment factory buildings are overcrowded, congested and poorly ventilated. As a result garment workers are exposed to toxic substance and dust. Raw materials contain dust and fiber particles that hang in the air. Dye, a toxic substance emitted from colored cloth, spreads in the workroom. The workers, particularly the operators and sewing helpers, who are mostly women, continuously inhale these substances. Most factories do not have adequate ventilation and exhaust fans and few workers use masks. Below effects are listed as health & safety effects and family & social effects for night shift –

Table 2.4: Various effects for Night shift women worker [7]

Health and safety effects	Family and social effects
• changes in natural body rhythms • ongoing sleep problems • increased physical and mental fatigue • concentration difficulties • increased risk of accidents • increased exposure to hazardous substances, noise and manual handling risks • increased risk of heart disease • menstrual problems and difficulties during pregnancy • disturbed eating patterns and poor diet • gastrointestinal disorders and gastric and duodenal ulcers • more colds and other	• isolation from family activities • lack of contact with partners • reduced interest in sex • reduced contact with school-age children • higher rates of marriage breakup • reduced friendship networks • loss of access to education, sports etc. • exclusion from community, social and cultural events • irritability and anger in personal relationships

2.15.3 Suggestions for Women

Paul-Majumder and Khatun (1997) showed that female garment workers are willing to pay more for safe and secure transport. Second, supplying cheap, secure, and hygienic housing facilities for female garment workers would help eliminate the gender imbalance arising from the growth of export-oriented garment manufacturing. Additional services that would greatly help eliminate the detrimental effects of export oriented industrialization on women include health insurance services, financial services for savings and credit, day-care services, and legal services that meet the specific needs of women as workers. Empirical evidence suggests that investment in support services brings profits to employers by raising the productivity of female workers (Paul-Majumder 1998) [7]. Government realized the importance of workforce and adopted welfare policies such as increasing wages, limiting working hours, providing trainings, establishing daycare centers and schools for the children of the workers etc. it made a significant to resolve conflict [32].

Night-Shift Differential Pay: Night-shift employees must be paid a differential of not less than 10% of the regular wage for each hour of work performed between 10:00 p.m. and 6:00 a.m.

2.16 Absenteeism

In every organization, employees are a pivotal variable without which the inanimate assets are worthless. However, personal management, especially the less educated garment workers management is not easy. Employee maintenance administration is a major duty of management. The workers major demand are fair working hours arrangements, leave and holidays, minimum wages and salary, incentives and benefits etc [33]. Absenteeism is a habitual pattern of absence from a duty or obligation. Traditionally, absenteeism has been viewed as an indicator of poor individual performance, as well as a breach of an implicit contract between employee and employer; it was seen as a management problem, and framed in economic or quasi-economic terms. More recent scholarship seeks to understand absenteeism as an indicator of psychological, medical, or social adjustment to work.

The psychological model that discusses this is the "withdrawal model", which assumes that absenteeism represents individual withdrawal from dissatisfying working conditions. This finds empirical support in a negative association between absence and job satisfaction, especially satisfaction with the work itself. Even employees who fully intend to continue their relationship with the organization occasionally get sick or must attend to personal business during the times they are scheduled to work. Unscheduled absenteeism is now a serious problem in many organizations. Furthermore, few of the managers surveyed expect absenteeism to improve in the near future. Unscheduled absenteeism also adversely affects productivity, especially when compounded by employee turnover [34].

2.17 Worker Motivation

Employee motivation is generally assumed to have an important effect on personnel relations, production indices, employee turnover and such other factor which play an important part in determining the overall well-being of any business or industrial concern (Jurgensen, 1947). The role of motivational process in determining worker's level of performance is now widely recognized by industrial psychologists. Viteles (1953) has identified the development of the 'will to work' as industry's core problem in the utilization of its manpower. Maier (1955) indicates the need for greater attention to problems or

motivation and frustration by industrial firms; and McGregor (1960) and Likert (1961) have outlined theories of management based largely on assumptions about human motivation .Motivation refers to the state of an individual's perspective which represents the strength of his or her propensity to exert effort toward some particulars behavior (Gibson,1980). It is an internal force that makes an organization member put forth a certain amount of effort to accomplish something (Dunham and Pierce, 1989).

2.18 Labor Cost

Apparel trade involves a globally integrated production system in which capital, labor, information, and materials from a number of firms are integrated and dispersed worldwide (Christerson, 1994). Difference in labor cost between countries in the relative abundance of labor and capital and the apparel industry's labor intensity, wage differences between countries have been a key factor in global shifts in apparel production. The less developed countries continue to have significant competitive advantage in world markets (Dickerson, 1999) [35].

2.18.1 Salary and wages

'Salary' refers to the amount of money of a worker gets in a month. On the other hand, 'wages' is the remuneration paid to a worker for his/her service in the factory and includes only the performance wages. Usually it refers to the hourly rate. As per section 120 of the Bangladesh Labour Code 2006, wages includes

- Bonus or other additional remuneration payable as per the terms of employment.
- Remuneration of holiday and over time works.
- Remuneration payable for any order of the court or for any award or resolution between the parties.
- Money payable for lay off or temporary dismissal. [33]

In the national accounts, in accordance with the System of National Accounts, wages and salaries include the values of any social contributions, income taxes, etc., payable by the employee even if they are actually withheld by the employer for administrative convenience or other reasons and paid directly to social insurance schemes, tax authorities, etc., on behalf of the employee. According to popular usage of the two terms, salary normally refers to those payments that are computed a weekly monthly or yearly basis for 'white collar worker'

whereas wage refers to those payments that are computed on an hourly or a daily basis for 'blue collar workers' [36].

The basic purpose of salary and wages administration is to establish and maintain an equitable salary and wage structure. Its secondary objective is the establishment and maintenance of an equitable cost structure. A good administration of salary and wages reduces the likely hood of friction and grievances of workers over wage inequities. It enhances workers morale and inspires them to put up their best in the work place [33]. When wages rise in line with productivity increases they are both sustainable and create a stimulus for further economic growth by increasing households' purchasing power [37].

2.18.2 Factors influencing wages

The minimum wages in light of 10 issues:

- ✓ Cost of living
- ✓ Living standards
- ✓ Production cost
- ✓ Productivity
- ✓ Cost of the goods produced
- ✓ Inflation rate
- ✓ Job pattern and associated risk
- ✓ Business capacity
- ✓ Socioeconomic condition of the specific industrial sector and the country as well as other relevant issues. [32]

Moazzem (2007) suggest a number of factors need to be considered fixing the minimum wage of industrial workers. These are:

- ➢ Workers' minimum requirement for decent living
- ➢ Enterprise 's capacity to adjust with the additional cost originating from the rise in wage
- ➢ Consideration of the wage structure of similar types of industrial sectors. And
- ➢ Adjustment of the wage with country's economic development. [32]

2.19 Over time

The concept of over time is that there are a limited number of hours each day or each week that a worker should be available or scheduled to work. If a worker works longer that this then a premium is paid for those additional hours [28]. In most RMG factories, workers work overtime, which accounts for a substantial portion of their monthly income. If export orders fall, unchanged employment situation can be accompanied with cessation of overtime opportunities. Workers often try to complement their low wages by working overtime, which, in effect, is a mandatory practice in Bangladesh's RMG factories [32]. Overtime income

accounts for about one-quarter of the monthly earnings of garment workers. Production beyond the target is remunerated at the rate of overtime work. Both male and female garment workers have to work on weekly holidays. Although they were paid for overtime work on weekly holidays, no alternate holidays are given [7].

2.19.1 Who works overtime?

It is more usual for hourly paid workers to have a recognized system of paid overtime than salaried staff. Manual workers have the highest levels of paid overtime averaging more than nine hours a week, with men working more overtime than women. Other groups, such as professional staff, work considerable amounts of unpaid overtime [27].

2.19.2 What are the advantages & disadvantages for overtime?

Overtime can provide flexibility for employers to meet fluctuations in demand, bottlenecks in production and labor shortages without the need to recruit extra staff. Overtime is used regularly in jobs which cannot be split up easily (such as transport) and where repair and maintenance has to be done outside normal working hours. Providing paid overtime, even with premium payments, is often less costly for employers than recruiting and training extra staff or purchasing extra capital equipment. Regular overtime can encourage inefficiency, because employees may slacken their pace of work to qualify for overtime. This is especially true where employees use extensive overtime to compensate for low pay. The regular working of long hours can adversely affect employees' performance, health and home life. Employees can become fatigued when working excessive overtime. This can result in high absence levels and unsafe working practices which place the employee and others at risk. Supervisors can come to depend on their control over overtime as an inducement for their subordinates. Overtime can thereby become a source of inefficiency, deception and disputes [27].

2.20 Bonus

The garment workers receive some nonwage benefits in addition to their monthly salary and overtime income. The most widely reported benefit is the Eid (a religious festival) bonus. In addition, garment workers are given an attendance bonus (for perfect attendance), efficiency bonus (for completing the production target on time), and a production bonus. However, there are wide gender differences in all these benefits [7].

CHAPTER 3

APPAREL INDUSTRY IN BANGLADESH

3.1 Introduction

Together with food and shelter, clothing is one of the three basic needs of human. It fulfills mainly three requirements protection, decoration and identification. It serves as protection against the elements such as heat, cold, wind, rain and snow, and against injury at work, in transport or in sport. The other general requirements of clothing are suitability, appearance, stability, comfort and aftercare [38]. Garments began to be made with different fabric to suit the climatic conditions and thus the requirement of seasonal wears emerged. Now-a-day's garments are situational wears too. The variety of garments increased the demand/usage of garments, which resulted in mass production of garments by manufacturing unit, replacing the normal tailoring shops [15].

Scientific approach and engineering application have become indispensible for manufacturing garments. Unless and until manufacturing is done with scientific approach, companies will find it difficult to meet the cost of production. As a result, man started thinking of the modernization, engineering tools and techniques used for garments manufacturing for increasing the productivity [15].

3.2 History of RMG Industry in Bangladesh

Clothing is a highly labour-intensive, low-technology product, requiring little fixed capital, the manufacture of which, along with textiles, has provided many countries of the world, including today's advanced industrialized economies, with the first rung on their ladder to industrialization [39, 40]. In the field of industrialization, role of textile industry is found very prominent in both developed & developing countries. During last 200 years or more many countries of the world have used textile and clothing industry as an engine for growth and a basis for attaining economic development (Ahmed, 1991). It has historically been recognized as the incubator of innovation, as well as a fertile environment for developing the knowledge and the technology that fueled the first industrial revolution of the 18th century. Trade in ready-made garment (RMG) gains more state attention and attractiveness due to the national economic contribution (export earnings), direct & indirect employment generation especially

women employment & empowerment and as a pioneering industrial ladder [41, 42]. Furthermore, textile and apparel production is the biggest employment provider in the world [43]. Also RMG industry inherits its uniqueness in diverse magnitudes compares to other industries and it is one of the most geographically dispersed and socially diverse industries in its production networking [41].

In the history of RMG industry 1st Garments Production started in Paris in 1829 with 80 sewing machines and it manufactured military uniform [9, 44]. In the 1950s, labors in the Western World became highly organized, forming trade unions. This and other changes provided workers greater rights including higher pay which resulted in higher cost of production. Retailers started searching for places where the cost of production was cheaper. Developing economies like Hong Kong, Taiwan and South Korea presented themselves as good destinations for relocations because they had open economic policies and had non-unionized and highly disciplined labor force that could produce high quality products at much cheaper costs. [39]

In order to control the level of imported RMG products from developing countries into developed countries, Multi Fibre Agreement (MFA) was made in 1974. The MFA agreement imposed an export rate 6 percent increase every year from a developing country to a developed country. It also allowed developed countries to impose quotas on countries that exported at a higher rate than the bilateral agreements [39, 45]. In the face of such restrictions, producers started searching for countries that were outside the umbrella of quotas and had cheap labor. This is when Bangladesh started receiving investment in the RMG sector and the export-oriented readymade garment (RMG) industry emerged at this time.

Daewoo of South Korea was an early entrant in Bangladesh, when it established a joint venture in December 27, 1977 with Desh Garments Ltd. making it the first export oriented ready-made garment industry in Bangladesh [46]. In the early 1980s, some Bangladeshis received free training from Korean Daewoo Company [39]. After these workers came back to Bangladesh, many of them broke ties with the factory they were working for and started their own factories.

In 1960 was established Reaz & Jewel Garments, the pioneer, as a small tailoring outfit, named Reaz Store in DHAKA. It served only domestic markets for about 15 years. In 1977,

Reaz & Jewel Garments shipped 40,000 shirts to France & Germany (Wahid and Weiss, 1996). It was the first direct export of garments from Bangladesh [9, 47].

The performance of the export sector, fuelled by a phenomenal growth of the RMG, has been one of the most notable success stories of the Bangladesh economy over the last two decades [42, 48, 49]. Today, the RMG export sector consists of multibillion dollar manufacturing and export industries in the country. This sector is still considered as the lifeline of the Bangladesh's economy and plays and indispensable role for the social stability for the country [48].

Till the end of 1982, there were only 47 garment manufacturing units. The breakthrough occurred in 1984-85, when the number of garment factories increased to 587. The number of RMG factories shot up to around 5,400 in 2012 [50].

With the expiry of the MFA system at the end of 2004, Bangladesh has entered into a new era, embracing a fierce competition from all other dominant textile and clothing suppliers that have long been severely constrained by quantitative restrictions imposed by developed countries [49]. To confront such situation, the adopted export oriented strategy involved currency devaluations, reduced trade barriers and restrictions on repatriation for foreign investor profits. It gave tax holidays for foreign investors who established garment factories, created Export Processing Zones (EPZs), and made it easier for foreigners to participate in Bangladesh business venture, and even to own them. Not surprisingly, these policies attracted foreign investment [51]. Also, International buyers were reported to have been expanding their offices and networks in Dhaka, viewing Bangladesh to be one of their most important suppliers in the post-MFA period [49].

Since the early 1990s, the knit section expanded mainly producing and exporting shirts, T-shirts, trousers, sweaters and jackets [52]. The US and the EU are the two principal markets for Bangladesh. In 2006, 90 percent of Bangladesh's total earnings from garment exports came from its exports to the United States and Europe and now it is 78.60 percent [47, 49, 50]. It turns out that even in the face of other economic giants, Bangladesh's labor is "cheaper than anywhere else in the world." says Tipu Munshi, former Head of the Bangladesh Garment Manufacturers and Exporters Association (BGMEA). With cheap labor advantage, Bangladesh garment industry is still holding competitive position in the global apparel market [48].

Garment sector is the largest employer of women in Bangladesh [51]. It has provided employment opportunities to women from the rural areas that previously did not have any opportunity to be part of the formal workforce. Bangladesh's flagship export-oriented ready-made garment industry, however, with female labour accounting for 90 percent of the work force, was "built to a large extent, on the supply of cheap and flexible female labour in the country" [53]. The garment sector comprises of about 16 percent of GDP (FY 2010-11) providing employment (both directly and indirectly) to 10.72 percent of national labor force, in which 6.83 percent are directly employed (BBS & BGMEA) [40].

The RMG sector is expected to grow despite the global financial crisis of 2009. In 2011, Bangladesh was second largest ready-made garments (RMG) manufacturer after China, by the next five years Bangladesh will become the largest ready-made garments (RMG) manufacturer [54]. Bangladesh was the sixth largest exporter of apparel in the world after China, the EU, Hong Kong, Turkey and India in 2006. According to a 2011 report by controversial and powerful international consulting giant McKinsey & Company 80 percent of American and European clothing companies planned to move their outsourcing from China, where wages had risen, and were considering Bangladesh as the "next hot spot" making it the "next China" due to its low costs [54, 55]. Currently, the tariff relaxation for Bangladesh enables the country to enjoy exponential export growth overtime and emerge as the second largest apparel exporter of the world [40].

Currently, about 95% domestic demand of Yarn and Fabrics are met by Primary Textile Sector (PTS). About 90% of knit yarn demand & 40% of woven fabrics demand of RMG exporters are met by PTS [56].

Garment industry in Bangladesh has been facing multidimensional problems since its establishment. Acute power crisis followed by non tariff restriction, chronic labor unrest, lack of infrastructural facilities, inadequate supply of material and accessories, inability or lack efforts to diversify the products and markets, irregularities and relating to customs, bond, and shipping, financing and the like are the major problems hampering the production and increasing the cost of production significantly. Instead of having these problems, Bangladesh should be on the radar screen of all European and US apparel buyers. This is especially true as Bangladesh’s RMG exports will strengthen the country’s position and are likely to grow-double by 2015 and nearly triple by 2020 (reach up to US $ 41 billion) [1, 54, 56].

Table 3.1: Important Issues related to the Bangladesh ready-made garment industry [47]

Year(s)	*Issue*
1977-1980	Early period of growth
1982-1985	Boom days
1985	Imposition of quota restrictions
1990s	Knitwear sector developed significantly
1993-1995	Child labour issue and its solution
2003	Withdrawal of Canadian quota restriction
2005	Phase-out of export-quota system

Source: Compiled by the author from Quddus and Rashid (2000), Mainuddin (2000) and databases of the Bangladesh Garment Manufacturers and Exporters Association, and the Export Promotion Bureau, Bangladesh.

3.3 Trade Information of RMG sector in Bangladesh

Bangladesh secured 2nd position as apparel exporter in the world. The volume of knitwear & woven wear export, share in world exports, number of RMG employment, number of RMG factories, apparel importers from Bangladesh, world map of knitwear & woven wear exporters and the overall trade information of Bangladesh as well as the entire world are given below-

Table 3.2: Top 25 World's Knitwear & Woven wear Exporters in 2012

Knit				Woven			
SL.	**Exporters**	**Value exported in 2012 (USD thousand)**	**Share in world exports (%)**	**SL.**	**Exporters**	**Value exported in 2012 (USD thousand)**	**Share in world exports (%)**
	World	**212,756,749**	**100**		**World**	**195,704,055**	**100**
1	China (Inc. Hong Kong)	98,372,042	46.2	**1**	China (Inc. Hong Kong)	71,206,275	36.4
2	**Bangladesh**	**11,040,479**	**5.2**	**2**	Italy	12,527,883	6.4
3	Germany	8,477,139	3.7	**3**	**Bangladesh**	**10,796,658**	**5.5**
4	Turkey	8,427,980	4	**4**	Germany	9,991,125	4.8
5	Italy	7,805,710	3.7	**5**	Viet Nam	8,245,683	4.2
6	Viet Nam	6,855,467	3.2	**6**	India	7,429,975	3.8
7	India	5,466,347	2.6	**7**	France	5,699,106	2.9
8	Cambodia	4,261,079	2	**8**	Turkey	5,435,871	2.8
9	France	4,047,166	1.9	**9**	Spain	5,435,832	2.8
10	Netherlands	4,029,366	1.9	**10**	Netherlands	3,963,418	2
11	Belgium	4,016,790	1.9	**11**	Indonesia	3,744,507	1.9
12	Spain	3,842,468	1.8	**12**	UK	3,698,593	1.9
13	Indonesia	3,439,663	1.6	**13**	Belgium	3,314,180	1.7
14	UK	2,675,838	1.3	**14**	Mexico	2,685,776	1.4
15	USA	2,444,727	1.2	**15**	Morocco	2,569,814	1.3
16	Portugal	2,055,892	1	**16**	Tunisia	2,394,073	1.2
17	Pakistan	2,006,290	0.9	**17**	Romania	2,391,928	1.2
18	Sri Lanka	1,968,580	0.9	**18**	USA	2,331,248	1.2
19	Thailand	1,844,379	0.9	**19**	Denmark	1,944,415	1
20	El Salvador	1,649,617	0.8	**20**	Poland	1,881,929	1
21	Mexico	1,625,953	0.8	**21**	Cambodia	1,846,923	0.9
22	Denmark	1,593,808	0.8	**22**	Sri Lanka	1,812,190	0.9
23	Poland	1,434,968	0.7	**23**	Pakistan	1,694,386	0.9
24	Peru	1,419,332	0.7	**24**	Austria	1,166,871	0.6
25	Austria	1,083,590	0.5	**25**	Thailand	1,138,008	0.6

Source: Compiled from WTO, COMTRADE, Trade Map

Table 3.3: Growth of the Industry and Employment

No. of Factories and Employment		
YEAR	**NUMBER OF GARMENT FACTORIES**	**EMPLOYMENT IN MILLION WORKERS**
1983-84	134	0.04
1984-85	384	0.12
1985-86	594	0.20
1986-87	629	0.28
1987-88	685	0.31
1988-89	725	0.32
1989-90	759	0.34
1990-91	834	0.40
1991-92	1163	0.58
1992-93	1537	0.80
1993-94	1839	0.83
1994-95	2182	1.20
1995-96	2353	1.29
1996-97	2503	1.30
1997-98	2726	1.50
1998-99	2963	1.50
1999-00	3200	1.60
2000-01	3480	1.80
2001-02	3618	1.80
2002-03	3760	2.00
2003-04	3957	2.00
2004-05	4107	2.00
2005-06	4220	2.20
2006-07	4490	2.40
2007-08	4743	2.80
2008-09	4925	3.50
2009-10	5063	3.60
2010-11	5150	3.60
2011-12	5400	4.00

Source: www.bgmea.com.bd/business and trade/Trade information
(Accessed the during period of 2012-2013)

Table 3.4: Key Statistics of RMG Sector

COMPARATIVE STATEMENT ON EXPORT OF RMG AND TOTAL EXPORT OF BANGLADESH			
YEAR	**EXPORT OF RMG (IN MILLION US$)**	**TOTAL EXPORT OF BANGLADESH (IN MILLION US$)**	**% OF RMG'S TO TOTAL EXPORT**
1983-84	31.57	811.00	3.89
1984-85	116.2	934.43	12.44
1985-86	131.48	819.21	16.05
1986-87	298.67	1076.61	27.74
1987-88	433.92	1231.2	35.24
1988-89	471.09	1291.56	36.47
1989-90	624.16	1923.70	32.45
1990-91	866.82	1717.55	50.47
1991-92	1182.57	1993.90	59.31
1992-93	1445.02	2382.89	60.64
1993-94	1555.79	2533.90	61.40
1994-95	2228.35	3472.56	64.17
1995-96	2547.13	3882.42	65.61
1996-97	3001.25	4418.28	67.93
1997-98	3781.94	5161.20	73.28
1998-99	4019.98	5312.86	75.67
1999-00	4349.41	5752.20	75.61
2000-01	4859.83	6467.30	75.14
2001-02	4583.75	5986.09	76.57
2002-03	4912.09	6548.44	75.01
2003-04	5686.09	7602.99	74.79
2004-05	6417.67	8654.52	74.15
2005-06	7900.80	10526.16	75.06
2006-07	9211.23	12177.86	75.64
2007-08	10699.80	14110.80	75.83
2008-09	12347.77	15565.19	79.33
2009-10	12496.72	16204.65	77.12
2010-11	17914.46	22924.38	78.15
2011-12	19089.69	24287.66	78.60

Source: www.bgmea.com.bd/business and trade/Trade information
(Accessed the during period of 2012-2013)

Table 3.5: Value and Quantity of Total Apparel Export

VALUE AND QUANTITY OF TOTAL APPAREL EXPORT						
FISCAL YEAR BASIS (VALUE IN MN. US$ QUANTITY IN MN DOZEN)						
YEAR	TOTAL APPAREL EXPORT IN MN.US$			TOTAL APPAREL EXPORT IN MN.DZ		
	WOVEN	KNIT	TOTAL	WOVEN	KNIT	TOTAL
1992-93	1240.48	204.54	1445.02	36.05	10.66	46.71
1993-94	1291.65	264.14	1555.79	34.35	10.81	45.16
1994-95	1835.09	393.26	2228.35	47.21	15.30	62.51
1995-96	1948.81	598.32	2547.13	48.82	23.18	72.00
1996-97	2237.95	763.30	3001.25	53.45	27.54	80.99
1997-98	2844.43	937.51	3781.94	65.59	32.60	98.19
1998-99	2984.96	1035.02	4019.98	64.79	36.66	101.45
1999-2000	3081.19	1268.22	4349.41	66.63	45.27	111.90
2000-2001	3364.32	1495.51	4859.83	71.48	52.54	124.02
2001-2002	3124.82	1458.93	4583.75	77.05	63.39	140.44
2002-2003	3258.27	1653.82	4912.09	82.83	69.18	152.01
2003-2004	3538.07	2148.02	5686.09	90.48	91.60	182.08
2004-2005	3598.20	2819.47	6417.67	92.26	120.13	212.39
2005-2006	4083.82	3816.98	7900.80	108.82	165.02	273.84
2006-2007	4657.63	4553.60	9211.23	133.08	199.54	332.62
2007-2008	5167.28	5532.52	10699.80	147.43	241.60	389.03
2008-2009	5918.51	6429.26	12347.77	169.59	290.92	460.51
2009-2010	6013.43	6483.29	12496.72	172.80	292.70	465.50
2010-2011	8432.40	9482.06	17914.46	247.28	441.03	688.31
2011-2012	9603.34	9486.39	19089.73	49.94	56.46	106.39

Source: www.bgmea.com.bd/business and trade/Trade information
(Accessed the during period of 2012-2013)

Table 3.6: Comparative Statistics of Bangladesh Apparel Export
(Value in US$ million; Quantity in million dozen)

	Knitwear			Woven Wear			Total Export	
Fiscal Year	Value	Quantity	% Share of value in BD Export	Value	Quantity	% Share of value in BD Export	Value	Quantity
94-95	393.26	15.30	11.32	1835.09	47.21	52.85	2228.35	62.51
95-96	598.32	23.18	15.41	1948.81	48.82	50.20	2547.13	72.00
96-97	763.30	27.54	17.28	2237.95	53.45	50.65	3001.25	80.99
97-98	940.31	32.60	18.22	2843.33	65.59	55.09	3783.64	101.45
98-99	1035.36	36.66	19.49	2984.81	64.79	56.18	4020.17	111.90
99-00	1269.83	45.27	22.08	3082.56	66.63	53.59	4352.39	124.02
00-01	1496.23	52.54	23.14	3364.20	71.48	52.02	4860.43	140.44
01-02	1459.24	63.39	24.38	3124.56	77.05	52.20	4583.80	152.01
02-03	1653.83	69.18	25.26	3258.27	82.83	49.76	4912.10	182.08
03-04	2148.02	91.60	28.25	3538.07	90.48	46.54	5686.09	212.39
04-05	2819.47	120.13	32.58	3598.20	92.26	41.58	6417.67	273.84
05-06	3816.98	165.02	36.26	4083.82	108.82	38.78	7900.80	332.62
06-07	4553.60	199.54	37.39	4657.63	133.08	38.25	9211.23	389.03
07-08	5532.52	241.60	39.21	5167.28	147.43	32.30	10699.80	389.03
08-09	6429.00	290.92	41.30	5918.51	169.59	38.02	12347.51	460.51
09-10	6483.29	292.70	40.01	6013.43	172.80	37.11	12496.72	465.50
10-11	9482.06	441.03	41.36	8432.40	247.28	36.78	17914.46	688.31
11-12	9486.39	441.23	39.06	9603.34	281.62	39.54	19089.73	722.85

Source: EPB (Accessed the during period of 2012-2013)

Table 3.7: Export Performance of RMG of Bangladesh for 2010-11, 2011-12 & 2012-13 in Million US ($)

Export of RMG in FY 12-13 (in Million USD)					Monthly Growth Rate Compared to Last Year (%)			
Year	Month	Woven	Knit	Total	Month	Woven	Knit	Total
2011	January	749.32	760.61	1509.93	January	+31.40	+42.15	+36.61
	February	737.65	718.95	1456.60	February	+31.62	+49.21	+39.75
	March	838.28	814.00	1652.28	March	+36.14	+47.25	+41.40
	April	736.70	866.41	1603.11	April	+45.62	+58.86	+52.49
	May	816.18	972.76	1788.94	May	+46.80	+53.84	+50.55
	June	917.70	1037.41	1955.11	June	+47.44	+42.52	+44.78
2011	July	1007.88	888.00	1895.88	July	+26.20	+32.28	+28.98
	August	1052.43	870.63	1923.06	August	+33.12	+34.90	+33.92
	September	519.21	475.93	995.14	September	-12.30	+0.50	-6.61
	October	796.05	704.70	1500.75	October	+12.64	+26.00	+18.54
	November	621.73	626.91	1248.64	November	-3.60	+17.21	+5.83
	December	794.23	890.73	1684.96	December	+1.96	+18.42	+10.04
2012	January	773.48	930.81	1704.29	January	+1.69	+24.22	+12.87
	February	732.09	873.29	1605.38	February	+1.83	+18.39	+10.21
	March	699.16	847.59	1546.75	March	-14.11	+1.11	-6.39
	April	698.72	721.72	1420.44	April	-19.35	-2.03	-11.39
	May	875.98	866.63	1742.61	May	-9.95	+6.18	-2.59
	June	699.16	847.59	1546.75	June	-11.76	-1.23	-6.82
2012	July	1001.07	993.84	1994.91	July	-0.68	+11.92	+5.22
	August	1004.24	997.72	2001.97	August	-4.57	+14.59	+4.10
	September	746.32	697.17	1443.40	September	+43.72	+46.49	+45.04
	October	873.16	761.48	1634.64	October	+9.68	+8.05	+8.92
	November	653.96	710.04	1364.00	November	+5.18	+13.26	+9.24
	December	908.93	1042.68	1951.62	December	+14.44	+17.06	+15.83
2013	January	944.96	1147.64	2092.60	January	+22.17	+23.29	+22.78
	February	811.24	979.71	1790.71	February	+10.81	+12.19	+11.56
	March	854.68	991.77	1846.45	March	+22.24	+17.01	+19.38

Source: www.bkmea.com/knitwear Industry/facts-figures
(Accessed the during period of 2012-2013)

Table 3.8: Major apparel items exported from Bangladesh, in million USD

MAIN APPAREL ITEMS EXPORTED FROM BANGLADESH					
(VALUE IN MN. US$)					
YEAR	**SHIRTS**	**TROUSERS**	**JACKETS**	**T-SHIRT**	**SWEATER**
1993-94	805.34	80.56	126.85	225.90	….
1994-95	791.20	101.23	146.83	232.24	….
1995-96	807.66	112.02	171.73	366.36	70.41
1996-97	759.57	230.98	309.21	391.21	196.60
1997-98	961.13	333.28	467.19	388.50	296.29
1998-99	1043.11	394.85	393.44	471.88	271.70
1999-2000	1021.17	484.06	439.77	563.58	325.07
2000-2001	1073.59	656.33	573.74	597.42	476.87
2001-2002	871.21	636.61	412.34	546.28	517.83
2002-2003	1019.87	643.66	464.51	642.62	578.37
2003-2004	1116.57	1334.85	364.77	1062.10	616.31
2004-2005	1053.34	1667.72	430.28	1349.71	893.12
2005-2006	1056.69	2165.25	389.52	1781.51	1044.01
2006-2007	943.44	2201.32	1005.06	2208.9	1248.09
2007-2008	915.6	2512.74	1181.52	2765.56	1474.09
2008-2009	1000.16	3007.29	1299.74	3065.86	1858.62
2009-2010	993.41	3035.35	1350.43	3145.52	1795.39
2010-2011	1566.42	4164.16	1887.50	4696.57	2488.19
2011-2012	1733.54	4686.39	2231.16	4713.11	2340.34

Source: www.bgmea.com.bd/business and trade/Trade information
(Accessed the during period of 2012-2013)

Table 3.9: Bangladesh's RMG Export to World for knit (Top 10 Countries)

Country	Knit(Million US$)	
	Jul-Mar	Jul-Mar
	2011-12	2012-13
Germany	$ 1528.15	$ 1574.94
U.K	$ 811.63	$ 930.02
USA	$ 739.40	$ 803.43
France	$ 615.37	$ 625.38
Spain	$ 495.46	$ 517.27
Italy	$ 441.45	$ 397.15
Canada	$ 286.05	$ 343.60
Denmark	$ 233.60	$ 279.51
Netherlands	$ 239.52	$ 236.54
Belgium	$ 245.28	$ 222.22
Total	$ 5635.91	$ 5929.61

Source: Compiled from www.bgmea.com.bd/business and trade/Trade information
(Accessed the during period of 2012-2013)

Table 3.10: Bangladesh's RMG Export to World for Woven (Top 10 Countries)

Country	Woven (Million US$)	
	Jul-Mar	Jul-Mar
	2011-12	2012-13
USA	$ 2617.90	$ 2825.49
Germany	$ 1041.49	$ 1124.66
U.K	$ 737.86	$ 882.94
Canada	$ 355.26	$ 383.96
Spain	$ 292.16	$ 374.63
France	$ 296.04	$ 346.97
Italy	$ 215.35	$ 250.46
Japan	$ 172.63	$ 205.82
Netherlands	$ 168.98	$ 188.40
Belgium	$ 174.36	$ 185.65
Total	$ 6072.03	$ 6768.98

Source: Compiled from www.bgmea.com.bd/business and trade/Trade information
(Accessed the during period of 2012-2013)

Yearly growth of products from 2010-2011 to 2011-2012 in million USD is given below-

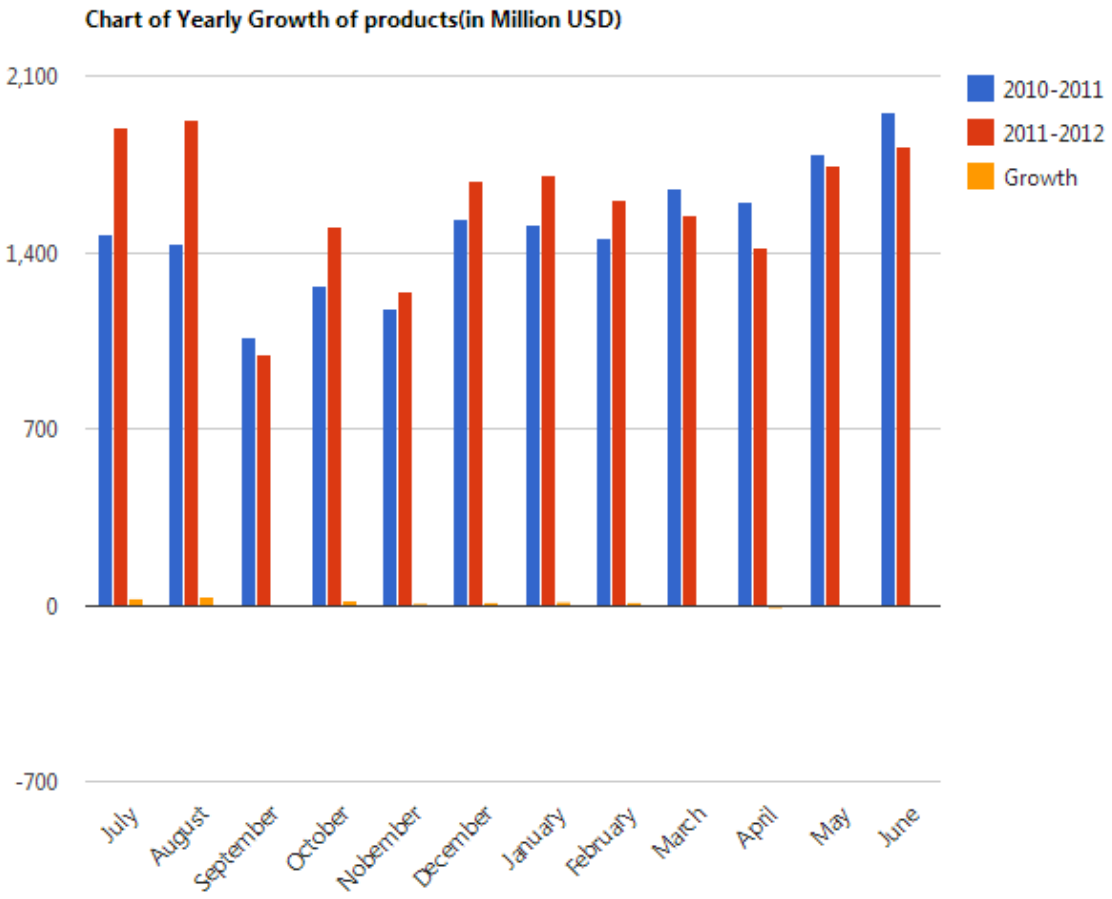

Figure 3.1: Chart of Yearly Growth of Products (in Million USD)

Source: BGMEA/Business & Trade/Statistics
(Accessed the during period of 2012-2013

Table 3.11: Year Wise World Clothing Export (in Thousand USD)

Exporters	1985	1990	1995	2000	2005	2006	2007	2008	2009	2010	2011	2012
World		$108,129,000	$158,353,000	$197,821,087	$278,019,531	$309,450,215	$347,294,093	$364,153,901	$316,383,555	$351,423,136	$412,456,992	$405,141,702
European union (27)				$56,240,000	$85,592,184	$91,860,053	$105,722,516	$114,894,533	$98,202,249	$100,164,213	$116,235,789	$26,041,652
Bangladesh	$167,528	$642,956	$1,969,208	$5,066,630	$6,889,865	$8,317,988	$8,854,847	$10,919,800	$12,524,582	$15,660,042	$19,938,723	$21,838,008
China	$2,450,000	$9,669,191	$24,048,878	$36,070,920	$74,162,523	$95,378,726	$115,520,128	$120,404,748	$107,263,731	$129,820,286	$153,773,608	$148,297,707
Hong Kong, China	$6,717,766	$15,406,310	$21,297,138	$24,214,315	$27,292,318	$28,390,526	$28,764,634	$27,907,679	$22,825,690	$24,048,955	$24,504,787	$ 21,280,615
India	$929,594	$2,529,693	$4,110,242	$5,964,500	$8,738,943	$9,564,341	$9,929,810	$10,967,763	$12,004,893	$11,229,332	$14,364,621	$ 12,896,323
Indonesia	$339,122	$1,646,497	$3,376,372	$4,734,039	$4,958,901	$5,760,000	$5,869,800	$6,284,683	$5,915,037	$6,819,975	$8,045,240	$ 7,184,171
Republic of Korea	$4,449,966	$7,878,866	$4,957,487	$5,027,057	$2,580,975	$2,182,780	$1,914,436	$1,741,315	$1,396,387	$1,609,764	$1,839,543	$1,738,587
Mexico		$587,000	$2,730,761	$8,630,780	$7,305,680	$6,323,463	$5,138,931	$4,910,886	$4,112,819	$4,363,454	$4,637,617	$ 4,311,691
Pakistan	$255,824	$1,013,513	$1,611,000	$2,144,202	$3,603,595	$3,906,892	$3,806,365	$3,906,000	$3,357,488	$3,930,180	$4,549,630	$3,700,673
Romania		$363,000	$1,360,173	$2,333,083	$4,614,460	$4,443,087	$4,335,731	$4,072,847	$3,055,735	$3,042,094	$3,635,488	$3,231,840
Sri Lanka	$279,298	$637,859	$1,758,000	$2,812,000	$2,873,571	$3,047,922	$3,271,523	$3,437,444	$3,265,312	$3,491,431	$4,211,455	$ 3,780,770
Thailand	$572,946	$2,816,771	$5,008,415	$3,758,926	$4,085,276	$4,247,459	$4,073,040	$4,240,649	$3,724,496	$4,299,578	$4,561,185	$ 2,982,386
Tunisia	$279,764	$1,125,989	$2,322,077	$2,226,997	$3,124,347	$3,018,088	$3,571,060	$3,765,592	$3,120,268	$3,089,175	$3,424,788	$ 3,395,364
Turkey	$1,208,257	$3,330,683	$6,118,751	$6,533,095	$11,833,106	$12,051,922	$13,886,333	$13,590,732	$11,555,927	$12,760,245	$13,947,694	$ 13,863,852
United states	$785,123	$2,564,758	$6,651,082	$8,628,573	$4,997,922	$4,875,958	$4,297,254	$4,456,969	$4,179,775	$4,674,289	$5,222,793	$ 4,725,681
Viet Nam				$1,821,197	$4,680,634	$5,579,138	$7,400,354	$8,724,435	$8,539,540	$10,389,596	$13,153,686	$ 15,101,133

Source: Compiled from WTO (Accessed the during period of 2012-2013)

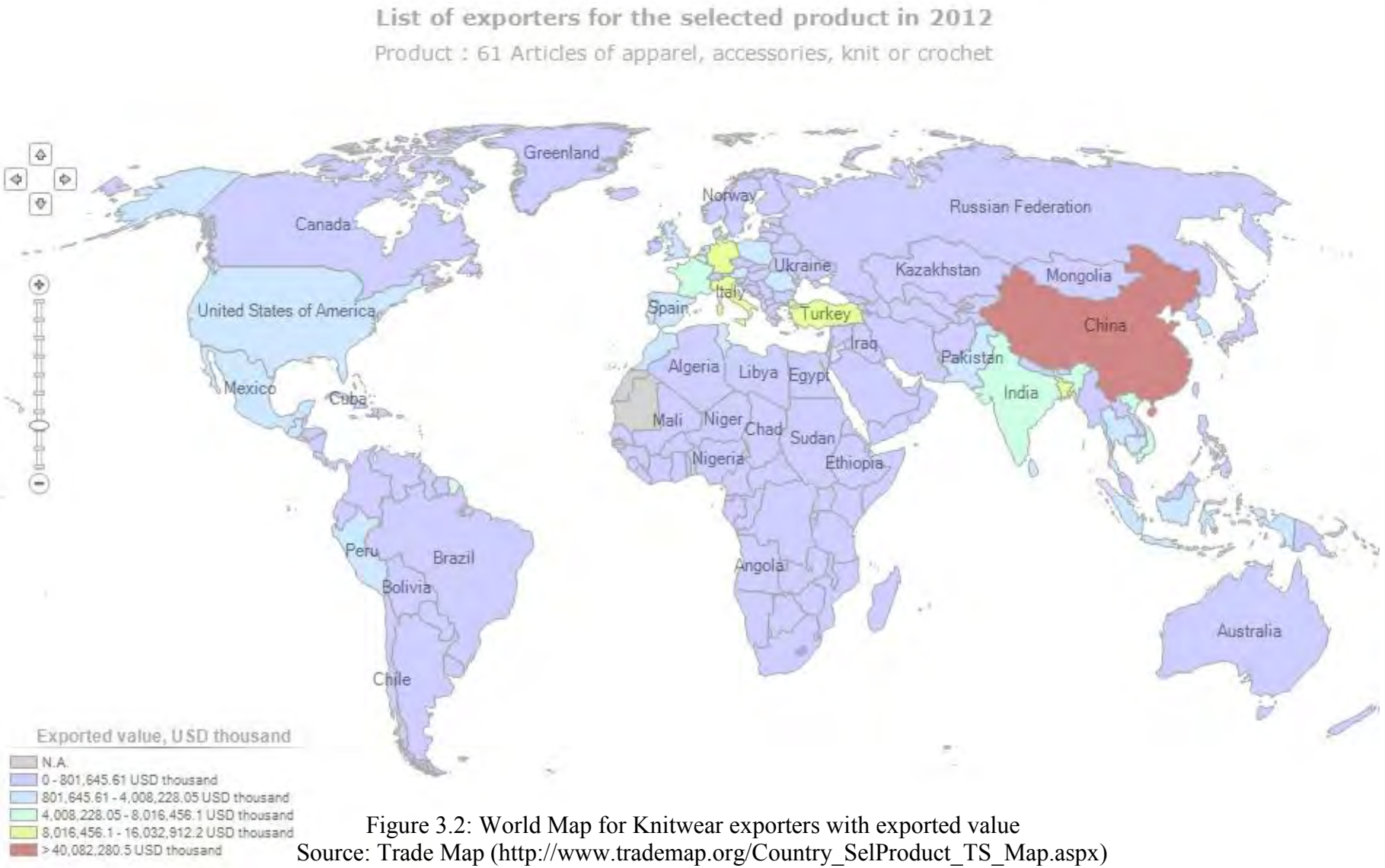

Figure 3.2: World Map for Knitwear exporters with exported value
Source: Trade Map (http://www.trademap.org/Country_SelProduct_TS_Map.aspx)
(Accessed during the period of 2012-2013)

Figure 3.3: World Map for Woven wear exporters with exported value
Source: Trade Map (http://www.trademap.org/Country_SelProduct_TS_Map.aspx)
(Accessed during the period of 2012-2013)

CHAPTER 4

OBSERVED DATA & ANALYSIS

4.1 Organogram of CFDL (Level-2)

Crescent Fashion & Design Limited (CFDL) is an apparel manufacturing unit of Bangladesh Export Import Company Ltd. (BEXIMCO). CFDL consists of five different levels in which all five levels are practicing double shift. Among these levels, level-2 is the pioneering level where the double shift is first implemented on 2009. This thesis work is entirely performed on CFDL (Level-2). General shift, Shift-A & Shift-B are the three different shifts available in CFDL (Level-2). The working hours of General shift, Shift-A & Shift-B are 9:00-17:00 (without overtime), 07:30-18:30 (including 2 hours overtime) & 19:30–6:00 (including 2 hours overtime) respectively. After 15 days, Shift-A & Shift-B will be rotating and their working hours will be 19:30–6:00 (including 2 hours overtime) & 07:30-18:30 (including 2 hours overtime) respectively and the General shift will be remain unchanged forever. The employees of every shift will tag with the assigned shift in which he/she recruited. An employee normally can't change the shift without company's prior notice. Production, finishing, cutting, sample, quality, IE, planning, store, maintenance, CAD, personnel & administration are the different departments in CFDL (Level-2). General Manager (GM) is the Head of the all departments. Production, finishing, cutting, sample & quality departments are under the Manager (factory), who is reporting to GM. Other departmental Heads are reporting directly to GM. All departmental managers or departmental in charge are in the General shift. Shift in charge for both A & B shift is the second in command for every department in the organogram. Other employees are responsible for concerned shifts. All the information is taken for the month of March'2013.

For Day Shift: Lunch break: 13:00 – 14:00
For Night Shift: Dinner/Night break: 1:00 – 1:30

Note:
06:00 – 07:30 am: Allocated time for shift rotating & cleaning.
18:30 – 19:30 pm: Allocated time for shift rotating & cleaning.
All other breaks time will be used for cleaning.

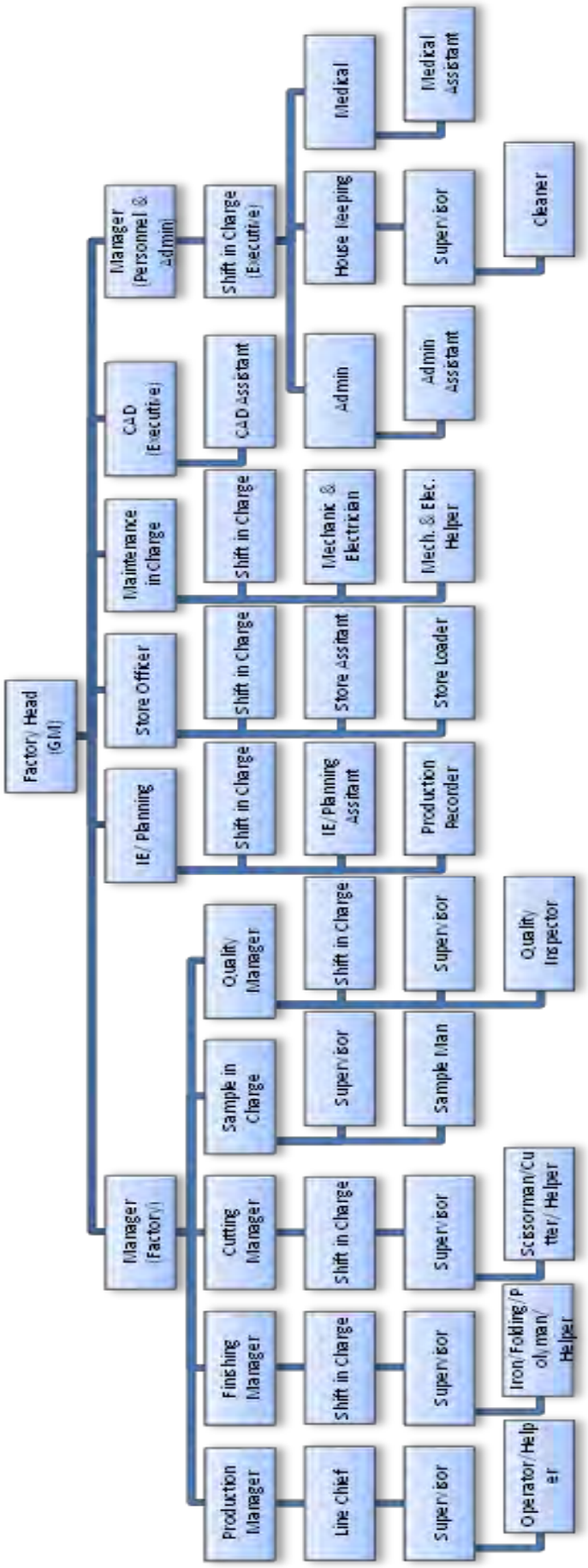

Figure 4.1: Organogram of CFDL (Level-2)

4.2 Practiced Double Shift in Beximco

CFDL (Level-2) of BEXIMCO practiced double from 2009 in a discontinuous manner. When there are huge export orders, they implemented double shift through contract basis workers. But from 2010, they are maintaining the two shift production to till now. Team A will assign for the day shift which duration is 10 hours (07:30 – 18:30) with one hour lunch break from 13:00 to 14:00 and team B will assign for the night shift which duration is 10 hours (19:30 – 6:00) with half an hour dinner/night break from 1:00 to 1:30. It will continue for 2 weeks and after two week the shift will rotate. That means team B will assign for the day shift and team A will assign for the night shift. Every after two weeks especially after the weekend, the shift is rotated. Friday is treated as off day in CFDL as well as in the entire Bangladesh.

Table 4.1: Practiced Double Shift in Beximco

Week	Time	Sat	Sun	Mon	Tues	Wed	Thur	Fri
1	07:30 – 18:30	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	Off
	19:30 – 6:00	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	
2	07:30 – 18:30	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	Off
	19:30 – 6:00	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	
Shift Change								
3	07:30 – 18:30	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	Off
	19:30 – 6:00	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	
4	07:30 – 18:30	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	**Shift 2**	Off
	19:30 – 6:00	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	**Shift 1**	

4.3 Product Details

In the course of the thesis, it is required to select a product which will produce in all shifts with the same manufacturing process so that comparison among several parameters of double shifts can be justified. Also it is required to take a basic style because for fashion or semi-basic style, high experienced production personnel will be necessary to present during production which is impossible for night shift. Normally experts are enjoying the general shift. Through this consideration, I have found an order/style which is manufactured in CFDL (level-2) in both shifts. The order is from Wal-Mart buyer (Style# FG-1583/FG-1755) & the item is Jegging full length for ladies. It is a knit item having trousers like construction. CFDL (level-2) has planned for this style for both shifts so that it will reduce the sewing line layout time once it is balanced. Also, the production parameters are unaffected by the sewing machine & sewing line characteristics for both shifts. So, the variations are only caused by the shift change as well as the workers behavior to adopt with the shift.

Production System for Garment Manufacturing: Progressive Bundle System

Line Layout: Straight Line

Product Type: Basic

YOUNG STUFF APPAREL GROUP TECH PACK	
DESCRIPTION:	**JEGGING FULL LENGTH**
FABRICATION:	**51% POLYESTER, 42% COTTON, 7% SPANDEX**

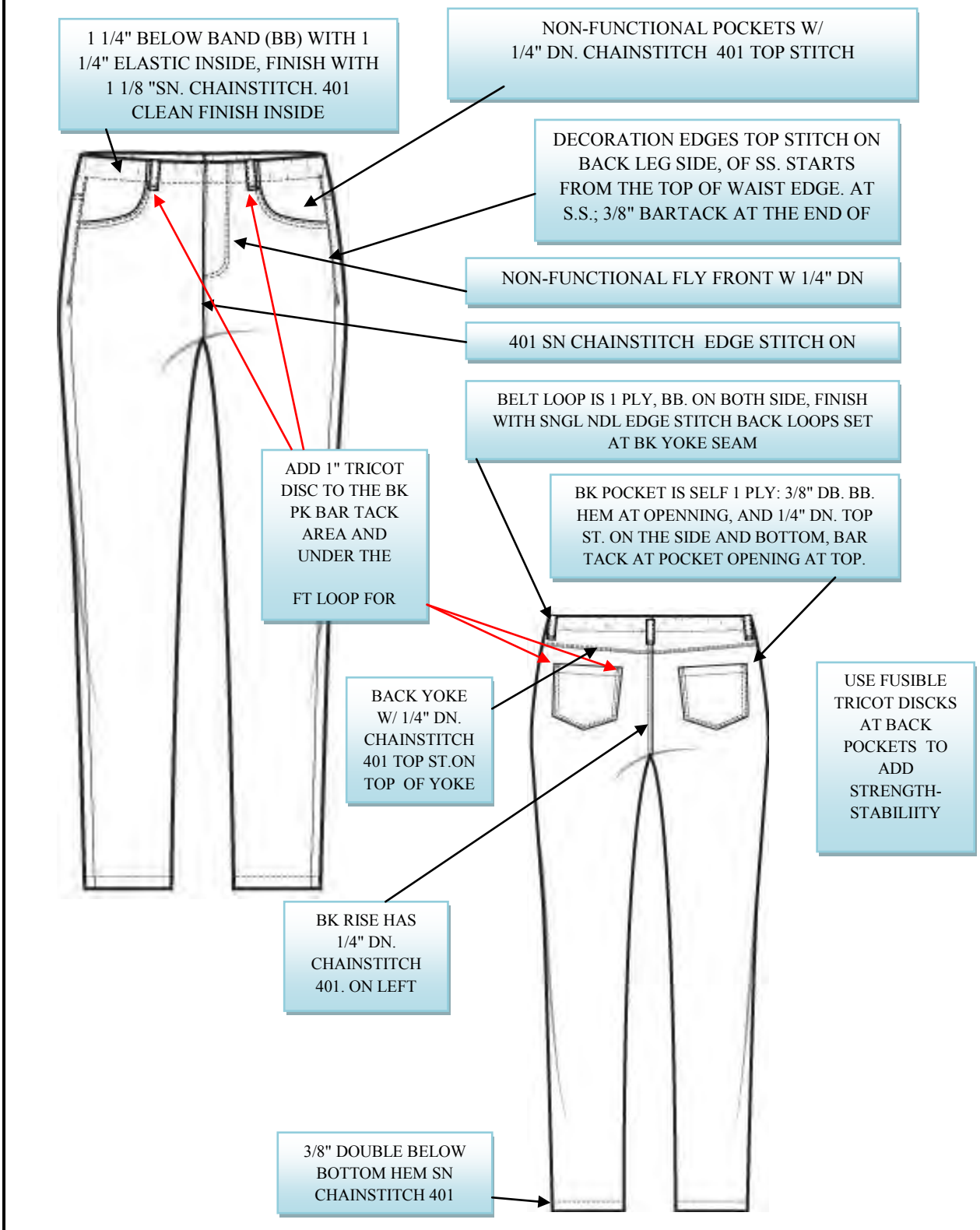

Figure 4.2: Product details of Legging (Ankle Length)

4.3.1 Measurement Chart

Table 4.2: Measurement chart of Leggings/Jegging

YS#	WM 2801-FG 1583	SIZE: XS - XXL	DESCRIPTION	JEGGING ANKLES	STATUS
WM#	FL 13916	DATA CRAETED: 1/0/00	FABRICATION	51 POLY-42 COTTON-7 SPANDAX	REVISED FINAL

QOUTE ID :8664904 STYLE Nbr :FL 13916

POM	POM DESCRIPTION	ADDL POM DESCRIPTION	TOL+	TOL-	XS	SM	MD	LG	XL	XXL
A-69-GEN	**INSIDE LEG-CROTCH TO HEM**		0.5	-0.5	27	27	27	27	27	27
H-05-GEN	**WAIST(BOTTOM)**	AT TOP EDGE	0.375	-0.375	12	13	14	15	16.5	18.25
H-15-GEN	**WAISTBAND DEPTH**		0.125	-0.125	1-125	1.125	1.125	1.125	1.125	1.125
I-19-GEN	**HIP POSITION FROM WAIST-MEASURING HIP IN AV (BOTTOMS)**		0.125	-0.125	6.25	6.5	6.75	7	7.25	7.5
I-22-GEN	**FULL HIP MEASURING HIP IN AV (BOTTOM)**		0.375	-0.375	15.25	16.25	17.25	18.25	19.75	21.5
J-12-GEN	**HEM /SWEEP AT ANKLE (BOTTOM)**		0.25	-0.25	4.625	5	5.375	5.75	6.25	6.875
J-13-GEN	**HEM HEIGHT**		0.125	-0.125	0.375	0.375	0.375	0.375	0.375	0.375
L-01-GEN	**FRT RISE**	TO TOP	0.25	-0.25	8.875	9.25	9.625	10	10.5	11
L-05-GEN	**BACK RISE**	TO TOP	0.25	-0.25	13.375	13.75	14.125	14.5	15	15.5
L-12-GEN	**THIGH 2.5 CM/1 INCH BELOW CROTCH**		0.25	-0.25	8.75	9.5	10.25	11	12	13
L-13-GEN	**KNEE POSITION**		0.125	-0.125	13	13	13	13	13	13
L-14-GEN	**KNEE WIDTH**		0.25	-0.25	6	6.5	7	7.5	8.25	9
M-17-GEN	**BACK YOKE DEPTH (BOTTOMS)**	AT CTR BK	0.25	-0.25	2.75	2.75	2.75	2.75	2.75	2.75
M-18-GEN	**SIDE YOKE DEPTH (BOTTOMS)**	AT SIDE SEAM	0.25	-0.25	2.25	2.25	2.25	2.25	2.25	2.25
N-01-GEN	**FLY LENGTH**		0.25	-0.25	4.125	4.625	5.125	5.625	6.125	6.625
N-03-GEN	**FLY WIDTH**		0.125	-0.125	1.25	25	1.25	1.25	1.25	1.25
O-09-GEN	**BACK POCKET POSITION FROM BACK RISE (BOTTOMS)**		0.25	-0.25	1	1,25	1.5	1.75	2.125	2.625
O-20-GEN	**CENTER POCKET LENGTH**	BACK POCKET	0.25	-0.25	4.25	4.5	4.75	5	5.25	5.5
O-23-GEN	**SIDE POCKET LENGTH**	BACK POCKET	0.25	-0.25	3.25	3.5	3.75	4	4.25	4.5
O-24-GEN	**POCKET WIDTH**	BACK POCKET TOP EDGE	0.25	-0.25	4.25	4.5	4.75	5	5.25	5.5
O-24-GEN	**POCKET WIDTH**	BACK POCKET BOTTOM	0.25	-0.25	3.375	3.625	3.875	4.125	4.375	4.625
O-29-GEN	**FIT POCKET OPENING WIDTH**	FROM SIDE SEAM	0.25	-0.25	2.875	3.125	3.375	3.625	3.875	4.125
O-30-GEN	**FIT POCKET OPENING LENGTH**	FROM TOP OF WAIST DOWN	0.25	-0.25	2.75	3	3.25	3.5	3.75	4
O-06A	**INNER BACK POCKET POSITION FROM YOKE**		0.125	-0.125	1.75	1.75	1.75	1.75	1.75	1.75
O-06B	**OUTSIDE-BACK POCKET POSITION FROM YOKE**		0.125	-0.125	1.625	1.625	1.625	1.625	1.625	1.625
Q-09-GEN	**BELT LOOP OPENING LENGTH**	INSIDE MEASUREMENT	0.125	-0.125	2	2	2	2	2	2
Q-10-GEN	**BELT LOOP WIDTH**		0.125	-0.125	0.5	0.5	0.5	0.5	0.5	0.5
Z-01	**BELT LOOP LENGTH**	OUTSIDE MEASUREMENT	0.125	-0.125	2.25	2.25	2.25	2.25	2.25	2.25
Z-02	**BACK LOOP POSITION**	FROM SIDE SEAM	0.25	-0.25	1.25	1.5	1.75	2	2.25	2.5
Z-03	**FIT LOOP POSITION**	FROM SIDE SEAM	0.25	-0.25	3	3.25	3.5	3.75	4	4.25
Z-04	**SIDE SEAM TOP STITCH**	FROM TOP	0.25	-0.25	5	5.25	5.5	5.75	6	6.25
Z-O5	**BELT LOOP PLACEMENT**	FROM TOP EDGE OF WAIST			0.25	0.25	0.25	0.25	0.25	0.25

4.4 Operation Breakdown/Bulletin

CFDL (level-2) is practicing progressive bundle system as an apparel manufacturing system with straight line layout. In the operation breakdown of this style, 40 operations are implemented with total 66 manpower requirement, in which operators are 48 & helpers are 18. They are sitting in two rows having output QC tables in the front. The inputs are given from the back side through the centre table. The breakdown is assigned as preparation of back part, preparation of front part, preparation of waist band & loop and finally the assembly. All the operators are operating different sewing machines according to the manufacturing process & all the helpers are doing manual processes such as marking, pressing/ironing, placing etc. 8 different sewing machines are used in this style. Operation breakdown is optimized with the line balancing method. It is observed that several attachments or working aids are used to enhance the productivity. Individual operation's SMV is determined through GSD & the total SMV is found as 20.318. Individual operation's SMV is also influenced by its measurement because higher the measurement, higher the length of operation, higher the SMV. Using this SMV & utilization percentage/efficiency, the target production is set 156 pcs/hour. It is noted that same number of operators & helpers are employed for both shifts along with the same machines & attachments.

Table 4.3: Operation Breakdown for Leggings/Jegging

Style No:	FG-1583/ FG-1755		Target/Hr:	156	Tar/10hrs:	1560	Date: 06-1-13	
Buyer:	WALMART		SMV:	20.318	Helpers:	18	Rev#: 20-2-13	
Description:	Long pant 2 back pocket 2 front dummy pocket & manual waist band with elestic		R-SMV:	25.385	Operators:	48	Rev #:	
			Utilization:	80%	Ttl MP:	66		
A	*B*	*C*	*D*	*E*	*F*	*G*	*H*	REQUIRED
Sl.	M/C	Attachment	Operation	SMV	Tar/Hr	Req W-Place		Operator	Helper
			Prepration of back part						
1	OL5	T/L guide	Sew back yoke	0.460	130	1.20	1	1	
2	FL	Guide	Topstitch back yoke	0.400	150	1.04	1	1	
3	LS1	Reg foot	Tack back rise	0.200	300	0.52	1	1	
4	OL5	T/L guide	Close back rise	0.343	175	0.89	2	2	
5	CS2	Guide	Topstitch back rise	0.343	175	0.89	1	1	
6	OL3	T/L guide	Overlock pocket 3 sides	0.500	120	1.30	1	1	
7	CS1	Folder	Sew hem back pkt	0.492	122	1.28	1	1	
8	IRON	Table	Iron back pkt	0.751	80	1.95	2		2
9	MAN	Pattern	Mark back pocket placement	0.498	120	1.29	2		2
10	LS2	Angolar	Attach back pocket x 2	1.237	49	3.22	4	4	
			Perparation of front part						
11	OL3	T/L guide	Overlock fly facing	0.150	400	0.39	1	1	
12	OL3	T/L guide	Overlock front pocket facing	0.318	189	0.83	1	1	
13	OL5	T/L guide	Close front rise with fly facing	0.603	100	1.57	1	1	
14	CS1	Gauge	Topstitch front rise	0.400	150	1.04	1	1	
15	LS2		Sew J stitch w/ pattern	0.400	150	1.04	1	1	
16	MAN	Pattern	Mark facing for pocket attach	0.460	130	1.20	1		1
17	LS1	Reg foot	Attach shade label at facing	0.365	164	0.95	1	1	
18	LS1	Reg foot	Tack facing to front pocket opening	0.600	100	1.56	2	2	
19	FL	Gauge	Topstitch front pocket opening w/ facing	0.750	80	1.95	2	2	
			Preparation of waist band & loop						
20	FL	Folder	Make waist loop x 5	0.481	125	1.25	1	1	
21	MAN	Pattern	Measure & cut elastic	0.180	333	0.47	1		1
22	LS2	Reg foot	Mark & Tack elastic 2 ends	0.250	240	0.65	1	1	
			Assembly						
23	MAN	Table	Assembly 2 part	0.600	100	1.56	2		2
24	OL5	T/L guide	Close side seam	0.773	78	2.01	3	3	
25	LS1	CR-1/16"	Topstitch side seam hip including mark	0.750	80	1.95	2	2	
26	MAN	Pattern	Mark waist around	0.400	150	1.04	1		1
27	FL	Stretcher	Attach Elastic to waist	0.630	95	1.64	2	2	
28	LS1	Reg foot	Cut & tack label at back center	0.465	129	1.21	2	1	1
29	LS1	Reg foot	Fold & tack waist band with elestic x 1	0.300	200	0.78	2	2	
30	FL	Stretcher	Close waist around	0.473	127	1.23	2	2	
31	OL5	T/L guide	Close inseam	0.541	111	1.41	2	2	
32	LS1	Reg foot	Fold & Tack before sew bottom hem	0.150	400	0.39	2	2	
33	FL		Sew bottom hem	0.500	120	1.30	2	2	
34	IRON	Pattern	press fusing	0.600	100	1.56	2		2
35	MAN	Pattern	Mark loop placement at waist	0.425	141	1.11	1		1
36	LS1	Reg foot	Cut loop X 5	0.492	122	1.28	1	1	
37	MAN	Pattern	Mark loop for attach	0.400	150	1.04	1		1
38	BT	Gauge	BT loop x 10	1.000	60	2.60	3	3	
39	BT	Gauge	BT back pkt,hipe cross point x 8	0.638	94	1.66	2	2	
40	MAN	Trimmer	Thread trimming	1.000	60	2.60	4		4
TOTAL				**20.318**		**52.83**	**66**	**48**	**18**

Dise cut :
1. Pocket fusing

Band knif cut :
2. Front pocket facing
3. Fly facing
4. Back pocket

Machines Requirement:					
LS1	13	BA		FL	10
LS2	6	BH		WELT	
OL3	3	EH		FUSE	
OL5	9	BT	5	KAN	
CS1	2	SNP		IRON	4
CS2	1	FOA		MAN	14

4.4.1 Operation Layout

Table 4.4: Operation Layout for Leggings/Jegging

MAN	Output QC Table		Output QC Table	MAN
MAN	Thread trimming		Thread trimming	MAN
BT	BT loop x 10		BT back pkt, hip cross point x 8	BT
BT	BT loop x 10		BT back pkt, hip cross point x 8	BT
MAN	Mark loop placement at waist		Mark loop for attach	MAN
IRON	Press fusing		Cut loop X 5	LS1
FL1	Sew bottom hem		Sew bottom hem	FL1
LS1	Fold & Tack before sew bottom hem		Fold & Tack before sew bottom hem	LS1
OL5	Close inseam		Close inseam	OL5
KAN	Close waist around		**Front Part QC Table**	MAN
LS1	Fold & tack WB with elastic x 1		Close waist around	KAN
FL	Attach Elastic to waist		Fold & tack WB with elastic x 1	LS1
MAN	Mark waist around		Cut & tack label at back center	LS1
LS1	Topstitch SS hip including mark		Attach Elastic to waist	FL
OL5	Close side seam		Close side seam	OL5
MAN	Assembly 2 part		Close side seam	OL5
FL2	Make waist loop x 5		Mark & Tack elastic 2 ends	LS2
CS2	Topstitch front pkt opening w/ facing		Measure & cut elastic	MAN
MAN	Mark facing for pocket attach		Topstitch front pkt opening w/ facing	CS2
LS2	Sew J stitch w/ pattern		Tack facing to front pocket opening	LS1
OL3	Overlock fly facing		Topstitch front rise	CS1
OL5	Close front rise with fly facing		**Back Part QC Table**	MAN
LS2	Attach back pocket x 2		Attach back pocket x 2	LS2
LS2	Attach back pocket x 2		Attach back pocket x 2	LS2
OL3	Overlock pocket 3 sides		Iron back pkt	IRON
LS1	Tack back rise		Sew hem back pkt	CS1
OL5	Close back rise		Topstitch back yoke	CS2
CS2	Topstitch back rise		Sew back yoke	OL5
MAN	Mark back pocket placement		Mark back pocket placement	MAN

Centre Table

4.5 Comparative study of Day Shift & Night Shift based on

In this study, it is being tried to keep all the machines, line layout, production lines, operation breakdown as well as the style identical for both shifts so that the occurred variations are the cause of shift change only. Keeping all other factors same, the comparative study of day shift & night shift is done based on -

1. Date wise production
2. Average Hourly Production
3. Quality
4. Labor Absenteeism
5. Hourly production Cost
6. Overtime

4.5.1 Actual production status

There are 10 sewing lines in CFDL (level-2) named as 5A01, 5B01, 5C01…5J01. For day shift, the production starts from 7:30 to till 18:30 where the last two hours (16:30-18:30) are remarked as overtime for which workers are paid as 200% of their basic pay (Bangladesh labor code 2006, section 102 & 108). There is also 1 hour lunch break from 13:00-14:00. It has been taken 15 different days actual production status for the Style# FG-1583/FG-1755 for the month of March'2013. Remaining days of this month is either holiday or producing other styles. In the blank space, there will be other styles' production or no production at all, they are excluded as only the above mentioned style is consider for this study. It has been observed from this data, production per two hours is increasing drastically from the early hours (07:30-9:30) to late hours (16:30-18:30). Line to line productivity variation is found also in this data.

Table 4.5: Date wise actual production status for Day Shift for 10 sewing lines

Date	5A01					5B01				
	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30
2-Mar-13	200	280	140	200	740	280	260	360	360	400
9-Mar-13	180	320	400	320	280	220	340	360	360	220
10-Mar-13	40	460	400	340	260	180	300	400		360
11-Mar-13	200	320	360	380	340	180	300	380	360	380
12-Mar-13	140	320	320	360	360	240	280	320	380	280
13-Mar-13	180	320	340	360	300	200	260	300	360	380
14-Mar-13	140	340	340	260	420	200	320	320	360	300
15-Mar-13	120	240	440	200		200	300	340	160	
16-Mar-13	180	320	360	340	400	200	320	380	380	320
17-Mar-13	180	320	360	400	440	180	280	380	400	460
18-Mar-13	180	320	440	540	420	220	320	500	460	400
19-Mar-13	180	280	320	360		160	320	320	340	
20-Mar-13	200	280	320	370		120	240	400	400	
21-Mar-13	160	240	340	400	460	180	260	360	400	400
22-Mar-13	200	300	360	280		100	300	340	280	
Total	**2480**	**4660**	**5240**	**5110**	**4420**	**2860**	**4400**	**5460**	**5000**	**3900**
Avg Hourly Production	**165.33**	**310.67**	**349.33**	**340.67**	**401.82**	**190.67**	**293.33**	**364.00**	**357.14**	**354.55**

Date	5C01					5D01				
	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30
2-Mar-13	100	80	200	300	820	240	380	440	320	120
9-Mar-13	200	300	320	340	340	220	380	320	380	200
10-Mar-13	260	140	320	300	340	400	200	360	360	220
11-Mar-13	140	320	340	300	420	260	400	400	400	140
12-Mar-13	160	340	400	400	200	200	320	380	400	200
13-Mar-13	140	320	440	300		200	320	340	380	
14-Mar-13	180	300	440	380	200	200	300	320	380	300
15-Mar-13	220	280	400	100		160	340	300	200	
16-Mar-13	140	300	400	420	340	320	340	300	360	280
17-Mar-13	240	460	400	200	400	260	300	400	400	340
18-Mar-13	140	280	380	560	520	300	400	400	400	400
19-Mar-13	120	340	320	280	80	140	240	320	280	180
20-Mar-13	200	320	320	320	200	340	240	380	100	200
21-Mar-13	140	280	380	360	440	140	380	340	400	380
22-Mar-13	100	260	520	260		140	340	260	260	
Total	**2480**	**4320**	**5580**	**4820**	**4300**	**3520**	**4880**	**5260**	**5020**	**2960**
Avg Hourly Production	**165.33**	**288.00**	**372.00**	**321.33**	**358.33**	**234.67**	**325.33**	**350.67**	**334.67**	**246.67**

Date	5E01					5F01				
	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30
2-Mar-13	200	300	320	380	300	80	140	60	320	400
9-Mar-13	220	300	280	340	360					
10-Mar-13	140	300	460	400	200					
11-Mar-13	220	320	320	320	420					
12-Mar-13	180	280	280	400	360					
13-Mar-13	140	280	280	380						
14-Mar-13	260	220	260	360	400					
15-Mar-13	220	300	300	200						
16-Mar-13	180	280	360	500						
17-Mar-13	100	200	360	440	500			120	160	520
18-Mar-13	300	400	600	300	300	100	100	160	240	800
19-Mar-13	160	220	300	340	120	40	80	200	460	320
20-Mar-13	140	280	260	490		100	100	240	700	
21-Mar-13	140	300	360	320	440					
22-Mar-13	160	280	260	300						
Total	**2760**	**4260**	**5000**	**5470**	**3400**	**320**	**420**	**780**	**1880**	**2040**
Avg Hourly Production	**184.00**	**284.00**	**333.33**	**364.67**	**340.00**	**80.00**	**105.00**	**156.00**	**376.00**	**510.00**

Date	5G01					5H01				
	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30
2-Mar-13						20	280	280	360	460
9-Mar-13						260	260	280	300	400
10-Mar-13						140	280	360	340	320
11-Mar-13						160	260	300	360	420
12-Mar-13						80	140	300	360	520
13-Mar-13				80		160	280	320	320	
14-Mar-13	40	80	160	180	220	120	240	300	280	560
15-Mar-13	80	120	200	320		80	160	260	500	
16-Mar-13	120	280	280	260	120	160	320	340	380	500
17-Mar-13	220	200	200	240	540	120	240	320	400	520
18-Mar-13	140	240	220	320	480	200	260	300	320	420
19-Mar-13	140	220	280	280	120	180	240	320	300	100
20-Mar-13	200	240	300	400		140	180	340	480	
21-Mar-13	160	260	260	420	440	140	220	260	280	600
22-Mar-13	180	240	260	440		160	240	320	420	
Total	**1280**	**1880**	**2160**	**2940**	**1920**	**2120**	**3600**	**4600**	**5400**	**4820**
Avg Hourly Production	**142.22**	**208.89**	**240.00**	**294.00**	**320.00**	**141.33**	**240.00**	**306.67**	**360.00**	**438.18**

Date	5I01					5J01				
	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30	07:30-9:30	09:30-11:30	11:30-13:30	14:30-16:30	16:30-18:30
2-Mar-13				240	1200	140	260	240	360	400
9-Mar-13	240	280	300	340	260	220	300	360	400	220
10-Mar-13	160	240	260	320	360	140	260	360	400	340
11-Mar-13	200	260	260	340	400	100	260	340	300	500
12-Mar-13	120	160	240	400	560	40	260	300	360	440
13-Mar-13	120	260	320	340		160	260	320	400	
14-Mar-13	60	200	260	260	520	80	200	260	280	280
15-Mar-13	100	160	240	280		140	280	340	400	
16-Mar-13	140	280	300	320	400	180	380	340	380	460
17-Mar-13	160	280	320	320	520	160	280	320	360	580
18-Mar-13	100	240	300	260	600	200	100	280	320	600
19-Mar-13	100	200	260	360	220	80	240	160	420	240
20-Mar-13	240	600				100	260	380	400	
21-Mar-13	120	260	340	360	520	80	380	320	360	460
22-Mar-13	120	240	300	480		140	240	340	420	
Total	**1980**	**3660**	**3700**	**4620**	**5560**	**1960**	**3960**	**4660**	**5560**	**4520**
Avg Hourly Production	**141.43**	**261.43**	**284.62**	**330.00**	**427.69**	**130.67**	**264.00**	**310.67**	**370.67**	**376.67**

Day Shift		
Time Duration	**Average Production/ 2 hours**	**Average Production/ Hour**
07:30-9:30	158	144
09:30-11:30	258	
11:30-13:30	307	
14:30-16:30	345	
16:30-18:30	377	

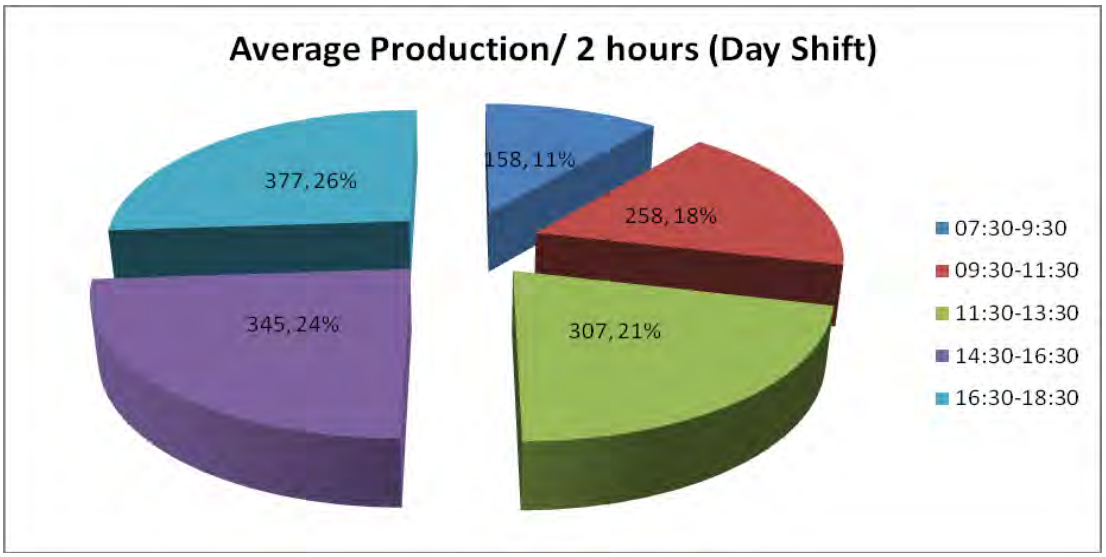

Figure 4.3: Average production per two hours for Day Shift

For night shift, the production starts from 19:30 to till 6:00 where the last two hours (4:00-6:00) are remarked as overtime. There is also half hour night break from 1:00-1:30. It has been taken 14 different days actual production status for the Style# FG-1583/FG-1755 for the month of March'2013, same as the day shift production status except for 2nd March' 2013. Remaining days of this month is either holiday or producing other styles. In the blank space, there will be other styles' production or no production at all, they are excluded as only the above mentioned style is consider for this study. It has been observed from this data, production per two hours is increasing drastically from the early hours (19:30-21:30) to late hours (4:00-6:00). Line to line productivity variation is found also in this data. In the night shift less overtime is practiced in CFDL (level-2) than that of day shift.

Table 4.6: Date wise actual production status for Night Shift for 10 sewing lines

Date	5A01					5B01				
	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00
9-Mar-13	240	320	280	260		240	360	360	240	
10-Mar-13	280	320	280	300		260	340	400	300	
11-Mar-13	300					260				
12-Mar-13	160	220	200	260		160	220	220	160	
13-Mar-13	160	220	300	400		160	180	260	320	
14-Mar-13	160	360	360	360		40	300	320	240	
15-Mar-13	140	240	280			100	200	440		
16-Mar-13	140	280	340	320	520	100	220	320	260	600
17-Mar-13	140	240	420	600	600	200	320	420	360	700
18-Mar-13	180	280	300	380	360	260	280	320	140	500
19-Mar-13	220	320	360	250		280	300	320	250	
20-Mar-13	180	320	340	360		160	340	340	360	
21-Mar-13						180	400	420	360	
22-Mar-13	240	400	300	200		300	600	120	120	
Total	**2540**	**3520**	**3760**	**3690**	**1480**	**2700**	**4060**	**4260**	**3110**	**1800**
Avg Hourly Production	**195.38**	**293.33**	**313.33**	**335.45**	**493.33**	**192.86**	**312.31**	**327.69**	**239.23**	**600.00**

Date	5C01					5D01				
	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00
9-Mar-13	240	340	320	280		300	200	400	500	
10-Mar-13	180	280	320	360		240	320	340	380	
11-Mar-13	220					260				
12-Mar-13	100	180	180	220		280	280	300	360	
13-Mar-13	80	160	200	200		200	200	400	340	
14-Mar-13	120	200	220	320		80	380	260	300	
15-Mar-13	100	200	260			160	280	260		
16-Mar-13	200	300	280	320	400	220	220	260	300	600
17-Mar-13	160	280	380	340	540	100	300	280	260	760
18-Mar-13	220	200	400	400	280	100	180	260	260	700
19-Mar-13	240	220	340	350		160	280	340	370	
20-Mar-13	160	320	320	400		180	260	320	440	
21-Mar-13	200	360	360	380		100	320	360	580	
22-Mar-13	300	380	80	80		120	220	140	140	
Total	**2520**	**3420**	**3660**	**3650**	**1220**	**2500**	**3440**	**3920**	**4230**	**2060**
Avg Hourly Production	**180.00**	**263.08**	**281.54**	**304.17**	**406.67**	**178.57**	**264.62**	**301.54**	**352.50**	**686.67**

Date	5E01					5F01				
	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00
9-Mar-13	240	380	400	360						
10-Mar-13	260	320	320	300						
11-Mar-13	260									
12-Mar-13	200	80	260	140						
13-Mar-13	200	200	320	300						
14-Mar-13	180	280	340	400						
15-Mar-13	140	180	320							
16-Mar-13	240	280	280	300	500					180
17-Mar-13	180	280	280	340	920		160	200	140	520
18-Mar-13	200	220	280	400	400	100	320	200	180	600
19-Mar-13	140	280	300	430		60	220	260	610	
20-Mar-13	120	280	360	140		120	360	320	340	
21-Mar-13	180	280	280	560					480	
22-Mar-13	180	420	200	240						
Total	**2720**	**3480**	**3940**	**3910**	**1820**	**280**	**1060**	**980**	**1750**	**1300**
Avg Hourly Production	**194.29**	**267.69**	**303.08**	**325.83**	**606.67**	**93.33**	**265.00**	**245.00**	**350.00**	**433.33**

Date	5G01					5H01				
	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00
9-Mar-13						140	220	300	300	
10-Mar-13						120	280	280	300	
11-Mar-13						200				
12-Mar-13							140	160	260	
13-Mar-13						120	200	280	400	
14-Mar-13		40	180	180		100	260	320	280	
15-Mar-13		80	80			60	200	120		
16-Mar-13	100	140	120	260	780	80	260	360	300	600
17-Mar-13	240	200	200	160	600	40	180	320	400	760
18-Mar-13	40	140	260	400	560	120	260	320	260	540
19-Mar-13	60	160	220	710		180	280	300	390	
20-Mar-13	240	240	380	310		100	220	280	280	580
21-Mar-13	200	220	300	560		140	240	260	640	
22-Mar-13	140	100	400	460		80	200	180	200	
Total	**1020**	**1320**	**2140**	**3040**	**1940**	**1480**	**2940**	**3480**	**4010**	**2480**
Avg Hourly Production	**145.71**	**146.67**	**237.78**	**380.00**	**646.67**	**113.85**	**226.15**	**267.69**	**334.17**	**620.00**

Date	5I01					5J01				
	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00	19:30-21:30	21:30-23:30	23:30-01:30	02:00-04:00	04:00-6:00
9-Mar-13	180	280	280	300		260	320	320	360	
10-Mar-13	180	280	360	340		180	300	320	360	
11-Mar-13	160					160				
12-Mar-13	160	260	280	300		120	240	280	320	
13-Mar-13	80	180	260	340		120	220	300	400	
14-Mar-13	60	320	260	300		120	260	280	300	
15-Mar-13	60	200	200			60	140	180		
16-Mar-13	160	260	300	420	460	140	240	280	240	700
17-Mar-13	140	180	180	580	620	100	140	300	420	740
18-Mar-13	140	260	280	320	500	80	260	180	320	660
19-Mar-13	160	260	400	330		80	260	280	530	
20-Mar-13	100	220	300	550		80	220	220	660	
21-Mar-13	120	220	400	540		140	180	200	760	
22-Mar-13	80	240	380	400		80	220	120	220	
Total	**1780**	**3160**	**3880**	**4720**	**1580**	**1720**	**3000**	**3260**	**4890**	**2100**
Avg Hourly Production	**127.14**	**243.08**	**298.46**	**363.08**	**526.67**	**122.86**	**230.77**	**250.77**	**407.50**	**700.00**

Night Shift		
Time Duration	**Avg Production/ 2 hours**	**Avg Production/ Hour**
19:30-21:30	154	160
21:30-23:30	251	
23:30-01:30	283	
02:00-04:00	339	
04:00-6:00	572	

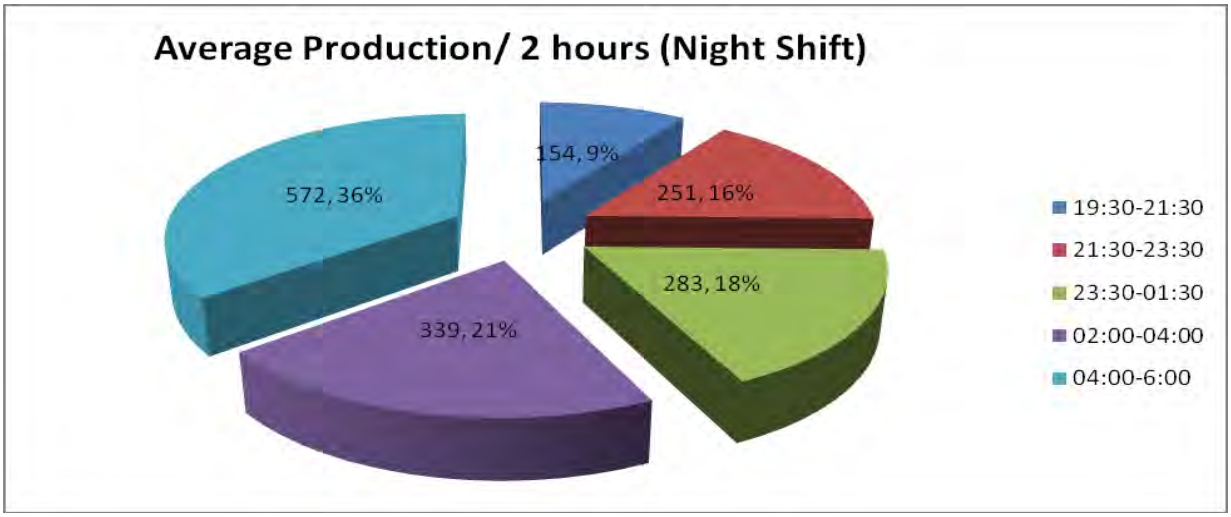

Figure 4.4: Average production per two hours for Night Shift

Above illustrated two pie charts (figure 4.3 & 4.4) reveal average production per two hours of Day shift & Night Shift. The five colored segmented areas which mention the average production in percentage. Maximum percentage of production occupied maximum area. Here Blue color represents the percentage of production of first two hour that's not quite impressive and shows the lowest production of 158 pieces & 154 pieces for Day shift & Night shift respectively. And the sky blue colored area presents the largest area which is the production of last two hours that shows the highest number of 377 pieces & 572 pieces respectively.

4.5.1.1 Production comparison between Day shift & Night shift (bi-hourly)

By analyzing the below bar diagram & table, it is observed that the average production per two hours increases gradually from the first hour to last hour. So the production of the last two hours increased surprisingly resembles the highest production. From the observation it is visible that the production of starting hours are almost same for the Day and Night shifts, and the rate of increase for the production are almost same in both cases except the last two hours. In the last two hours of Night shift the production jumped more than 1.5 times of previous two hours and it is 1.5 times of the production of the last two hours of day shift. It is because during the last 2 hours, the input operators are worked with output operators in sewing line.

Table 4.7: Production comparison between Day shift & Night shift (bi-hourly)

Time	Day Shift			Night Shift		
	Time Duration	Avg Production/ 2 hours	Avg Production/ Hour	Time Duration	Avg Production/ 2 hours	Avg Production/ Hour
1st 2 hours	07:30-9:30	158	144	19:30-21:30	154	160
2nd 2 hours	09:30-11:30	258		21:30-23:30	251	
3rd 2 hours	11:30-13:30	307		23:30-01:30	283	
4th 2 hours	14:30-16:30	345		02:00-04:00	339	
last 2 hours	16:30-18:30	377		04:00-6:00	572	

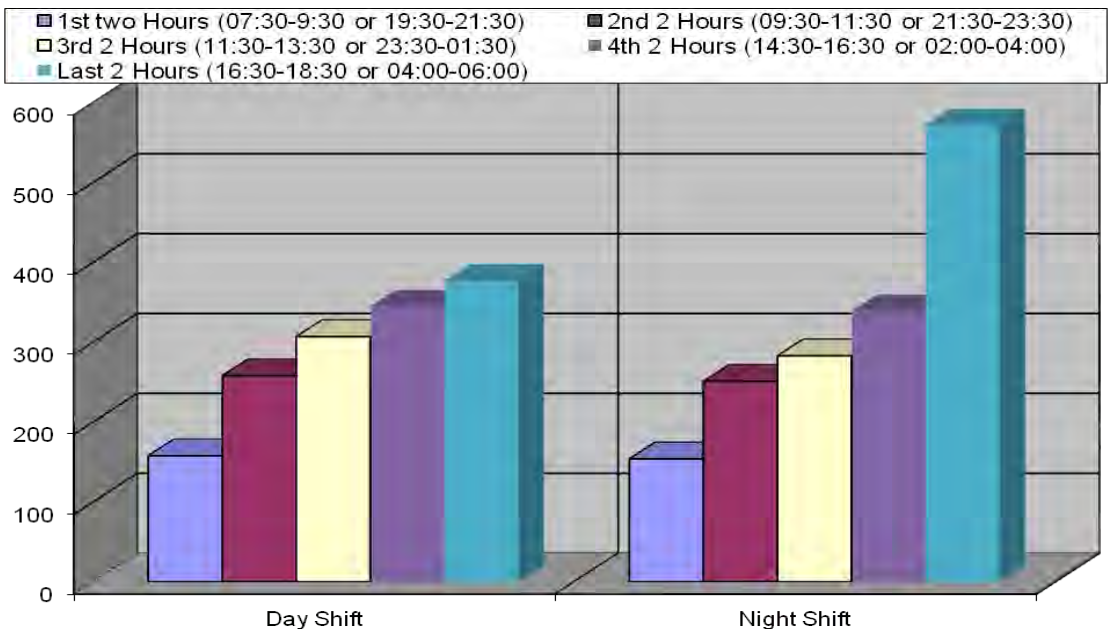

Figure 4.5: Bar diagram for Production comparison between Day shift & Night shift

4.5.2 Hourly Average Production

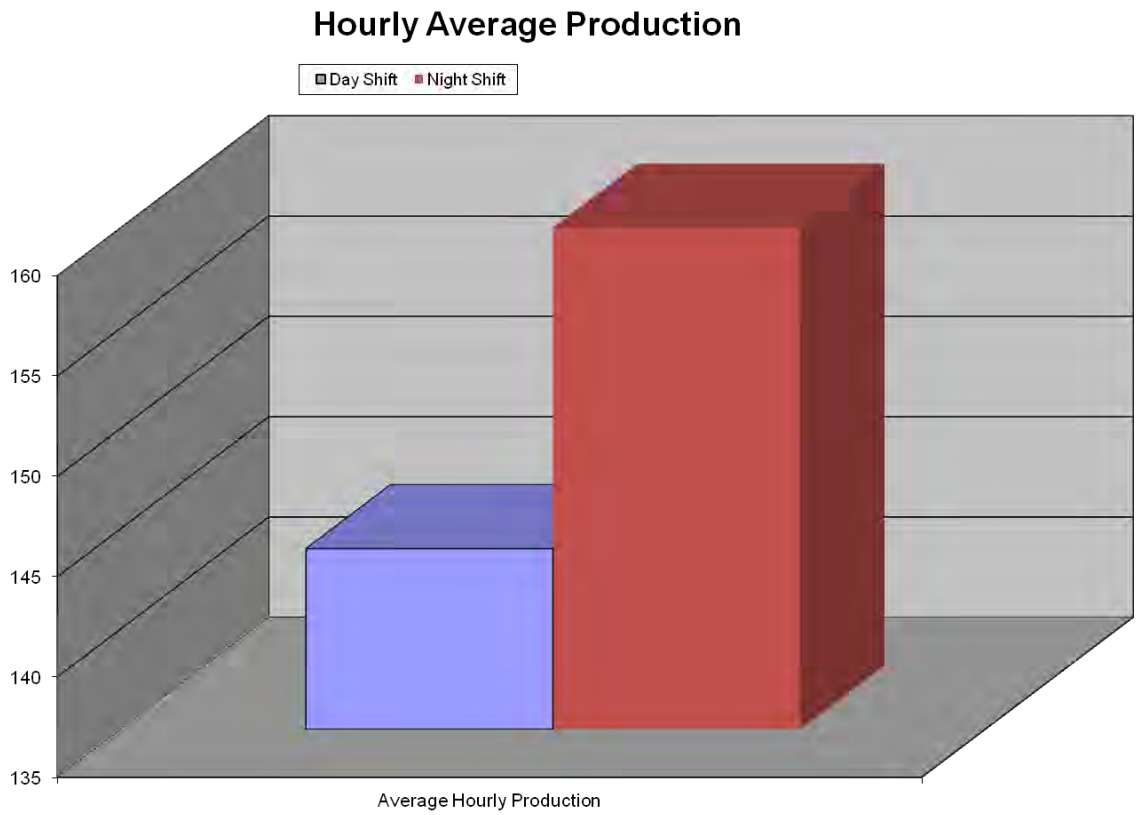

Figure 4.6: Average hourly production for Day & Night Shift

This bar diagram demonstrates the average production for Day and Night shifts. The blue bar stands for the Day shift & red bar for Night shift. From the observation it is cleared that the average production per hour of Night shift is higher than that of Day shift. It can be explained as the night shift operators are highly motivated & less absented than day shift operators because in night shift they received additional payment as night bill as well as extra conveyance bill BDT 10/= (day shift 15/=, night shift 25/=) along with extra Tiffin bill BDT 8/= (day shift 12/=, night shift 20/=). Also higher production in night shift may be attributed by the uninterrupted power supply, cool & calm environment as well as continuous cut pieces input in sewing line.

4.5.3 Quality Inspection Report

Wal-Mart's asking AQL level for major defects is 2.5 & for minor defects, the AQL level is 4.0 and the sampling plan is single. From the day shift production, it has been taken one inline inspection report and one final inspection report for the same style (FG-1583/FG-1755). The below tables are tabulated with the types of defects as well as their frequency. 9 different types of defects are identified in both reports in which workmanship & dirty marks problems are the high frequency problems. Sample size is taken according to table (sample size & code letters) is given to the appendix. From the single sampling plan (given also in appendix), the acceptable major & minor defects is 21 for the sample size 500 in the AQL level 2.5 & 4.0 respectively. From the day shift production inspection, the number of defects is within the acceptable range and the consequent inspection report is passed.

Similarly, from the night shift production, it has been taken one inline inspection report and one final inspection report for the same style (FG-1583/FG-1755). The below tables are tabulated with the types of defects as well as their frequency. 7 different types of defects are identified in both reports in which seam pucker & oil stain problems are the high frequency problems. Sample size is taken according to table (sample size & code letters) is given to the appendix. From the single sampling plan (given also in appendix), the acceptable major & minor defects are 21 for the sample size 500 in the AQL level 2.5 & 4.0 respectively. The acceptable major & minor defects are 14 & 21 for the sample size 315 in the AQL level 2.5 & 4.0 respectively. From the night shift production inspection, the number of defects is within the acceptable range and the consequent inspection report is passed.

Table 4.8: Day Shift Quality Inspection Report

AQL Level: Major= 2.5, Minor= 4.0						No. of Lots: 2	
Sampling Plan: Single		Lot-1		Lot-2		Total no of Defects in all Lots	Defect % Among all Defects
Total Order Qty		5,00,040 pcs		3,54,360 pcs			
Sampling Level : Normal		Lot size 64,000		Lot size 82,800			
Inspection Level : II		Sample size 500		Sample size 500			
Ac/Re		Mj=21/22, Mn=21/22		Mj=21/22, Mn=21/22			
No.	**Defects name**	**Major**	**Minor**	**Major**	**Minor**		
1	Stitching - Skipped stitches- SKIP STITCH/ AT BACK RISE	1		1		2	6.90
2	Stitching - Broken Stitches - BROKEN STITCH AT LEG BOTTOM HEM	1				1	3.45
3	OTHERS - Stitching - REJECT COLOR SHADE /			3		3	10.34
4	Seam Pucker - Puckering/ ropping/ twisted Hems/ Excessive puckering - PUCKRING AT WAIST BAND /	1	2	1		4	13.79
5	Embroidery - Pulling, puckering or incorrect placement			1		1	3.45
6	OTHERS – Workmanship - FABRICS BARRAY MARK, COLOR YARN AT LEG & COLOR FADED FRONT/ PART COLOR	3	3	1		7	24.14
7	OTHERS Dirty marks / soiling - OIL & DIRTY STAIN AT FRONT & BACK	2	4			6	20.70
8	OTHERS Pressing - Lifter mark. /				2	2	6.90
9	Dusty/ soiled - OIL SPOT ON GMTS /			1	2	3	10.34
Total						29	
Inspection Result		**Passed**					

Table 4.9: Defects Percentage for Day Shift

Faults	Defects %
Stitching - Skipped stitches AT BACK RISE/ SKIP STITCH	6.90
Stitching - Broken Stitches - BROKEN STITCH AT LEG BOTTOM HEM	3.45
OTHERS – Stitching - REJECT COLOR SHADE /	10.34
Seam Pucker - Puckering/ ropping/ twisted Hems/ Excessive puckering - PUCKRING AT WAIST BAND	13.79
Embroidery - Pulling, puckering or incorrect placemen	3.45
OTHERS – Workmanship - FABRICS BARRAY MARK, COLOR YARN AT LEG & COLOR FADED FRONT/ PART COLOR SHADE	24.14
OTHERS Dirty marks / soiling - OIL & DIRTY STAIN AT FRONT & BACK	20.70
OTHERS Pressing - Lifter mark. /	6.90
Dusty/ soiled - OIL SPOT ON GMTS /	10.34

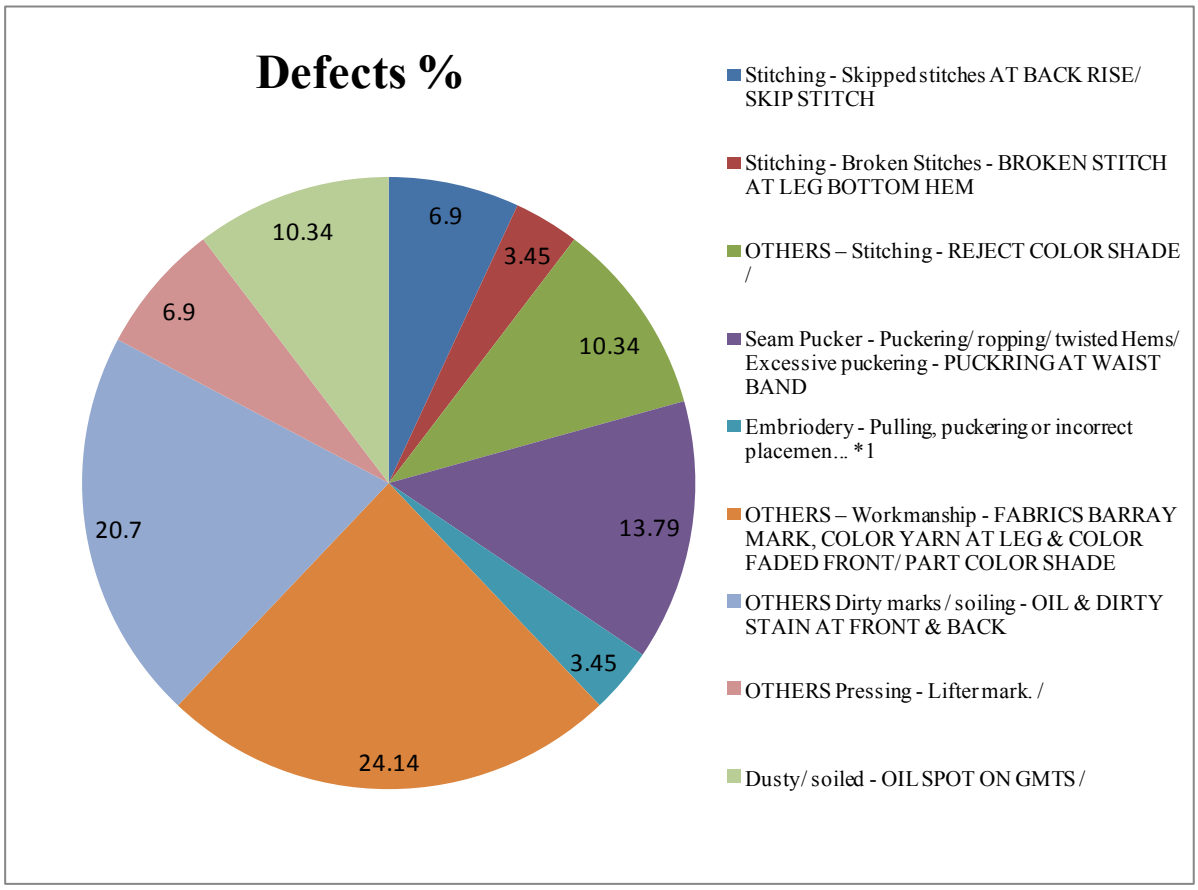

Figure 4.7: Pie diagram of Defects Percentage for Day Shift

Table 4.10: Night Shift Quality Inspection Report

AQL Level: Major= 2.5, Minor= 4.0 No. of Lots: 2							
Sampling Plan: Single		Lot-1		Lot-2		Total no of Defects in all Lots	Defect % Among all Defects
Total Order Qty		500040 pcs		425760 pcs			
Sampling Level : Normal		Lot size 35544		Lot size 11258			
Inspection Level : II		Sample size 500		Sample size 315			
Ac/Re		Mj=21/22, Mn=21/22		Mj=14/15, Mn=21/22			
No.	**Defects name**	**Major**	**Minor**	**Major**	**Minor**		
1	Stitching - Skipped stitches- SKIP STITCH/ SKIP STITCH AT BACK RISE	1		1		2	7.41
2	Seam Pucker - Poor/ puckering Seams- WAIST BAND PUCKRING/ Puckering/ ropping/ twisted Hems - TWISTED AT SIDE SEAM/ SIDE & INSEAM IS TWISTED	3	2	2	1	8	29.63
3	Embroidery - Pulling, puckering or incorrect placement			3	1	4	14.81
4	OTHERS - Workmanship- FABRIC DAMAGE	1				1	3.70
5	OTHERS Appearance - PART SHADING /			2	1	3	11.11
6	Dusty/ soiled- OIL STAIN	1	1	2	2	6	22.22
7	OTHERS Dirty marks / soiling- SPOT DIRTY	2	1			3	11.11
Total						27	
Inspection Result		**Passed**					

Table 4.11: Defects Percentage for Night Shift

Faults	Defects %
Stitching - Skipped stitches- SKIP STITCH/ SKIP STITCH AT BACK RISE	7.41
Seam Pucker - Poor/puckering Seams- WAIST BAND PUCKRING/ Puckering/ ropping/ twisted Hems – SIDE & INSEAM IS TWISTED	29.63
Embriodery - Pulling, puckering or incorrect placemen	14.81
OTHERS - Workmanship- FABRIC DAMAGE	3.70
OTHERS Appearance - PART SHADING /	11.11
Dusty/ soiled- OIL STAIN	22.22
OTHERS Dirty marks / soiling- SPOT DIRTY	11.11

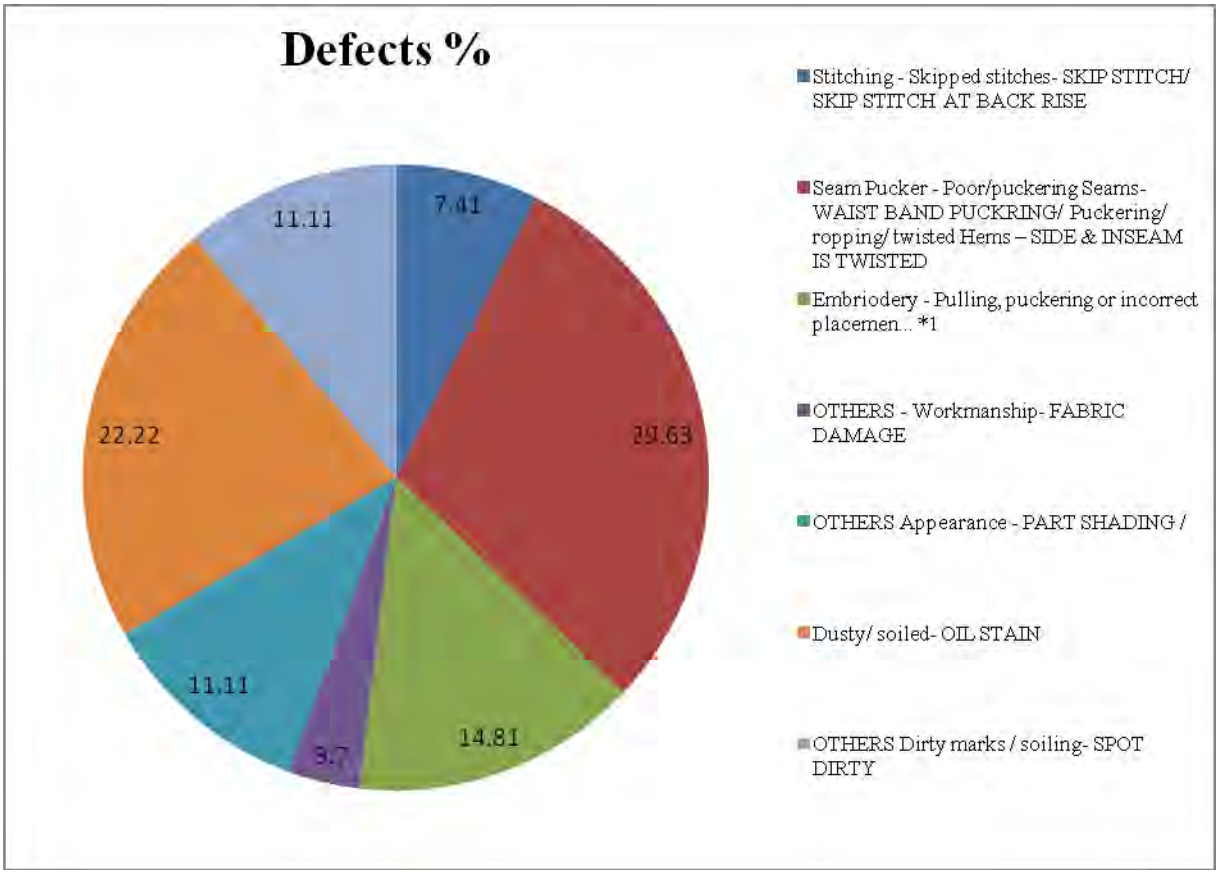

Figure 4.8: Pie diagram of Defects Percentage for Night Shift

Table 4.12: Comparison between Day Shift & Night Shift Quality Inspection report

Faults	Day Shift	Night Shift
Stitching - Skipped stitches	2	2
Stitching - Broken Stitches	1	
Stitching - - REJECT COLOR SHADE	3	
Seam Pucker	4	8
Embroidery	1	4
Workmanship	7	1
Appearance		3
Dirty marks / soiling	6	3
Pressing	2	
Dusty/ soiled	3	6
Total	**29**	**27**

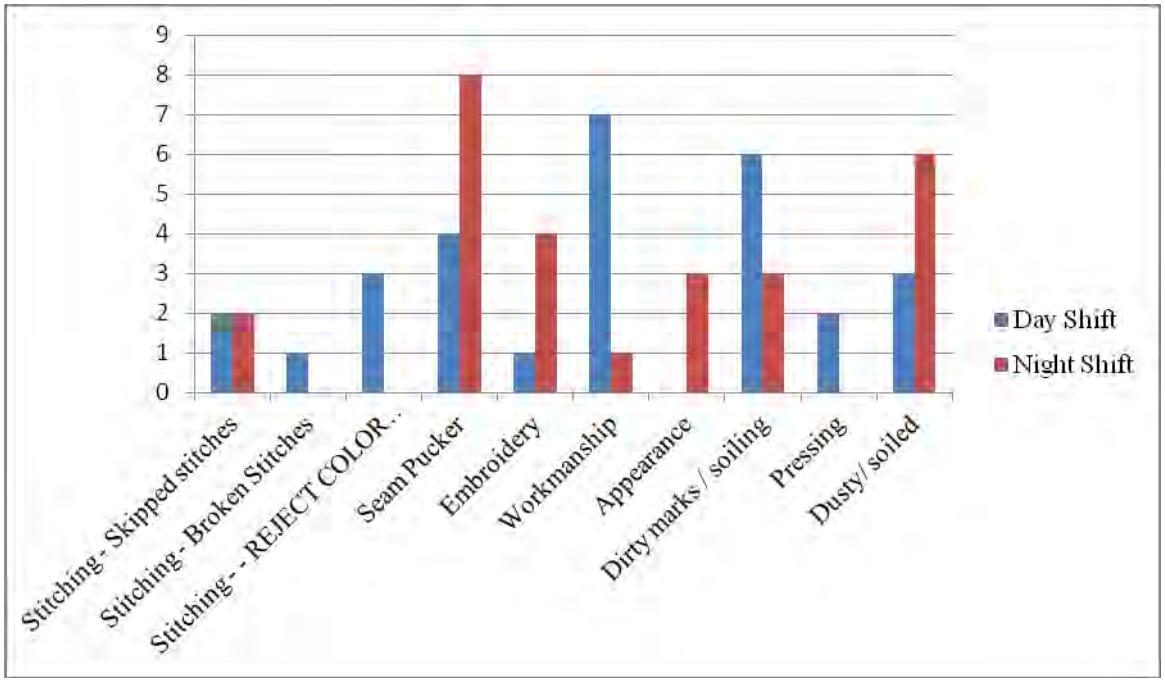

Figure 4.9: Quality Comparison between Day Shift & Night Shift Production

This bar diagram depicts the types of defects (quality problem) in apparels and their magnitude for both Day and Night shifts production. The blue bar stands for the Day shift & red bar for Night shift. It can be concluded from this above displayed diagram that there are no significant quality variations between Day shift & Night shift apparel production, though types of defects may be varied from shift to shift. May be they are random variables for which product's quality is not hampered & the total lot from both shifts are accepted under AQL level 2.5 (for major defects) & 4.0 (for minor defects) as per buyer's requirement.

4.5.4 Worker Absenteeism – General, Day & Night Shift

There are 11 different departments in CFDL (level-2), named as Q. A., store, sewing, sample, quality, planning, maintenance, IE, finishing, cutting, administration & personnel departments. Worker absenteeism is shown as department wise, shift wise as well as grade wise for the month of March ’2013. In March ‘2013, total working days are 25 days (considering 5 Friday and 1 national holiday as Independence Day). After taking number of employees in each grade of each department, it is multiplied by 25 to determine the total working days to calculate the absenteeism. As per wage structure on 2010 (given in appendix), the grade structure is mainly divided into two sections Worker ‘A’ & Assistant ‘B’. The worker ‘A’ section is graded as seven different grades from grade 1 to grade 7 which in this thesis work displayed as 1, 2, ...,7. The assistant ‘B’ section is graded as seven different grades from grade 1 to grade 4 which in this thesis work displayed as B1, B2, B3 & B4. Here the department wise absenteeism is not determined rather only shift wise absenteeism is determined.

Table 4.13: Worker Absenteeism for General, Day & Night Shift

Depar-tments	Designation	Grade	General Shift			Day Shift			Night Shift		
			No. of Employees	Total Working Days	Present Days	No. of Employees	Total Working Days	Present Days	No. of Employees	Total Working Days	Present Days
Q.A.	Quality in Charge	1	1	25	25						
	Q. A. Auditor	2				7	175	164	8	200	200
	Q. A. Inspector	3							2	50	46
	Jr. Q.A.	4				7	175	156	4	100	97
Store	Store Assistant	B1				1	25	24			
	Store Assistant	B2	1	25	16	6	150	144	6	150	125
	Store Labor	B4				8	200	188	6	150	128
Sewing	Line Chief	1				10	250	229	8	200	192
	Supervisor	2	1	25	25	29	725	662	29	725	715
	Sr. Sew Operator/ High Skill Operator	3	4	100	90	340	8500	7504	329	8225	7777
	Sew M. Operator	4	8	200	187	220	5500	4787	239	5975	5373
	Jr. Sew M. Operator	5				18	450	397	32	800	727
	General Sew M. Opr	6				1	25	23	1	25	20
	Sewing Helper/ Sewing Ironman/ Wash Helper	7	3	75	72	205	5125	4072	196	4900	4381
Sample	Quality Controller/ Sr. CAD Operator	1	2	50	50	1	25	24			
	Sample Man/ CAD Assitant	3	6	150	140				1	25	25
	Sewing Q. I.	4	1	25	19						
	Sr. CAD Asst.	5				1	25	24			
Quality	Quality in Charge/ Sr. Quality Controller	1	1	25	25	4	100	85	3	75	75
	Quality Supervisor	2	1	25	25	11	275	239	9	225	222
	Sr. Quality Insp.	3				22	550	515	22	550	537
	Finishing Q. I./ Sewing Q. I.	4	1	25	16	93	2325	1919	94	2350	2109
Planning	Planning Asst. / Computer Operator	B2	2	50	44	1	25	24	2	50	50
	Production Recorder	B3	1	25	25	1	25	23	1	25	25
	Production Recorder	4				1	25	23			
Main-tenance	Mech. Supervisor	1				1	25	17			
	Sr. Mech. Super./ Mechanic/ Electrician	2	1	25	25	13	325	286	10	250	246
	Store Asst.	B2							1	25	25
	Mech. Helper/ Plumber	B4				1	25	24	1	25	22
	Jr. Mechanic	5				1	25	13			
	Fusing Operator/ Needleman	6				2	50	47	2	50	50
IE	Sr. IE Asst./ IE Asst.	B2	1	25	19	4	100	90	2	50	48
Finishing	Finishing in Charge/ Packing in Charge	1				1	25	24	2	50	50
	Supervisor	2	1	25	23	6	150	141	7	175	163
	Sr. Sew Operator/ High Skill Operator	3				10	250	238	17	425	339
	Assortman/ Folding man/ Polyman/ Finishing Ironman/ Sewing M. Operator/ Packing man	4				106	2650	2455	82	2050	1970
	Jr. Folding man/ Jr. Polyman/ Jr. Sewing M. Operator/ Jr. Packing man/ Spotman	5				17	425	388	10	250	246
	General Sew M. Opr	6				1	25	20			
	Finishing Helper/ Fusing Helper/ Finishing Ironman	7				85	2125	1976	89	2225	2169
Cutting	Cutting in Charge/ Quality in charge	1				1	25	24	2	50	50
	Cutting Receiver & Wash Del Supervisor, Cutting Supervisor, Quality Supervisor	2	1	25	25	4	100	95	3	75	69
	Computer Operator	B2				1	25	24			
	Sr. Cutting Man/ Sr. Marker Man/ Sr. Q.I.	3				6	150	144	9	225	217
	Band Knife Opr./ Cutting Man/ Cutting Q. I.	4				34	850	802	34	850	831
	Scissor Man	5				23	575	543	17	425	404
	Input Man	6				2	50	48	3	75	75
	Cutting Helper	7				33	825	730	33	825	761
Admin	Medical Asst./ H. K. Supervisor/ CAPS Asst./ Sr. Admin Asst./ Admin Asst.	B2	3	75	68	4	100	93	3	75	75
	Checker/ Cleaner/ Peon/ Sweeper	B4	4	100	94	24	600	557	23	575	549
Total			**44**	**1100**	**1013**	**1367**	**34175**	**30005**	**1342**	**33550**	**31183**

Table 4.14: Shift wise Worker Absenteeism Percentage summary

Shift	Total Employees	Total Working Days	Present Working Days	Absent Days	Absent Percentage
General	44	1100	1013	87	7.91%
Day	1367	34175	30005	4170	12.20%
Night	1342	33550	31183	2367	7.06%
Total	2753	68825	62201	6624	9.62%

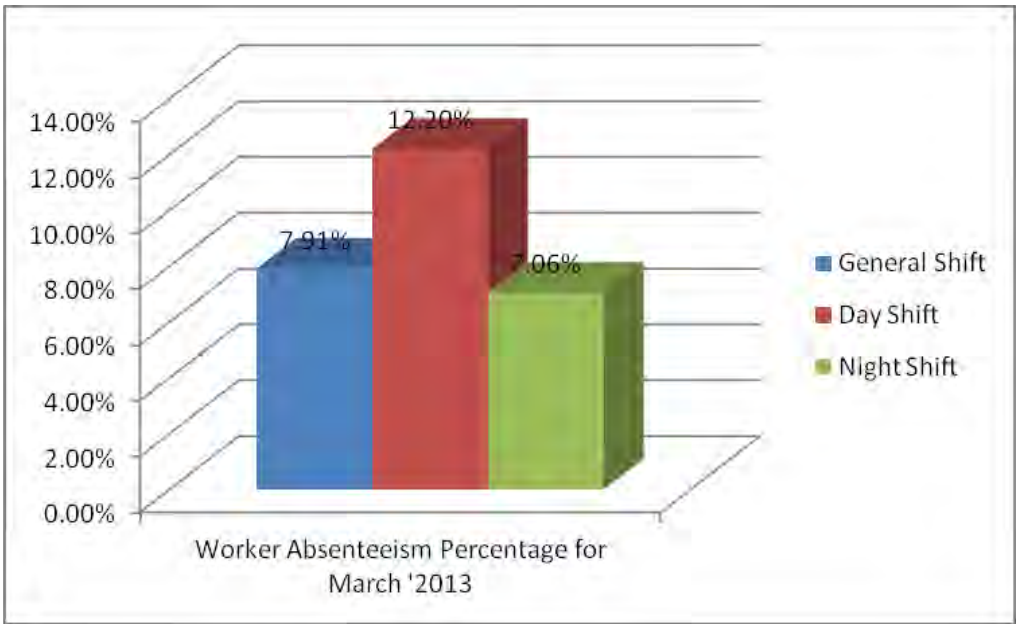

Figure 4.10: Worker Absenteeism percentage for March'2013

This bar diagram represents the absent percentage for General, Day and Night shifts. The blue bar stands for the Day shift & red bar for Night shift. From the observation it is clearly visible that the absenteesm is higer in the day shift from night shfit. It can be explained as the night shift operators are highly motivated than day shift operators because in night shift they received additional payment as night bill as well as extra conveyance bill BDT 10/= (day shift 15/=, night shift 25/=) along with extra Tiffin bill BDT 8/= (day shift 12/=, night shift 20/=). It is noted that CFDL (level-2) is practicing 7% extra workers employment for all shifts in all departments may be due to annual average absent percentage is 7%.

4.5.5 Hourly Production Cost

In the hourly production cost calculation, the cost is determined for single shift (General & day shift) and double shift (General, day & night shift). Here it is considered that the total working hours for single shift is 250 hours (25 days multiplied by daily 10 hours) and for double shift it is 500 hours (25 days multiplied by daily 20 hours) for the month of March '2013. Cost of machines, maintenance cost, utility cost, rent, workers wage & other expenses have been considered for determining the hourly cost for each shift. To determine the cost of machines, department wise machines such as sewing, cutting, finishing and boiler & generator cost is considered. Salvage value is considered as 10% of machine's price as per factory instruction/practice. Machine life time is varied according to machines' use, types of machine and its manufacturing design. For single shift, machine life time is higher than that of the double shift as in the single shift machines are operating about 50% less than the double shift. It is being noted that machine life time is not half from the single shift in case of double shift. Machine price is converted to BDT from the dollar value @ 85/= as per given price from the factory. Here, the machine salvage value is discounted to the present value @ 15% (according to the interest percentage used in the bank). The present value of salvage value is deducted from the machine price to determine actual machine price which is then divided by machine life time & working hours per shift to calculate the cost of machines per hour for each shift. In terms of generator (diesel) cost, it is divided by four as the generator is used for similar four plants.

The maintenance cost of sewing, cutting & finish machines are budgeted as BDT 500/= for each machine for single shift & BDT 800/= for each machine for double shift. Total number of machines for these three departments is 681 (562+25+94=681). Total maintenance cost is determined through summation of boiler maintenance cost, generator maintenance cost & departmental machines (sewing, cutting & finishing) maintenance cost (total number of machines multiplied by shift wise each machine's maintenance cost).

Utilities expenses are consisting of electricity bill, water bill, diesel cost for generator & gas bill. Diesel cost per month is same for both day shift and night shift as there is no significant power crisis especially in the industrial area during night as well as CFDL can't provide any separate data for shift wise diesel consumption. Diesel cost is calculated through considering

average running hour per month is 250 hrs, 90 liters diesel consumption per hour @ 80% load and the 1 liter diesel price is BDT 68/=.

Floor rent is same regardless the single shift or double shift. For this reason, hourly floor rent is half for double shift than that of single shift.

Other expenses include Tiffin cost, conveyance bill, communication expense, office vehicle running expense, buyer entertainment, administrative cost & drinking water cost. Tiffin is not provided to all unless the workers perform the overtime work. Conveyance bill is provided @15/= for day & general shift and @25/= for night shift workers applicable only for who are present in workplace. Total workers attendance (in days) is tabulated in worker absenteeism table (table# 4.14). For single shift it is found total 31018 days (1013+30005 = 31018) & for double shift, it is found total 62201 days (1013+30005+31183 = 62201). To determine conveyance bill for single shift, total attendance days (31018 days) is multiplied by 15/= and for double shift, total day shift attendance days (31018 days) is multiplied by 15/= added with total night shift attendance days (31183 days) is multiplied by 25/=.

Monthly salary expense is calculated department wise, designation as well as grade wise for the month of March'2013. The salary is taken from the 4th minimum wage structure for the garment workers, 2010 (given in appendix) as the industry did not provide any information regarding salary rather they verbally confirmed that they are following this structure. This structure is mainly divided into two sections Worker 'A' & Assistant 'B'. The worker 'A' section is graded as seven different grades from grade 1 to grade 7 which in this thesis work displayed as 1, 2, ...,7. The assistant 'B' section is graded as seven different grades from grade 1 to grade 4 which in this thesis work displayed as B1, B2, B3 & B4. Monthly salary is calculated by the number of employees is multiplied by the grade wise salary. Here wage of workers' absent days can't be deducted from the net salary as most of the leaves are paid leave & few of them are unpaid leave, also industry did not provide any separate leave information. In case of night shift, workers are given an additional payment for encouragement as night bill which is calculated as basic pay divided by 52 for each working day. This night bill is not more than 100/= for grade 1 & grade 2 and not more than 50/= for remaining grades. The amount of night bill is same as 1 hour overtime payment for each working day as overtime payment is 200% of basic pay (Bangladesh labor code 2006, section 108).

4.5.5.1 Hourly Production cost for Single Shift (Day Shift)

Working days in month =	**25 day**
Working hours per day =	**10 hr**
Total working time in Hours =	**250 Hrs/Month**
Total number of lines =	**10**

Cost of machines :

Table 4.15: Sewing department machines cost for single shift

SL no.	Machine Name (sewing section)	Unit Cost (Tk)	Salvage Value (10%)	Life time of M/c (yrs)	Present value of salvage value	Actual M/C price	No. of machines	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/250
1	Lock stitch machine	64,685.00	6,468.50	10	1,598.91	63,086.09	210	13,248,078.00	110,400.65	441.60
2	Flatlock machine	183,600.00	18,360.00	10	4,538.31	179,061.69	80	14,324,935.10	119,374.46	477.50
3	Overlock machine	136,000.00	13,600.00	10	3,361.71	132,638.29	151	20,028,381.49	166,903.18	667.61
4	Button holing machine	242,250.00	24,225.00	10	5,988.05	236,261.95	25	5,906,548.76	49,221.24	196.88
5	Button attaching machine	335,750.00	33,575.00	10	8,299.23	327,450.77	25	8,186,269.34	68,218.91	272.88
6	Bar tack machine	260,000.00	26,000.00	10	6,426.80	253,573.20	12	3,042,878.37	25,357.32	101.43
7	Blind stitch machine	69,000.00	6,900.00	15	847.97	68,152.03	10	681,520.28	3,786.22	15.14
8	Rib cutter machine	51,000.00	5,100.00	15	626.76	50,373.24	5	251,866.19	1,399.26	5.60
9	Snap button attaching machine	12,000.00	1,200.00	10	296.62	11,703.38	8	93,627.03	780.23	3.12
10	Kansai special	119,000.00	11,900.00	10	2,941.50	116,058.50	12	1,392,702.02	11,605.85	46.42
11	Picot machine	214,625.00	21,462.50	15	2,637.62	211,987.38	10	2,119,873.77	11,777.08	47.11
12	woven label cutter	3,200.00	320.00	10	79.10	3,120.90	2	6,241.80	52.02	0.21
13	Exhaust fan	28,200.00	2,820.00	20	172.30	28,027.70	12	336,332.37	1,401.38	5.61
	TOTAL						**562**	**69,619,254.53**	**570,277.79**	**2,281.11**

Table 4.16: Cutting department machines cost for single shift

SL no.	Machine Name (Cutting section)	Unit Cost (Tk)	Salvage Value (10%)	Life time of M/c (yrs)	Present value of Salvage value	Actual M/C price	No. of machines	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/250
1	Spreading machine	3,230,000.00	323,000.00	15	39,694.92	3,190,305.08	1	3,190,305.08	17,723.92	70.90
2	Straight knife cutting machine	73,100.00	7,310.00	8	2,389.65	70,710.35	10	707,103.48	7,365.66	29.46
3	Band knife cutting machine	99,450.00	9,945.00	20	607.64	98,842.36	2	197,684.72	823.69	3.29
4	Sticker machine	7,225.00	722.50	10	178.59	7,046.41	6	42,278.45	352.32	1.41
5	Exhaust fan	28,200.00	2,820.00	20	172.30	28,027.70	6	168,166.18	700.69	2.80
	TOTAL						**25**	**4,305,537.91**	**26,966.28**	**107.87**

Table 4.17: Finishing department machines cost for single shift

SL no.	Machine name (finishing section)	Unit Cost (Tk)	Salvage value (10%)	Life time of M/c (yrs)	Present value of Salvage value	Actual M/C price	no. of machines	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/250
1	Vacuum table	51,000.00	5,100.00	20	311.61	50,688.39	30	1,520,651.66	6,336.05	25.34
2	Steam iron	19,550.00	1,955.00	10	483.25	19,066.75	30	572,002.62	4,766.69	19.07
3	Metal detector	981,750.00	98,175.00	20	5,998.52	975,751.48	2	1,951,502.96	8,131.26	32.53
4	Sticker machine	7,225.00	722.50	10	178.59	7,046.41	12	84,556.91	704.64	2.82
5	Spot removal machine	2,500.00	250.00	10	61.80	2,438.20	4	9,752.82	81.27	0.33
6	Heat transfer machine	80,000.00	8,000.00	10	1,977.48	78,022.52	6	468,135.13	3,901.13	15.60
7	Thread suction machine	114,750.00	11,475.00	10	2,836.44	111,913.56	2	223,827.11	1,865.23	7.46
8	Exhaust fan	28,200.00	2,820.00	20	172.30	28,027.70	8	224,221.58	934.26	3.74
	TOTAL						**94**	**5,054,650.78**	**26,720.52**	**106.88**

Table 4.18: Boiler & Generator cost for single shift

SL no.	Machine name (others)	Unit Cost (Tk)	Salvage value (10%)	Life time of M/c (yrs)	Present value of Salvage value	Actual M/C price	No. of M/C	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/250
1	Boiler	3,000,000.00	300,000.00	15	36,868.35	2,700,000.00	1	2,700,000.00	15,000.00	60.00
2	*Generator	2,000,000.00	200,000.00	15	24,578.90	1,800,000.00	1	1,800,000.00	10,000.00	40.00
	Total						**2**	**4,500,000.00**	**25,000.00**	**100.00**

***Generator Cost = 80,00,000 BDT used for 4 similar Plants.**

Table 4.19: Total Cost of machines per hour for single shift

Cost of sewing Machines per Hour	2,281.11
Cost of cutting Machines per Hour	107.87
Cost of finishing Machines per Hour	106.88
Cost of Boiler & Generator per Hour	100.00
Total cost of Machines per Hour	**2,595.86**

Table 4.20: Maintenance cost for single shift

Average maintenance cost per month per machine =	500 Tk
Boiler maintenance cost per month per machine =	10,000 Tk
Generator maintenance cost per month per machine=	25,000 Tk
So, Total Maintenance cost =	**375,500 Tk**
Total maintenance cost per hour	**1,502 Tk**

(Total no. of machines in sewing, cutting & finishing department = 562+25+94 = 681)

Table 4.21: Utilities expenses for single shift

Bill	Bill per month	Bill per Hour
Electricity Bill	400,000.00	1,600.00
Water Bill	200,000.00	800.00
**Diesel	1,530,000.00	6,120.00
Gas Bill	150,000.00	600.00
Total	**2,122,500.00**	**8,490.00**

**Average Running Hour = 250 hrs/month; 90 Liters/Hr @ 80% load; 1 Liter Diesel = 68/=

Table 4.22: Rent for single shift

Floor rent per month	=	1,200,000 Tk
Floor rent per Hour	**=**	**4800.00 Tk**

Table 4.23: Other Expenses for single shift

Department	Cost/month (Tk)	Cost/Hour (Tk)
***Tiffin cost	300,000.00	1,200.00
****Conveyance Bill	465,270.00	1,861.08
Communication Expense	140,000.00	560.00
Office Vehicle expense	650,000.00	2,600.00
Buyer Entertainment	150,000.00	600.00
Administrative cost	700,000.00	2,800.00
Drinking Water	60,000.00	240.00
Total	**2,465,270.00**	**9,861.08**

*** Tiffin bill @ 12/= for Day shift
****Conveyance bill @ 15/= for Day Shift

Table 4.24: Monthly salary of workers for single shift

Depart-ments	Designation	Grade	Net Salary (BDT)	General Shift	Day Shift	Total Workers	Total Salary (BDT)
				No. of Workers	No. of Workers		
Q.A.	Quality in Charge	1	9,300	1		1	9,300
	Q. A. Auditor	2	7,200		7	7	50,400
	Q. A. Inspector	3	4,218			0	-
	Jr. Q.A.	4	3,861		7	7	27,027
Store	Store Assistant	B1	6,500		1	1	6,500
	Store Assistant	B2	5,100	1	6	7	35,700
	Store Labor	B4	3,280		8	8	26,240
Sewing	Line Chief	1	9,300		10	10	93,000
	Supervisor	2	7,200	1	29	30	216,000
	Sr. Sew Operator/ High Skill Operator	3	4,218	4	340	344	1,450,992
	Sew M. Operator	4	3,861	8	220	228	880,308
	Jr. Sew M. Operator	5	3,553		18	18	63,954
	General Sew M. Opr	6	3,322		1	1	3,322
	Sewing Helper/ Sewing Ironman/ Wash Helper	7	3,000	3	205	208	624,000
Sample	Quality Controller/ Sr. CAD Operator	1	9,300	2	1	3	27,900
	Sample Man/ CAD Assitant	3	4,218	6		6	25,308
	Sewing Q. I.	4	3,861	1		1	3,861
	Sr. CAD Asst.	5	3,553		1	1	3,553
Quality	Quality in Charge/ Sr. Quality Controller	1	9,300	1	4	5	46,500
	Quality Supervisor	2	7,200	1	11	12	86,400
	Sr. Quality Insp.	3	4,218		22	22	92,796
	Finishing Q. I./ Sewing Q. I.	4	3,861	1	93	94	362,934
Planning	Planning Asst. / Computer Operator	B2	5,100	2	1	3	15,300
	Production Recorder	B3	4,400	1	1	2	8,800
	Production Recorder	4	3,861		1	1	3,861
Main-tenance	Mech. Supervisor	1	9,300		1	1	9,300
	Sr. Mech. Super./ Mechanic/ Electrician	2	7,200	1	13	14	100,800
	Store Asst.	B2	5,100			0	-
	Mech. Helper/ Plumber	B4	3,280		1	1	3,280
	Jr. Mechanic	5	3,553		1	1	3,553
	Fusing Operator/ Needleman	6	3,322		2	2	6,644
IE	Sr. IE Asst./ IE Asst.	B2	5,100	1	4	5	25,500

Finishing	Finishing in Charge/ Packing in Charge	1	9,300		1	1	9,300
	Supervisor	2	7,200	1	6	7	50,400
	Sr. Sew Operator/ High Skill Operator	3	4,218		10	10	42,180
	Assortman/ Folding man/ Polyman/ Finishing Ironman/ Sewing M. Operator/ Packing man	4	3,861		106	106	409,266
	Jr. Folding man/ Jr. Polyman/ Jr. Sewing M. Operator/ Jr. Packing man/ Spotman	5	3,553		17	17	60,401
	General Sew M. Opr	6	3,322		1	1	3,322
	Finishing Helper/ Fusing Helper/ Finishing Ironman	7	3,000		85	85	255,000
Cutting	Cutting in Charge/ Quality in charge	1	9,300		1	1	9,300
	Cutting Receiver & Wash Del Supervisor, Cutting Supervisor, Quality Supervisor	2	7,200	1	4	5	36,000
	Computer Operator	B2	5,100		1	1	5,100
	Sr. Cutting Man/ Sr. Marker Man/ Sr. Q.I.	3	4,218		6	6	25,308
	Band Knife Opr./ Cutting Man/ Cutting Q. I.	4	3,861		34	34	131,274
	Scissor Man	5	3,553		23	23	81,719
	Input Man	6	3,322		2	2	6,644
	Cutting Helper	7	3,000		33	33	99,000
Admin	Medical Asst./ H. K. Supervisor/ CAPS Asst./ Sr. Admin Asst./ Admin Asst.	B2	5,100	3	4	7	35,700
	Checker/ Cleaner/ Peon/ Sweeper	B4	3,280	4	24	28	91,840
Total				**44**	**1367**	**1411**	**5,664,787**

Total Salary per Hour	**=**	**28,323.94**

Table 4.25: Total expenses per hour for single shift

M/C Cost per Hour	**=**	**2,595.86**
Total maintenance cost per Hour	**=**	**1,502.00**
Total utility expense per Hour	**=**	**9,120.00**
Floor rent per Hour	**=**	**4,800.00**
Total salary per Hour	**=**	**28,323.94**
Other expenses per Hour	**=**	**9,861.08**
Total expense (BDT) per Hour	**=**	**56,202.87**

4.5.5.2 Hourly Production Cost for Double Shift (Day & Night Shift)

Working days in month =	25 day
Working hours per day =	20 hr
Total working time in Hours =	500 Hrs/Month
Total number of lines =	10

Cost of machines :

Table 4.26: Sewing department machines cost for double shift

SL no.	Machine Name (sewing section)	Unit Cost (Tk)	Salvage Value (10%)	Life time of M/c (yrs)	Present value of salvage value	Actual M/C price	No. of machines	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/500
1	Lock stitch machine	64,685.00	6,468.50	7	2,431.75	62,253.25	210	13,073,182.76	155,633.13	311.27
2	Flatlock machine	183,600.00	18,360.00	7	6,902.20	176,697.80	80	14,135,823.68	168,283.62	336.57
3	Overlock machine	136,000.00	13,600.00	7	5,112.74	130,887.26	151	19,763,975.69	235,285.42	470.57
4	Button holing machine	242,250.00	24,225.00	7	9,107.07	233,142.93	25	5,828,573.13	69,387.78	138.78
5	Button attaching machine	335,750.00	33,575.00	7	12,622.09	323,127.91	25	8,078,197.85	96,169.02	192.34
6	Bar tack machine	260,000.00	26,000.00	7	9,774.36	250,225.64	12	3,002,707.64	35,746.52	71.49
7	Blind stitch machine	69,000.00	6,900.00	10	1,705.57	67,294.43	10	672,944.26	5,607.87	11.22
8	Rib cutter machine	51,000.00	5,100.00	10	1,260.64	49,739.36	5	248,696.79	2,072.47	4.14
9	Snap button attaching machine	12,000.00	1,200.00	7	451.12	11,548.88	8	92,391.00	1,099.89	2.20
10	Kansai special	119,000.00	11,900.00	7	4,473.65	114,526.35	12	1,374,316.19	16,360.91	32.72
11	Picot machine	214,625.00	21,462.50	10	5,305.20	209,319.80	10	2,093,197.98	17,443.32	34.89
12	woven label cutter	3,200.00	320.00	7	120.30	3,079.70	2	6,159.40	73.33	0.15
13	Exhaust fan	28,200.00	2,820.00	15	346.56	27,853.44	12	334,241.25	1,856.90	3.71
	TOTAL						**562**	**68,704,407.63**	**805,020.17**	**1,610.04**

Table 4.27: Cutting department machines cost for double shift

SL no.	Machine Name (Cutting section)	Unit Cost (Tk)	Salvage Value (10%)	Life time of M/c (yrs)	Present value of Salvage value	Actual M/C price	No. of machines	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/500
1	Spreading machine	3,230,000.00	323,000.00	10	79,840.66	3,150,159.34	1	3,150,159.34	26,251.33	52.50
2	Straight knife cutting machine	73,100.00	7,310.00	5	3,634.36	69,465.64	10	694,656.38	11,577.61	23.16
3	Band knife cutting machine	99,450.00	9,945.00	15	1,222.19	98,227.81	2	196,455.63	1,091.42	2.18
4	Sticker machine	7,225.00	722.50	7	271.61	6,953.39	6	41,720.31	496.67	0.99
5	Exhaust fan	28,200.00	2,820.00	15	346.56	27,853.44	6	167,120.63	928.45	1.86
	TOTAL						**25**	**4,250,112.29**	**40,345.47**	**80.69**

Table 4.28: Finishing department machines cost for double shift

SL no.	Machine name (finishing section)	Unit Cost (Tk)	Salvage value (10%)	Life time of M/c (yrs)	Present value of Salvage value	Actual M/C price	No. of machines	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/500
1	Vacuum table	51,000.00	5,100.00	15	626.76	50,373.24	30	1,511,197.14	8,395.54	16.79
2	Steam iron	19,550.00	1,955.00	7	734.96	18,815.04	30	564,451.29	6,719.66	13.44
3	Metal detector	981,750.00	98,175.00	15	12,065.17	969,684.83	2	1,939,369.67	10,774.28	21.55
4	Sticker machine	7,225.00	722.50	7	271.61	6,953.39	12	83,440.63	993.34	1.99
5	Spot removal machine	2,500.00	250.00	7	93.98	2,406.02	4	9,624.06	114.57	0.23
6	Heat transfer machine	80,000.00	8,000.00	7	3,007.50	76,992.50	6	461,955.02	5,499.46	11.00
7	Thread suction machine	114,750.00	11,475.00	7	4,313.88	110,436.12	2	220,872.24	2,629.43	5.26
8	Exhaust fan	28,200.00	2,820.00	15	346.56	27,853.44	8	222,827.50	1,237.93	2.48
	TOTAL						**94**	**5,013,737.56**	**36,364.21**	**72.73**

Table 4.29: Boiler & Generator cost for double shift

SL no.	Machine name (others)	Unit Cost (Tk)	Salvage value (10%)	Life time of M/c (yrs)	Present value of Salvage value	Actual M/C price	No. of M/C	Total Cost (Tk)	Cost of m/c per month (TK)/life time of m/c*12	Cost of m/c per Hr(TK)[monthly cost/500
1	Boiler	3,000,000.00	300,000.00	10	74,155.41	2,700,000.00	1	2,700,000.00	22,500.00	45.00
2	*Generator	2,000,000.00	200,000.00	10	49,436.94	1,800,000.00	1	1,800,000.00	15,000.00	30.00
	Total						**2**	**4,500,000.00**	**37,500.00**	**75.00**

***Generator Cost = 80,00,000 BDT used for 4 similar Plants.**

Table 4.30: Total Cost of machines per hour for double shift

Cost of sewing machines per Hour	1,610.04
Cost of cutting machines per Hour	80.69
Cost of finishing machines per Hour	72.73
Cost of Boiler & Generator per Hour	75.00
Total cost of Machines per Hour	**1,838.46**

Table 4.31: Maintenance cost for double shift

Average maintenance cost per month per machine =	800 Tk
Boiler maintenance cost per month per machine =	15,000 Tk
Generator maintenance cost per month per machine=	35,000 Tk
So, Total Maintenance cost =	**594,800 Tk**
Total maintenance cost per hour	**1,190 Tk**

Table 4.32: Utilities expenses for double shift

Bill	Bill per month	Bill per Hour
Electricity Bill	700,000.00	1400.00
Water Bill	400,000.00	800.00
**Diesel	1,530,000.00	3060.00
Gas Bill	300,000.00	600.00
Total	**2,930,000.00**	**5860.00**

**Average Running Hour = 250 hrs/month; 90 Litres/Hr @ 80% load; 1 Litre Diesel = 68/=

Table 4.33: Rent expense for double shift

Floor rent per month	=	1,200,000 Tk
Floor rent per Hour	**=**	**4800.00 Tk**

Table 4.34: Other expenses for double shift

Department	Cost/month (Tk)	Cost/Hour (Tk)
***Tiffin cost	500,000.00	1000.00
****Conveyance Bill	1,244,845.00	2489.69
Communication Expense	140,000.00	280.00
Office Vehicle expense	650,000.00	1300.00
Buyer Entertainment	150,000.00	300.00
Administrative cost	1,000,000.00	2000.00
Drinking Water	120,000.00	240.00
Total	3,804,845.00	**7609.69**

*** Tiffin Bill @ 12/= for Day shift & @ 20/= for Night Shift
**** Conveyance Bill @ 15/= for Day shift & @ 25/= for Night Shift

Table 4.35: Monthly salary of workers for double shift

Departments	Grade	Net Salary (BDT)	Night Bill (BDT)	General Shift	Day Shift	Night Shift	Total Workers	Total Salary (BDT)
				No. of Workers	No. of Workers	No. of Workers		
Q.A.	1	9,300	100	1			1	9,300
	2	7,200	96		7	8	15	10,8768
	3	4,218	50			2	2	8,536
	4	3,861	50		7	4	11	42,671
Store	B1	6,500	87		1		1	6,500
	B2	5,100	50	1	6	6	13	66,600
	B4	3,280	42		8	6	14	46,172
Sewing	1	9,300	100		10	8	18	16,8200
	2	7,200	96	1	29	29	59	42,7584
	3	4,218	50	4	340	329	673	2,855,164
	4	3,861	50	8	220	239	467	1,815,037
	5	3,553	46		18	32	50	179,122
	6	3,322	43		1	1	2	6,687
	7	3,000	38	3	205	196	404	1,219,448
Sample	1	9,300	100	2	1		3	27,900
	3	4,218	50	6		1	7	29,576
	4	3,861	50	1			1	3,861
	5	3,553	46		1		1	3,553
Quality	1	9,300	100	1	4	3	8	74,700
	2	7,200	96	1	11	9	21	152,064
	3	4,218	50		22	22	44	186,692
	4	3,861	50	1	93	94	188	730,568
Planning	B2	5,100	50	2	1	2	5	25,600
	B3	4,400	50	1	1	1	3	13,250
	4	3,861	50		1		1	3,861
Maintenance	1	9,300	100		1		1	9,300
	2	7,200	96	1	13	10	24	173,760
	B2	5,100	50			1	1	5,150
	B4	3,280	42		1	1	2	6,602
	5	3,553	46		1		1	3,553
	6	3,322	43		2	2	4	13,374
IE	B2	5,100	50	1	4	2	7	35,800
Finishing	1	9,300	100		1	2	3	28,100
	2	7,200	96	1	6	7	14	101,472
	3	4,218	50		10	17	27	114,736
	4	3,861	50		106	82	188	729,968
	5	3,553	46		17	10	27	96,391
	6	3,322	43		1		1	3,322
	7	3,000	38		85	89	174	525,382

Cutting	1	9,300	100		1	2	3	28,100
	2	7,200	96	1	4	3	8	57,888
	B2	5,100	50		1		1	5,100
	3	4,218	50		6	9	15	63,720
	4	3,861	50		34	34	68	264,248
	5	3,553	46		23	17	40	142,902
	6	3,322	43		2	3	5	16,739
	7	3,000	38		33	33	66	199,254
Admin	B2	5,100	50	3	4	3	10	51,150
	B4	3,280	42	4	24	23	51	168,246
Total				**44**	**1367**	**1342**	**2753**	**11,055,671**

Total Salary per Hour	**=**	**22,111.34**

Table 4.36: Total expenses per hour for double shift

M/C Cost per Hour	**=**	**1,838.46**
Total maintenance cost per Hour	**=**	**1,189.60**
Total utility expense per Hour	**=**	**5,860.00**
Floor rent per Hour	**=**	**2,400.00**
Total salary per Hour	**=**	**22,111.34**
Other expenses per Hour	**=**	**7,609.69**
Total expense (BDT) per Hour	**=**	**41,009.09**

4.5.5.3 Comparison between Hourly production Cost of Single Shift (Day Shift) & Double Shift (Day & Night Shift)

This bar diagram exhibits the comparison between Hourly Cost of Single Shift (Day Shift) & Double Shift (Day & Night Shifts). The blue bar stands for the Single shift & red bar for Double shift. It is clearly seen that the hourly cost for night shift is less than day shift which is about BDT 15000/=. It can be explicated as the machine life time will not be half for double shift and the floor rent is not double for double shift. Double shift is less expensive too from single shift in terms of workers salary as lack of general staffs in night shift though night shift workers received extra amount as night bill, Tiffin bill & conveyance bill.

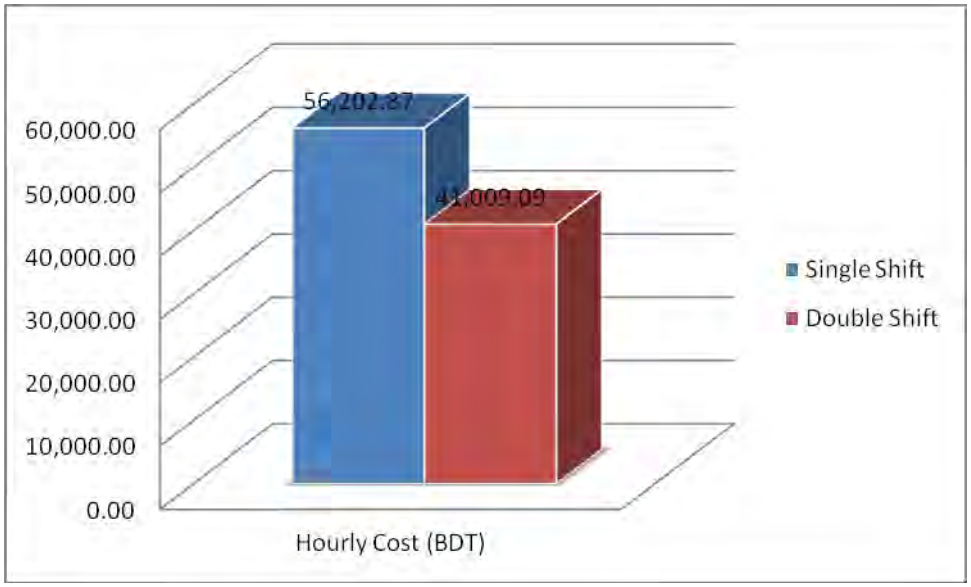

Figure 4.11: Hourly cost of single shift & double shift

4.5.6 Overtime (OT) Hours

According to Bangladesh Labour Code (2006) Section 100, regular work hours shall not be more than 8 hours per day and according to Section 102 & 108, working hours more than 8 hours per day and 48 per week shall be consider as overtime and all overtime hours shall be compensated at a rate of 200% of basic pay. Also according to section 100, daily work hours including overtime shall not exceeding the limit 10 per day and according to section 102, weekly work hours including overtime shall not exceeding the limit 60 per week. In CFDL (level-2), working hours between 16:30 to 18:30 (two hours) are regarded as day shift overtime and working hours between 4:00 to 6:00 (two hours) are regarded as night shift overtime. Basic hourly pay can be calculated as BDT 200 (medical allowance) is deducted from Net salary which is then divided by 208 (26 days per month multiplied by daily 8 hours). For the overtime (OT) hours, the payment is double of basic hourly pay. So, in the OT hours, the production cost is double than that of normal hours. In Bangladesh RMG sector, it is commonly seen that the OT exceeds more than 2 hours. Workers who are working more than 10 hours, are exhausted can cause productivity & quality deterioration as well as they are accident prone on that moment. In CFDL (level-2), grade 1 & grade 2 employees are not subjected to OT payment. OT requirement mostly depends on available lead time of existing orders, associated production plan as well as adequate supply of raw materials such as fabrics, accessories.

Table 4.37: Overtime hours for General, Day & Night Shift

Depart-ments	Grade	General Shift			Day Shift			Night Shift		
		No. of Workers	Total Working Days	OT Hours	No. of Workers	Total Working Days	OT Hours	No. of Workers	Total Working Days	OT Hours
Q.A.	1	1	25							
	2				7	175		8	200	
	3							2	50	101
	4				7	175	365	4	100	292
Store	B1				1	25	85			
	B2	1	25	41	6	150	481	6	150	404
	B4				8	200	953	6	150	543
Sewing	1				10	250		8	200	
	2	1	25		29	725		29	725	
	3	4	100	87	340	8500	17500	329	8225	16951
	4	8	200		220	5500	10722	239	5975	9769
	5				18	450	967	32	800	1237
	6				1	25	59	1	25	32
	7	3	75		205	5125	7036	196	4900	7711
Sample	1	2	50		1	25				
	3	6	150	560				1	25	78
	4	1	25	94						
	5				1	25	71			
Quality	1	1	25		4	100		3	75	
	2	1	25		11	275		9	225	
	3				22	550	1762	22	550	1879
	4	1	25		93	2325	5199	94	2350	5895
Planning	B2	2	50	140	1	25	79	2	50	112
	B3	1	25		1	25	81	1	25	77
	4				1	25	74			
Main-tenance	1				1	25				
	2	1	25		13	325		10	250	
	B2							1	25	61
	B4				1	25	76	1	25	53
	5				1	25				
	6				2	50	138	2	50	138
IE	B2	1	25		4	100	107	2	50	102
Finishing	1				1	25		2	50	
	2	1	25		6	150		7	175	
	3				10	250	911	17	425	1547
	4				106	2650	9573	82	2050	7565
	5				17	425	1393	10	250	853
	6				1	25	80			
	7				85	2125	7427	89	2225	7492

Cutting	1				1	25		2	50	
	2	1	25		4	100		3	75	
	B2				1	25	61			
	3				6	150	438	9	225	630
	4				34	850	2189	34	850	2346
	5				23	575	1497	17	425	1180
	6				2	50	137	3	75	265
	7				33	825	1825	33	825	1872
Admin	B2	3	75	379	4	100	319	3	75	293
	B4	4	100	475	24	600	2019	23	575	1885
Total		**44**	**1,100**	**1,776**	**1,367**	**34,175**	**73,624**	**1,342**	**33,550**	**71,363**

Table 4.38: Shift wise overtime hours summary

Shift	Total Employees	Working Days	Working Days Present	Normal Working Hours	Overtime Hours	OT Percentage
General	44	1,100	1,013	8,104	1,776	21.92%
Day	1,367	34,175	30,005	240,040	73,624	30.67%
Night	1,342	33,550	31,183	249,464	71,363	28.61%
Total	2,753	68,825	62,201	497,608	146,763	29.49%

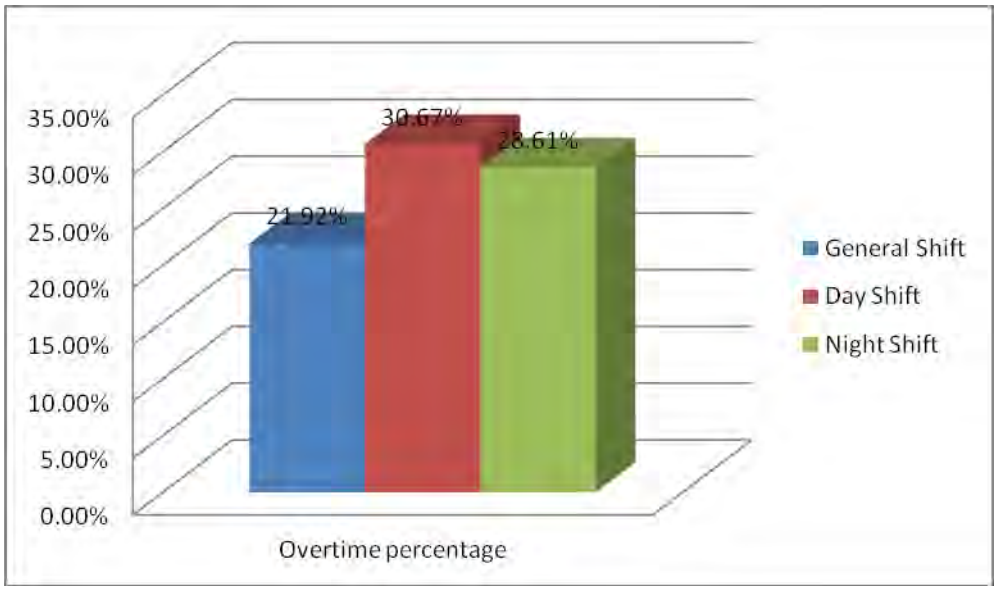

Figure 4.12: Shift wise overtime percentage

This bar diagram represents the overtime percentage for General, Day and Night shift. The blue bar stands for the General shift, red bar for Day shift & green bar for Night shift. From the observation it is clearly visible that the overtime hours is higer in the day shift than that of night shfit. It is noted that higher the overtime hours, higher the cost for production as overtime payment is 200% of basic pay. In this study overtime payment is not calculated rather only overtime hours is determined. As per labor law, daily two hours overtime is accepted with eight hours normal working hours and total working hours in week should not exceed 60 hours. That means 25% overtime percentage in relation to normal working time is accepted. But the diagram reveals that more than 25% overtime percentage for day shift & night shift which is breach of laws. Day shift overtime is high than that of night shift which may be explained as adequate & smooth raw material supply that may not possible in night shift overtime hours (4:00-6:00).

4.6 Benefits of Double Shifting

The complete analyses show that the following benefits can be achieved through double shifting

- **Assurance of quality improvement:** With the long working hour, the quality of garments is subjected to deteriorate. It is common in apparel industry to practice more than two hours (total working time up to 16 hours) overtime during single shift to meet daily production target. That's why the improvement of quality is ensured by double shifting as the span of each shift in double shifting is 8-11 hours.

- **Surety of on time delivery:** On time shipment (OTS) is confirmed through double shifting as the volume of daily production is increased.

- **Competitive rates:** Lower production cost which confirms lowest product price among competitors is comprised by double shifting.

- **Cost efficiency:** Profit maximization, the consequences of lowest manufacturing cost is dealt with double shifting.

- **Good relationship with buyers:** Maintaining OTS & quality improvement, double shifting is enhanced good relationships with buyer.

4.7 Need to be implemented in CFDL (Level-2) for double shifting:

Considering the cost effectiveness, double shifting can be utilized with the below provisions:

- ✓ **Child care facilities:** Provision of child care adapted to the needs of the employees at or near the place of work.
- ✓ **Canteen & rest facility:** Provision of rest areas and suitable meal facilities adapted to shift schedules.
- ✓ **Transport facilities:** Arrangements to ensure shift workers do not face transport difficulties, particularly night shift workers.
- ✓ **Security:** Provision of a safe and secure working environment, especially for women workers in night shifts. Also adequate security is needed in factory premises.
- ✓ **In house training & motivation:** In house training is needed to motivate the night shift workers & let them know how to cope with day shift & night shift work. It is also helped them to adjust with changing sleeping pattern. Provision to employees of professional advice and training on the health, safety and social effects of shift work, personal coping strategies and standard operating procedures that apply to specific shifts.
- ✓ **Entertainment:** Additional entertainment is needed for night shift workers. It can be done through playing songs in the floor.
- ✓ **Employee – Employer satisfaction:** Positive feedback from the employer is highly recommended for initiating double shift. It is advised to do consultation with employees, their families and unions in the design of rosters, including all arrangements for monitoring and changing rosters. Also need adequate supervision, including regular contact with shift workers in isolated situations. It has been suggested that married workers should be appointed for the same shift.
- ✓ **Adequate sleeping confirmation:** Assistance with modification of employees' homes to minimize noise, light, heat and other distractions, so adequate sleep is possible.
- ✓ **Expert advice:** Expert advice on the effects of the work environment and working hours on fatigue and alertness.
- ✓ **Roster formulation:** Formulation of rosters which do not result in excessive night work, excessive working hours, and inadequate rest breaks and/or breaks between shifts.
- ✓ **Breaks between shifts:** Breaks between shifts should not be less than 12 hours. On rosters with extended shifts, this minimum break (12 hours) should be alternated with a break of at least 24 hours.
- ✓ It is recommended that shifts do not start between midnight and 6 am.

CHAPTER 5

CONCLUSIONS & RECOMMENDATIONS

5.1 Conclusions

Currently, Bangladesh is securing 2nd place in the world apparel export with only 5.40% export coverage (> US$ 20 billion). It was 3rd in last year with 4.50% coverage and the growth rate is 20%. Accordingly to McKinsey report (2011), it will be $ 41 billion by 2020. In accordance with such steep growth rate our garments industries are not expand due to infrastructure, capital, and energy limitation. On the other hand, our manpower is booming regardless the situation. So, it is high time to implement double shifting in our garments industry in order to secure our place as well as keep the growth rate in apex through utilizing lower production cost. From the observation & analysis, the benefits of double shift are indisputable. After comparative study between single shift (day shift) & double shift (day & night shift) in terms of production, quality, labor absenteeism, hourly production cost, overtime; 16 pcs higher average hourly production for night shift than day shift, no significant quality difference between day & night shift; about 5% less labor absenteeism for night shift than day shift, BDT 15000 less hourly production cost for single shift than double shift and 2% less overtime worked in night shift than that of day shift. The RMG industries of Bangladesh should be aware of the importance of the use of double shifting. Though most of industries of Bangladesh practices single shift, there are some significant advantages for double shift than single shift which is found in this project. By using this result, it comes to find out that, higher the production per day & less production cost, higher the chance to defeat competitors through offering competitive price, higher the chance to getting order, higher the chance to meet on time delivery and better relationship with buyer. I hope that, these thesis findings will help the factory owners to think about the advantages of double shifting in their RMG factories.

Recent tragedy happened in Rana Plaza may put our RMG export in threat. But the hope is still stay alive, when Wendy R. Sherman, US under secretary of state for political affairs urged (on 28th May ’2013) international investors (apparel) not to turn their back on Bangladesh, because the solution is reform, not withdrawn. Now it is high time for Government to realize the importance of workforce and adopted welfare policies such as increasing wages, limiting working hours, providing trainings, establishing daycare centers and schools for the children of the workers etc.

5.2 Recommendations for further work:

- The financial feasibility can be further studied after implementing various facilities especially after providing transport facility, canteen facility; because they may increase the production cost.
- This study is completely based on progressive bundle system. It can be further studied by using modular system or any other production systems.
- Productivity and cost of making (CM) can be further studied after implementing Lean manufacturing.

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APPENDIX

Labour Law in Bangladesh:

Child Labor & Age Documentation

- The facility management shall maintain authentic age document (At least a medical certificate) for all the employees (Bangladesh Labour Code (2006), Sec.37).
- Shall not hire employees without any age proof. (Bangladesh Labour Code (2006), Sec.37)

Harassment/Abuse:

- No mental/verbal/physical/sexual abuse shall be at the facility (Bangladesh Labour Code (2006), Sec.332 for sexual harassment)

Freedom of Association

- There shall be workers participation committee as per Bangladesh Labour Code (2006), Sec.205
- Number of workers representative shall be at-least equal of the management representative in workers participation committee. Bangladesh Labour Code (2006), Sec.205
- The employees shall be free to join any union as per labor code 2006 section 195.

Work Hours

- Regular work hours shall not be more than 8 per day (Bangladesh Labour Code (2006), Sec.100)
- Daily work hours including overtime shall exceeding the limit 10 per day (Bangladesh Labour Code (2006), Sec.100)
- Weekly work hours including overtime shall not exceeding the limit 60 per week (Bangladesh Labour Code (2006), Sec.102)
- Employees are to be guaranteed at least one hour break after 6 hours of work or two ½ hour break one after 5 hours and the other after 8.5 hours. (Bangladesh Labour Code (2006), Sec.101)
- Female worker shall not work in between 10:00 pm to 6:00 am without any consent as per law. Bangladesh Labour Code (2006), Sec.109

- Seventh day rest shall be assured to the employees. Bangladesh Labour Code (2006), Sec.103.
- Facility management shall provide substitute holiday to the workers who worked on those holidays as per law requirements. Bangladesh Labour Code (2006), Sec.104

Wages and Benefit

- The wages of every worker shall be paid before the expiry of the seventh day after the last day of the wage period in respect of which the wages are payable.(Bangladesh Labor Code 2006 Section 123)
- Working hours more than 8 per day and 48 per week shall be consider as overtime and all overtime hours shall be compensated at a rate of 200%.Bangladesh Labour Code (2006), Sec.102 & 108
- Employees are to be provided with pay slips as per the Minimum Wages Rules (1961), Rule 17(2). Minimum wage shall be guaranteed to the employees as per Minimum Wages Gazette 2006. Daily rate is to be calculated as per Bangladesh Labour Code (2006), Sec.119 to meet the country law.
- Where the employment of any worker is terminated by retirement or by the employer, whether by way of retrenchment, discharge, removal, dismissal or otherwise, the wages payable to him shall be paid before the expiry of the seventh working day from the day on which his employment is so terminated. (Bangladesh Labor Code 2006 Section 123)
- Every worker shall be entitled for casual and sick leave right after joining. Bangladesh Labor code 2006 Section 115 and 116.
- The facility shall have a valid group insurance for employees as per Bangladesh Labor Code (2006), section 99.
- The facility shall provide maternity leave and maternity benefit. Bangladesh Labour Code (2006), Sec.47(4)
- The facility shall establish a Workers' Participation Fund and Workers' Welfare Fund. Bangladesh Labour Code (2006) Section 234 & 242

Health & Safety

- The factory management shall have approval on building plan from the Factory Chief Inspector as per Factories Rules (1979), Rule 3(1)

- The facility shall provide soap in the rest room areas. Factories Rules (1979) Rule 54 (1)
- The facility shall provide canteen facility to the employees (Bangladesh Labor code 2006 section 92). The facility shall provide dining area for employees (Bangladesh Labor code 2006 section 93).
- Sufficient seating arrangement (at least 30% of the employees who go for lunch) shall be provided in the dining hall. Factories Rules (1979) Rule 58
- As per Labor code 2006 section 94 child care room is to be provided. As per the factory rule 1979 section 65 there shall have washing facility with the child care room. As per the labor code 2006 Section 94 the child care room shall be safe and as well shall not be located near to the production floor.
- As per Factories Rules (1979) Rule 25 employees are to be provided with drinking water. It is suggested that the facility shall mark the drinking water location as "Pure drinking water" in local language. Bangladesh Labour Code (2006), Sec.58(1-2)
- Sufficient number of toilets shall be provided. Factories Rules (1979) Rule 27(1). As per Factories Rules (1979) Rule 27(1) tolilets shall be provided in every factory on the following scale:-

  (a) Where females are employed, there shall be at least one latrine for every 25 females.

  (b) Where males are employed, there shall be at least one latrine for every 25 males.

  Provided that, where the number of male employees exceeds 100, it shall be sufficient if there is one latrine for every 25 males up to the first 100, and one for every 50 thereafter. As per Factories Rules (1979) Rule 28 there shall be proper privacy in the toilets / marked by gender / separated for male and female.

- Secondary exit shall be available in all working area and all of the exit doors shall be remain open during the working hours. Factories Rules (1979), Rule 51(1-2)
- The facility shall install a fire alarm system Bangladesh Labor Code (2006), Sec.62 (5). Fire extinguisher shall be available in Factories Rules (1979), Rule 52(8). At least 25% employees shall train on using firefighting equipment's. Factories Rules (1979), Rule 52(9)
- Physically fit pregnant applicants are not hired reported by the employees /management.(Constitution of Bangladesh (1972), Art. 27)
- The facility shall have a well equipped ambulance room- Factories Rules (1979) Rule 56 (4). A record of all cases of accident and sickness shall be maintained. Factories Rules (1979) Rule 56(7).

- The facility shall provide sufficient natural or artificial light in the secondary stair. Bangladesh Labor Code (2006), Sec.57
- Provide copy of appointment letter, ID card and maintain service book for all employees. Bangladesh Labour Code (2006), Sec.5 & Sec.6
- The facility shall have full time doctor and nurse. Factories Rules (1979) section 56 (1)

Minimum wages:

According to declared gazette (minimum wage board , 2010) at different level on the go of worker wages frame are given below-

Worker: 'A' costume

Grade	Monthly original wage in money	Monthly house rent allowance 40% of original wage	Monthly treatment allowance money	Monthly total money
Grade 1	6,500.00	2,600.00	200.00	9.300.00
Designation	Pattern master, chief quality controller, chief cutting master/cutting chief, chief mechanic.			

Grade 2	5000.00	2000.00	200.00	7200.00
Designation	Mechanic/electrician, cutting master.			

Grade 3	2,870.00	1,148.00	200.00	4,218.00
Designation	Sample machinist, mechanic, senior sewing machine operator, senior winding machine operator, senior knitting machine operator, senior liking machine operator, senior cutter, senior quality inspector, senior marker / senior drawing man / senior drawing woman, senior line leader, senior over lock machine operator, senior button machine operator, senior Kansai machine operator.			

Grade 4	2,615.00	1,046.00	200.00	3861.00
Designation	Sewing machine operator, winding machine operator, knitting machine operator, liking machine operator, marker / drawing man / drawing woman , cutter, mending, pressing man / pressing woman / finishing iron man / finishing iron woman, folder(finishing section), packer, quality inspector, over lock machine operator, button machine operator, Kansai machine operator, poly man / poly woman, packing man / packing woman, line leader.			

Grade 5	2,395.00	958.00	200.00	3.553.00
Designation	Junior sewing machine operator, junior winding machine operator, junior knitting machine operator, junior liking machine operator, junior marker / drawing man / drawing woman, junior cutter, junior mending operator, junior pressing man / pressing woman / finishing iron man / finishing iron woman, junior folder(finishing section), junior electrician, junior, junior packer, junior over lock machine operator, junior button machine operator, junior Kansai machine operator.			

Grade 6	2,230.00	892.00	200.00	3,322.00
Designation	General sewing machine operator, general winding machine operator, general knitting machine operator, general liking machine operator, general mending operator, general fusing machine operator, general collar turning machine operator, general over lock machine operator, general button machine operator, general Kansai machine operator.			

Grade 7	2,000.00	800.00	200.00	3,000.00
Designation	Assistant sewing machine operator, assistant winding machine operator, assistant knitting machine operator, assistant liking machine operator, assistant mending machine operator, assistant cutter, assistant marker / drawing man / drawing woman, packet creasing machine operator / creasing man / creasing woman, line iron man / line iron woman, assistant dry washing man / assistant dry washing woman, over lock machine assistant, button machine assistant, Kansai machine assistant , assistant finishing.			

Trainee / freshman: Training allowance 2,500.00 tk. Training time 3 months. If you are not satisfied with the quality of work can be further extended for three months. The workers will be employed at the end of the corresponding period of beginner grade.

Assistant: "B" costume

Grade	the monthly wage	The monthly house rent allowance in the wage of 40%	Monthly medical allowance of Rs	Total monthly cost
grade 1	4500.00	1800.00	200.00	6500.00
Designation	Store keeper			

Grade 2	3500.00	1400.00	200.00	5100.00
Designation	Accounts Assistant, Store assistant, cashier, import / export assistant, computer operator			

Grade 3	3000.00	1200.00	200.00	4400.00
Designation	Typist, Clark / office assistant, telephone operator, time keeper , care taker security guard, driver, cash assistant			

Grade 4	2200.00	880.00	200.00	3280.00
Designation	Peon, checker, cook, sweeper.			

Note: 4th minimum wage structure for the garment workers.

Team- A		Day		HOURLY SWEING PRODUCTION REPORT											DATE :-	10-Mar-13
Sew. Ln.	Buyer	Style	DPI	Color	Dispo	Dispo line	Target	Work Hour.	2Hour. Target	2 Hour Actual Production					Total	Remarks
										07:30-9:30	09:30-11:30	11:30-14:30	14:30-16:30	16:30-18:30		
5A01	Walmart	FG-1583	300100	White	230361	5	1,500	10	300	40	460	400	340	260	1500	
5B01	Walmart	FG-1583	300100	White	230361	5	1,500	10	300	180	300	400	360	260	1500	
5C01	Walmart	FG-1583	202041	Serano	230101	11	1,500	10	300	140	320	300	340	400	1500	
5D01	Walmart	FG-1583	300100	Red	230361	3	1,500	10	300	200	360	360	360	220	1500	
5E01	Walmart	FG-1583	300100	Blue	230361	2	1,500	10	300	140	300	460	400	200	1500	
5F01	Just Group	940526	300052	navy	230193	3	620	10	124	60	100	100	140	200	600	
5G01	Just Group	940526	300052	khaki	230192	1	620	10	124	60	160	140	120	120	600	
5H01	Walmart	FG-1583	300100	Red	230361	3	1,500	10	300	140	280	360	340	320	1440	
5I01	Walmart	FG-1583	300100	Blue	230361	2	1,500	10	300	160	240	360	320	360	1440	
5J01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	140	260	360	400	340	1500	
TOTAL							13,240	100	2,648	1,260	2,780	3,240	3,120	2,680	13,080	

Create By: Pintu Sarkar,Plnning,CFDL- 2

Team- B	Night	HOURLY SWEING PRODUCTION REPORT								DATE :- 10-Mar-13						
Sew. Ln.	Buyer	Style	DPI	Color	Dispo	Dispo line	Target	Work Hour.	2Hour. Target	2 Hour Actual Production					Total	Remarks
										19:30-21:30	21:30-23:30	23:30-02:00	02:00-04:00	04:00-6:00		
5A01	Walmart	FG-1583	300100	Khaki	230361	5	920	10	184	280	320	280	300		1180	
5B01	Walmart	FG-1583	300100	Khaki	230361	5	1,500	10	300	260	340	400	300		1300	
5C01	Walmart	FG-1583	300100	Orange	230361	5	1,500	10	300	180	280	320	360		1140	
5D01	Walmart	FG-1583	300100	Aqua	230361	3	1,500	10	300	240	320	340	380		1280	
5E01	Walmart	FG-1583	300100	Lemon	230361	2	1,500	10	300	260	320	320	300		1200	
5F01	Just Group	940526	300052	Khaki	230193	4	620	10	124	40	120	160	180		500	
5G01	Just Group	940526	300052	Khaki	230193	4	620	10	124	NILL	60	120	140		320	
5H01	Walmart	FG-1583	300100	Army	230361	3	920	10	184	120	280	280	300		980	
5I01	Walmart	FG-1583	300100	Blue	230361	2	1,500	10	300	180	280	360	340		1160	
5J01	Walmart	FG-1583	300100	Blue	230361	1	1,500	10	300	180	300	320	360		1160	
TOTAL							12,080	100	2,416	1,740	2,620	2,900	2,960		10,220	

Create By: Pintu Sarkar,Plnning,CFDL- 2

Team- A		Day		HOURLY SWEING PRODUCTION REPORT											DATE :-	19-03-13
Sew. Ln.	Buyer	Style	DPI	Color	Dispo	Dispo line	Target	Work Hour.	2Hour. Target	2 Hour Actual Production					Total	Remarks
										07:30-9:30	09:30-11:30	11:30-14:30	14:30-16:30	16:30-18:30		
5A01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	180	280	320	360		1140	
5B01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	160	320	320	340		1140	
5C01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	120	340	320	280	80	1140	
5D01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	140	240	320	260	180	1140	
5E01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	160	220	300	340	120	1140	
5F01	Walmart	FG-1583	300100	Black	230361	1	1,400	10	280	40	80	200	460	320	1100	
5G01	Walmart	FG-1583	300100	Black	230361	1	1,400	10	280	140	220	280	280	120	1040	
5H01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	180	240	320	300	100	1140	
5I01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	100	200	260	360	220	1140	
5J01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	80	240	160	420	240	1140	
TOTAL							14,800	100	2,960	1,300	2,380	2,800	3,400	1,380	11,260	

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Team- B	Night	HOURLY SWEING PRODUCTION REPORT												DATE :-	19-03-13
Sew. Ln.	Buyer	Style	DPI	Color	Dispo	Dispo line	Target	Work Hour.	2Hour. Target	2 Hour Actual Production					Total	Remarks
										19:30-21:30	21:30-23:30	23:30-02:00	02:00-04:00	04:00-6:00		
5A01	Walmart	FG-1583	300100	white	230361	3	1,500	10	300	220	320	360	250		1150	
5B01	Walmart	FG-1583	300100	Red	230361	3	1,500	10	300	280	300	320	250		1150	
5C01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	240	220	340	350		1150	
5D01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	160	280	340	370		1150	
5E01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	140	280	300	430		1150	
5F01	Walmart	FG-1583	300100	Black	230361	1	710	10	142	60	220	260	610		1150	
5G01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	60	160	220	710		1150	
5H01	Walmart	FG-1583	300100	Sarano	230361	1	1,500	10	300	180	280	300	390		1150	
5I01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	160	260	400	330		1150	
5J01	Walmart	FG-1583	300100	Black	230361	1	1,500	10	300	80	260	280	530		1150	
TOTAL							14,210	100	2,842	1,580	2,580	3,120	4,220		11,500	

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CFDL-2 Bottom

Beximco Industrial Park

Daily Manpower Status

Date 31-Mar-13 Team-A (NIGHT)

	Authorised Manpower including 7% absentism			Employed			Manpower required as per current OB			Today Present			To day Variance (from present to Required)			Remarks
Line	Operator	Helper + fuse man	Iron Man	Operator	Helper + fuse man	Iron Man	Operator	Helper + fuse man	Iron man	Operator	Helper + fuse man	Iron man	Operator	Helper + fuse man	Iron man	LINE WISE TOTAL MANPOWER
1	58	15.6	5	62	14	5	54	15	3	61	13	4	7	-2	1	78
2	58	15.6	5	58	14	6	51	15	5	55	14	5	4	-1	0	74
3	58	15.6	5	60	14	5	51	15	5	59	13	5	8	-2	0	77
4	58	15.6	5	64	12	4	51	15	5	61	11	4	10	-4	-1	76
5	58	15.6	5	54	17	6	51	15	5	53	17	5	2	2	0	75
6	58	15.6	5	59	11	3	54	15	3	58	11	3	4	-4	0	72
7	58	15.6	5	56	17	5	54	15	3	55	17	5	1	2	2	77
8	58	15.6	5	57	16	6	54	15	3	55	16	6	1	1	3	77
9	58	15.6	5	52	23	8	51	15	5	51	19	8	0	4	3	78
10	58	15.6	5	57	18	5	51	15	5	55	17	5	4	2	0	77
C-Team					0						0					
NEW																
Total	580	156	50	579	156	53	522	150	42	563	148	50	41	-2	8	761
				Daily fill only this column						Daily fill only this column						