# Faculty of Engineering

Department of Textile Engineering

Project On

# STUDY ON INDUSTRIAL ENGINEERING

**Course Title: Thesis**

**Course code: TE-4214**


**Submitted By:**

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The Report presented in Partial Fulfillment of the requirement for the degree of **Bachelor of Science in Textile Engineering**

**Advance in Apparel Manufacturing Technology**

**Duration Time: May 01, 2025 to September 17, 2025**

# LETTER OF APPROVAL

To

The Head

Department of Textile Engineering

Daffodil International University

Daffodil Smart City (DSC), Birulia, Savar, Dhaka-1216, Bangladesh

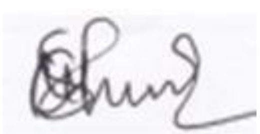
<u>Subject: Approval of Thesis Report of B.Sc. in TE Program</u>

Dear Sir,

We would like to inform you that the project report titled *"Study on Industrial Engineering"* has been completed by the following students: Md. Rashadul Islam Rony (ID: 182-23-5395), Ali Azam (ID: 182-23-5398), and Md. Mizanur Rahman (ID: 182-23-5406). This report is now ready for final evaluation. It has been prepared after careful research and analysis of real-world data, with full involvement from the students throughout the process. The report contains valuable insights that we believe will be beneficial for readers.

We kindly request you to accept this thesis report and consider it for final evaluation.

Yours Sincerely



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**Md. Masud Raihan**

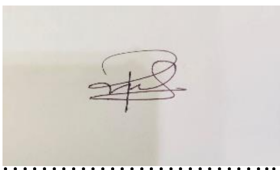
Assistant Professor

Department of Textile Engineering

# DECLARATION

It is hereby certified that we have written this thesis under the supervision of **Md. Masud Raihan**, Assistant Professor, Department of Textile Engineering at Daffodil international University, Faculty of Engineering.

This is also to confirm that we have not submitted the thesis or any portion of it anywhere to any degree or diploma.



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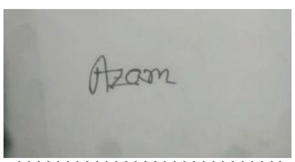
Rashadul Islam Rony

ID: 182-23-5395

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Ali Azam

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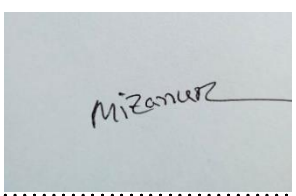


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Mizanur Rahman

ID: 182-23-5406

# DEDICATION

At the outset we would like to sincerely thank Almighty Allah whose blessings and guidance has helped us in writing our thesis.

We wish to express our deepest appreciation to Md. Masud Raihan, Assistant Professor, Department of Textile Engineering, Daffodil International University, who has been so much to us in this study and during the entire process.

We also want to deeply thank our fathers whose commitment, sacrifices and guidance have been the strength of our academic successes.

# ACKNOWLEDGEMENT

First, we would hereby like to thank Almighty Allah first, through His blessings we have been able to complete this industrial training.

We would like to especially thank our supervisor, Md. Masud Raihan, Assistant Professor, Department of Textile Engineering, Daffodil International University, Dhaka, whose thorough understanding coupled with interest in garment manufacture both inspired and directed us during the project. His constant encouragement, wise advises, patient supervision, positive feedbacks and untiring work in the revisions and enhancement of our work were irreplaceable to this successful completion of this training.

We also wish to thank the management at Natural Denims Ltd. wholeheartedly who gave us the chance to complete our training in their establishment. We would like to express our particular gratitude to Mr. Abu Khaer Ferdous (Manager, I.E. & Planning) and Md. Kaisar Ahmed (IE Executive) who provided us with kind guidance and supervision during our training duration. We also feel greatly obliged to all the employees of the Natural Denims Ltd. who invested their time, knowledge and experience in us.

We are glad that all the people at the Natural Denims Ltd. were very cooperative, motivating and gave us valuable information throughout our two months training period.

Lastly, we go ahead and pay our humble gratitude and respect to our parents who have never given up and indeed we have in no way thanked them enough, because their sacrifice and inspiration are what powered us.

# ABSTRACT

In this thesis, the research on Standard Minute Value (SMV) and division of actions in garment production are discussed. The study was carried out in Natural Denims Ltd where the SMV data and other information were obtained. Major tasks were time studies, operation breakdown, production and capacity tests, setting targets, and evaluation of the overall performance.

The post and pre-implementation situations were compared to estimate the level of labor productivity and efficiency. An alternative production layout was even prepared to illustrate increases in productivity.

Its analysis indicates the way in which time, capacity, targets, SMV and operations evaluation techniques can be measured. It also carries information on operations failures, experimentation and reviews of different processes. The result is the calculated SMV of various garments e.g. pants (12.5), extended pants.

# Table of Contents

# CHAPTER - 1: INTRODUCTION

## 1.1 Introduction:

In the garment industry, productivity plays a crucial role in boosting profits. Achieving this requires efficient use of machinery, labor, methods, and raw materials. Minimizing waste and ensuring optimal utilization of materials can significantly enhance profitability. Reducing lead times and downtime, as well as making better use of time, can further increase profits. An industrial engineering team can contribute greatly by minimizing wasted time, improving workflow, and ensuring a balanced workforce. This research focuses on how industrial engineers can enhance productivity and profitability in the garment industry.

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## 1.2 IE Industrial Engineering Job Nature:

Industrial Engineers work to optimize how organizations use their essential resources—people, machines, materials, information, and energy—to produce goods or provide services. They serve as a bridge between management goals and actual performance. Unlike other types of engineers who mainly focus on designing products or processes, Industrial Engineers focus on boosting efficiency by improving how people, business operations, and technology are managed.

**To solve organizational, production and related problems most efficiently, industrial engineers**

1. Analyze the product and its requirements.
2. Apply mathematical techniques to meet product needs.
3. Design manufacturing and information systems for efficient operations
4. Create management control systems for financial planning and cost analysis.
5. Develop production planning and control systems to streamline processes and maintain quality.
6. Improve systems for the distribution of goods and services.
7. Identify the best plant location by considering raw material availability, transportation, and costs

## 1.3 Objective of the project:

- Boost productivity.
- Improve processes by minimizing unnecessary movements
- Reduce work-in-progress (WIP) and eliminate bottlenecks.
- Enhance operational efficiency.

- Lower the man-machine ratio
- Optimize processes to cut costs, waste, and defects.

## 1.4 The significance of the Project:

- Textile and the apparel sector contributes to 80-85 per cent of the foreign earnings of the country.
- IE plays a major role in textiles and its related sectors.
- This initiative could help technology manufacturers take the lead in advancing the textile and apparel industry in developing countries..
- As a developing nation, Bangladesh relies heavily on foreign currency earnings.

## 1.5 Scope of this Project:

- There are vast opportunities to make improvements in the (IE) department of garment factories.
- Nowadays, IE is in high demand for boosting production.
- The Readymade garments industry offers numerous opportunities to develop and apply IE techniques for efficiency gains.
- It is an engaging field, attracting research from various industries to improve productivity through IE.
- RMG industry leaders understand the growing need for a strong IE department to maximize production output.

# CHAPTER – 2: LITERATURE REVIEW

## 2.0 Definition:

Industrial engineering (IE) is a field that aims at raising productivity, efficiency and quality through analysis, design and optimization or redesign of systems, processes, products and services as well as facilities in industries like; textiles, apparel and manufacturing industries.

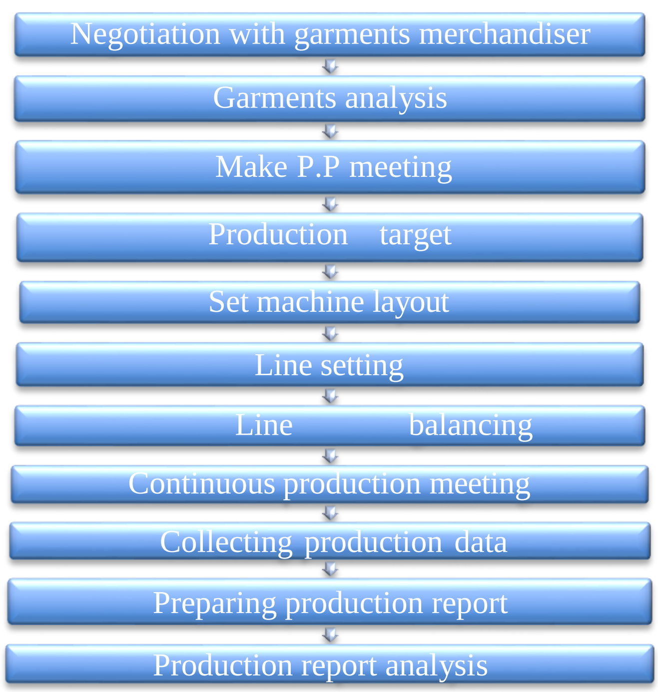
## 2.1 Concept of IE:

Efficient manufacturing is essential for commercial production, requiring the seamless integration of people, time, machinery, and textiles into a well-organized system. The technology used in apparel production should maintain product quality, streamline processes, meet delivery deadlines, and optimize resource utilization while keeping costs low.

### 2.1.1 Objects of IE:

- Find ways to improve operations and reduce production costs.
- Create programs aimed at reducing expenses.

### 2.1.2 Process Flow chart of IE:



## 2.1.3 The tasks of an Industrial Engineer (IE)

- Identify the most efficient work methods and establish the best approach to complete tasks while maintaining quality standards (Standard Time).
- Develop fair salary structures and incentive programs.
- Analyze profitable lot sizes and optimize processing at each stage to support system design for inventory management.

## 2.1.4 What an IE does Example activities:

- Develop time standards, costing methods, and performance benchmarks.
- Choose efficient processes and assembly methods.
- Select and design appropriate tools and equipment.
- Plan facility design, including plant location, building layout, machinery placement, material handling systems, and storage for raw materials and finished goods.
- Implement cost control measures.
- Utilize mathematical and statistical analysis for better decision-making.
- Conduct performance evaluations to enhance efficiency.

## 2.1.5 Job description of an Industrial Engineer:

- Design the production layout.
- Determine essential work aids.
- Prepare daily production reports.
- Monitor and follow up on line WIP.
- Track hourly production.
- Prepare style changeover reports.
- Follow up on sample production reports.

## 2.2 Line Balancing:

Line balancing helps distribute workload evenly across all workstations or process stages, eliminating bottlenecks and excess capacity. When restrictions occur, downstream tasks are delayed, and idle capacity leads to higher fixed costs. This process is managed by assessing quality and performance standards (S/M).

The type of clothing being produced determines the approach to line balancing, which ultimately aims to enhance productivity. In mass production, a structured line with in-line finishing and Packing is set up either as a continuous flow or by sections. Each line consists of multiple workstations with different tasks. Hourly production varies based on the complexity of operations, the standard time required for each task, workforce allocation, operator skill levels, and available inventory. The operation with the lowest hourly output becomes the bottleneck, limiting overall production efficiency.

### 2.2.1 Efficiency:

Efficiency is a key metric for measuring production performance, even though effectiveness provides a broader perspective. Efficiency helps determine how well a specific production goal is met. It is typically calculated in terms of time per garment or the required output level.

The standard efficiency target is 100%, meaning that if an operator meets their assigned production goal, their efficiency is considered 100%. If they achieve only 80% of the target, their efficiency is 80%.

The formula to calculate efficiency is:

Efficiency(%)=(Total Production×SMVTotal Manpower×Working Hours×60)×100\text{Efficienc y} (\%) = \left( \frac{\text{Total Production} \times \text{SMV}}{\text{Total Manpower} \times \text{Working Hours} \times 60} \right) \times 100Efficiency(%)=(Total Manpower×Working Hours×60Total Production×SMV)×100

Where:

- **Total Production** = Number of garments produced
- **SMV (Standard Minute Value)** = Time allocated per garment
- **Total Manpower** = Number of workers involved
- **Working Hours** = Total hours worked

### 2.2.2 Cycle checks:

A cycle review is a short-term study conducted to quickly set a goal or verify whether an employee can complete a task within a specified time. It focuses on assessing the time required for a single work cycle.

Cycle time refers to the duration an operator takes to complete one full cycle of a task, from the start (collecting materials) to the finish (disposing or passing the completed work). This helps in evaluating productivity and setting realistic performance targets.

## 2.3 Standard Minute Value (SMV):

SMV, or Standard Minute Value, is the time required to complete a specific task efficiently under ideal conditions. In the textile manufacturing industry, it is also known as Standard Allowed Minutes (SAM).

Determining the correct SMV is crucial for merchants to ensure smooth and timely execution of export orders. It helps in setting production targets, optimizing workflow, and improving overall efficiency on the garment production floor.

## 2.4 Bottleneck:

A bottleneck occurs when a shortage of materials or resources slows down the overall production process, limiting system capacity. It is similar to the narrow neck of a bottle, where the flow from a wider section to a smaller opening is restricted. In manufacturing, a bottleneck represents a point of congestion that reduces efficiency and disrupts smooth workflow. Identifying and addressing bottlenecks is essential for maintaining optimal production performance.

## 2.5 Bottleneck areas:

A. Bottleneck before input in line:

- Errors in construction or assembly.
- Supply of incorrect materials or components.
- Delays in resolving issues.
- Mistakes in barcode labeling.
- Defects or inconsistencies in patterns.

B. Bottleneck in Line:

- Shading of color.
- Selecting the worker incorrectly.
- Failure of employees to work.

## 2.6 Pitch Time:

In industrial engineering, **pitch time** refers to the ratio between the total Standard Minute Value (SMV) of a garment and the number of operations required for a particular style. It is calculated as:

**Pitch time = (Total Garment SMV) / (Number of Operations)**

Pitch time plays a key role in setting up production lines and calculating production targets, as it helps determine the optimal time required for each operation to ensure efficiency.

## 2.7 Rating:

In time study, **rating** (known as **grading** in the U.S.) is an essential factor in assessing worker performance. An experienced time study practitioner can accurately rate an operator's performance, setting them apart from beginners.

Rating involves comparing an operator's actual speed of work to a mental benchmark of **normal performance**. This numerical value helps determine how efficiently a task is being completed. For accurate rating, there must be a clearly defined standard of performance to serve as a reference.

The formula for rating is:

Rating(%)=(Basic TimeObserved Time)×100\text{Rating} (\%) = \left( \frac{\text{Basic Time}}{\text{Observed Time}} \right) \times 100Rating(%)=(Observed TimeBasic Time)×100

Where:

- **Basic Time** = Adjusted time for standard performance
- **Observed Time** = Time recorded during the study

## 2.8 Work study:

Work Studies is a standardized global method used to assess and set time standards and material requirements. Its primary goal is to enhance production efficiency by making the best use of human effort, equipment, and materials, ensuring maximum output with minimal waste.

### 2.8.1 Objectives of Work Study:

- Enhanced workflow processes.
- Reduced fatigue for operators and employees.
- Effective labor management.
- Optimal use of resources.
- Proper assessment of machinery requirements.

- Fair salaries distribution.
- Help with accurate delivery calculation.

## 2.9 Method Study:

Methodological studies focus on systematically documenting and evaluating existing techniques to develop more efficient and streamlined processes for both present and future tasks. The primary goal is to reduce costs while improving productivity. This approach is particularly important in the textile and clothing industries, where optimizing workflows can significantly enhance overall efficiency. Industrial engineers play a key role in conducting and overseeing these studies to ensure continuous process improvement.

### 2.9.1 Time Study:

Time Study is a measurement that is done in order to determine the amount of time that a particular task takes under certain conditions to be done. The obtained data is used in analysis to establish the standard time that an operator requires to complete the task using the desirable level of efficiency. This is useful in realistic performance target setting, enhanced productivity and optimized workflow.

### 2.9.2 Operator Performance:

Basically the operator performance can be monitored with the help of three efficiency factors.

- Single cycle efficiency.
- On-standard efficiency.
- Global efficiency.

Single cycle efficiency= $\frac{Target\ single\ cycle\ time\ in\ minute}{Average\ observed\ single\ cycle\ time\ in\ minute}$

On-standard efficiency= $\frac{Operator\ production \times SMV\ per\ piece\ of\ the\ operation}{Working\ time\ in\ minute - Off\ standard\ time\ in\ minutes}$

Here, the production time is not considered.

### 2.9.3 Capacity Study:

Capacity measurement reflects an operator's ability to perform efficiently based on their observed performance. Key factors in capacity analysis include **quotas, operator motivation, and capacity assessment** A supervisor can determine the total capacity of a department by evaluating the individual capacity of each operator. Essentially, it represents the **combined capability of all workers**, ensuring that production targets are realistic and achievable.

# CHAPTER – 3: EXPERIMENTAL DETAILS

# 3.0 EXPERIMENTAL DETAILS:

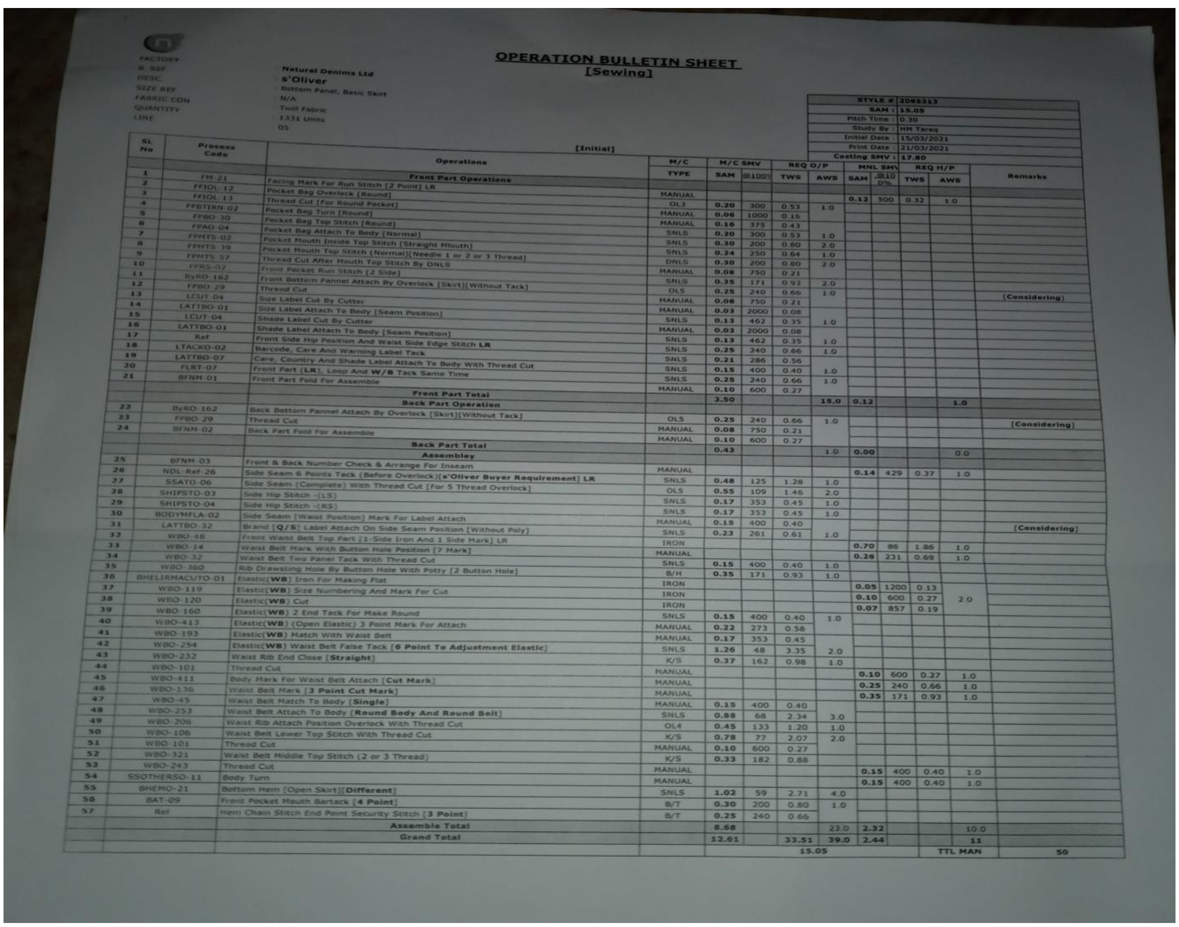
We collected the operation breakdown and format sheet from **Natural Denim Ltd.**, using data recorded as of **February 24, 2021**. The documentation process included several key steps: **format analysis, line capacity assessment, SMV calculation, setting production targets, pitch time evaluation, efficiency measurement, and overall calculations.** These steps helped in analyzing production performance and optimizing workflow efficiency.

## 3.1 Operation Bulletin: 5-Pocket Long Mens & Long Women Pants

**Natural Denim's Ltd.**

Buyer Name: S' OLIVER

ITEM: WOMENS PANT



**OPERATION BULLETIN SHEET**
**[Sewing]**

FACTORY : Natural Denims Ltd
B. REF : s'Oliver
DESC. : Bottom Panel, Basic Skirt
SIZE REF : N/A
FABRIC CON : Twill Fabric
QUANTITY : 1331 Units
LINE : 05

| | |
|---|---|
| STYLE # | 2065313 |
| SAM | 15.05 |
| Pitch Time | 0.30 |
| Study By | HM Tareq |
| Initial Date | 15/03/2021 |
| Print Date | 21/03/2021 |
| Costing SMV | 17.80 |

[Initial]

| SL No | Process Code | Operations | M/C TYPE | M/C SMV SAM | M/C SMV @100% | REQ O/P TWS | REQ O/P AWS | MNL SMV SAM | MNL SMV @100% | REQ H/P TWS | REQ H/P AWS | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Front Part Operations** | | | | | | | | | | |
| 1 | FM-21 | Facing Mark For Run Stitch (2 Point) LR | MANUAL | | | | | 0.12 | 500 | 0.32 | 1.0 | |
| 2 | FFIOL-12 | Pocket Bag Overlock [Round] | OL3 | 0.20 | 300 | 0.53 | 1.0 | | | | | |
| 3 | FFIOL-13 | Thread Cut [For Round Pocket] | MANUAL | 0.06 | 1000 | 0.16 | | | | | | |
| 4 | FPBTIRN-02 | Pocket Bag Turn [Round] | MANUAL | 0.16 | 375 | 0.43 | | | | | | |
| 5 | FPBO-30 | Pocket Bag Top Stitch [Round] | SNLS | 0.20 | 300 | 0.53 | 1.0 | | | | | |
| 6 | FPAO-04 | Pocket Bag Attach To Body [Normal] | SNLS | 0.30 | 200 | 0.80 | 2.0 | | | | | |
| 7 | FPMTS-02 | Pocket Mouth Inside Top Stitch [Straight Mouth] | SNLS | 0.24 | 250 | 0.64 | 1.0 | | | | | |
| 8 | FPMTS-39 | Pocket Mouth Top Stitch (Normal)(Needle 1 or 2 or 3 Thread) | DNLS | 0.30 | 200 | 0.80 | 2.0 | | | | | |
| 9 | FPMTS-57 | Thread Cut After Mouth Top Stitch By DNLS | MANUAL | 0.08 | 750 | 0.21 | | | | | | |
| 10 | FPRS-02 | Front Pocket Run Stitch (2 Side) | SNLS | 0.35 | 171 | 0.93 | 2.0 | | | | | |
| 11 | ByRO-162 | Front Bottom Pannel Attach By Overlock [Skirt][Without Tack] | OLS | 0.25 | 240 | 0.66 | 1.0 | | | | | [Considering] |
| 12 | FPBO-29 | Thread Cut | MANUAL | 0.08 | 750 | 0.21 | | | | | | |
| 13 | LCUT-04 | Size Label Cut By Cutter | MANUAL | 0.03 | 2000 | 0.08 | | | | | | |
| 14 | LATTBO-01 | Size Label Attach To Body [Seam Position] | SNLS | 0.13 | 462 | 0.35 | 1.0 | | | | | |
| 15 | LCUT-04 | Shade Label Cut By Cutter | MANUAL | 0.03 | 2000 | 0.08 | | | | | | |
| 16 | LATTBO-01 | Shade Label Attach To Body [Seam Position] | SNLS | 0.13 | 462 | 0.35 | 1.0 | | | | | |
| 17 | Ref | Front Side Hip Position And Waist Side Edge Stitch LR | SNLS | 0.25 | 240 | 0.66 | 1.0 | | | | | |
| 18 | LTACKO-02 | Barcode, Care And Warning Label Tack | SNLS | 0.21 | 286 | 0.56 | | | | | | |
| 19 | LATTBO-07 | Care, Country And Shade Label Attach To Body With Thread Cut | SNLS | 0.15 | 400 | 0.40 | 1.0 | | | | | |
| 20 | FLRT-07 | Front Part (LR), Loop And W/B Tack Same Time | SNLS | 0.25 | 240 | 0.66 | 1.0 | | | | | |
| 21 | BFNM-01 | Front Part Fold For Assemble | MANUAL | 0.10 | 600 | 0.27 | | | | | | |
| | | **Front Part Total** | | 3.50 | | | 15.0 | 0.12 | | | 1.0 | |
| | | **Back Part Operation** | | | | | | | | | | |
| 22 | ByRO-162 | Back Bottom Pannel Attach By Overlock [Skirt][Without Tack] | OLS | 0.25 | 240 | 0.66 | 1.0 | | | | | [Considering] |
| 23 | FPBO-29 | Thread Cut | MANUAL | 0.08 | 750 | 0.21 | | | | | | |
| 24 | BFNM-02 | Back Part Fold For Assemble | MANUAL | 0.10 | 600 | 0.27 | | | | | | |
| | | **Back Part Total** | | 0.43 | | | 1.0 | 0.00 | | | 0.0 | |
| | | **Assembley** | | | | | | | | | | |
| 25 | BFNM-03 | Front & Back Number Check & Arrange For Inseam | MANUAL | | | | | 0.14 | 429 | 0.37 | 1.0 | |
| 26 | NDL-Ref-26 | Side Seam 6 Points Tack (Before Overlock)[s'Oliver Buyer Requirement] LR | SNLS | 0.48 | 125 | 1.28 | 1.0 | | | | | |
| 27 | SSATO-06 | Side Seam (Complete) With Thread Cut [For 5 Thread Overlock] | OLS | 0.55 | 109 | 1.46 | 2.0 | | | | | |
| 28 | SHIPSTO-03 | Side Hip Stitch -(LS) | SNLS | 0.17 | 353 | 0.45 | 1.0 | | | | | |
| 29 | SHIPSTO-04 | Side Hip Stitch -(RS) | SNLS | 0.17 | 353 | 0.45 | 1.0 | | | | | |
| 30 | BODYMFLA-02 | Side Seam [Waist Position] Mark For Label Attach | MANUAL | 0.15 | 400 | 0.40 | | | | | | |
| 31 | LATTBO-32 | Brand [Q/S] Label Attach On Side Seam Position [Without Poly] | SNLS | 0.23 | 261 | 0.61 | 1.0 | | | | | [Considering] |
| 32 | WBO-48 | Front Waist Belt Top Part [1-Side Iron And 1 Side Mark] LR | IRON | | | | | 0.70 | 86 | 1.86 | 1.0 | |
| 33 | WBO-14 | Waist Belt Mark With Button Hole Position [7 Mark] | MANUAL | | | | | 0.26 | 231 | 0.69 | 1.0 | |
| 34 | WBO-32 | Waist Belt Two Panel Tack With Thread Cut | SNLS | 0.15 | 400 | 0.40 | 1.0 | | | | | |
| 35 | WBO-360 | Rib Drawsting Hole By Button Hole With Potty [2 Button Hole] | B/H | 0.35 | 171 | 0.93 | 1.0 | | | | | |
| 36 | BHELIRMACUTO-01 | Elastic(WB) Iron For Making Flat | IRON | | | | | 0.05 | 1200 | 0.13 | 2.0 | |
| 37 | WBO-119 | Elastic(WB) Size Numbering And Mark For Cut | IRON | | | | | 0.10 | 600 | 0.27 | | |
| 38 | WBO-120 | Elastic(WB) Cut | IRON | | | | | 0.07 | 857 | 0.19 | | |
| 39 | WBO-160 | Elastic(WB) 2 End Tack For Make Round | SNLS | 0.15 | 400 | 0.40 | 1.0 | | | | | |
| 40 | WBO-413 | Elastic(WB) (Open Elastic) 3 Point Mark For Attach | MANUAL | 0.22 | 273 | 0.58 | | | | | | |
| 41 | WBO-193 | Elastic(WB) Match With Waist Belt | MANUAL | 0.17 | 353 | 0.45 | | | | | | |
| 42 | WBO-254 | Elastic(WB) Waist Belt False Tack [6 Point To Adjustment Elastic] | SNLS | 1.26 | 48 | 3.35 | 2.0 | | | | | |
| 43 | WBO-232 | Waist Rib End Close [Straight] | K/S | 0.37 | 162 | 0.98 | 1.0 | | | | | |
| 44 | WBO-101 | Thread Cut | MANUAL | | | | | 0.10 | 600 | 0.27 | 1.0 | |
| 45 | WBO-411 | Body Mark For Waist Belt Attach [Cut Mark] | MANUAL | | | | | 0.25 | 240 | 0.66 | 1.0 | |
| 46 | WBO-136 | Waist Belt Mark [3 Point Cut Mark] | MANUAL | | | | | 0.35 | 171 | 0.93 | 1.0 | |
| 47 | WBO-45 | Waist Belt Match To Body [Single] | MANUAL | 0.15 | 400 | 0.40 | | | | | | |
| 48 | WBO-253 | Waist Belt Attach To Body [Round Body And Round Belt] | SNLS | 0.88 | 68 | 2.34 | 3.0 | | | | | |
| 49 | WBO-206 | Waist Rib Attach Position Overlock With Thread Cut | OL4 | 0.45 | 133 | 1.20 | 1.0 | | | | | |
| 50 | WBO-106 | Waist Belt Lower Top Stitch With Thread Cut | K/S | 0.78 | 77 | 2.07 | 2.0 | | | | | |
| 51 | WBO-101 | Thread Cut | MANUAL | 0.10 | 600 | 0.27 | | | | | | |
| 52 | WBO-321 | Waist Belt Middle Top Stitch (2 or 3 Thread) | K/S | 0.33 | 182 | 0.88 | | | | | | |
| 53 | WBO-243 | Thread Cut | MANUAL | | | | | 0.15 | 400 | 0.40 | 1.0 | |
| 54 | SSOTHERSO-11 | Body Turn | MANUAL | | | | | 0.15 | 400 | 0.40 | 1.0 | |
| 55 | BHEMO-21 | Bottom Hem [Open Skirt][Different] | SNLS | 1.02 | 59 | 2.71 | 4.0 | | | | | |
| 56 | BAT-09 | Front Pocket Mouth Bartack [4 Point] | B/T | 0.30 | 200 | 0.80 | 1.0 | | | | | |
| 57 | Ref | Hem Chain Stitch End Point Security Stitch [3 Point] | B/T | 0.25 | 240 | 0.66 | | | | | | |
| | | **Assemble Total** | | 8.68 | | | 23.0 | 2.32 | | | 10.0 | |
| | | **Grand Total** | | 12.61 | | 33.51 | 39.0 | 2.44 | | | 11 | |
| | | | | 15.05 | | | | | | TTL MAN | | 50 |

Unit: 02

Line: E

**Natural Denims Ltd.**

Buyer Name: ZARA

Item: DENIM PANT

**OPERATION BULLETIN**

| SMV | Current Pics | Number of Worker | Production Capacity / Hr. | Production Capacity / Day (10 hr.) | Worker Efficiency |
|---|---|---|---|---|---|
| 7.7 | 210 | 41 | 219 | 2195 | 66% |

| No. | Operation | M/C | SMV | Capacity / Hr. |
|---|---|---|---|---|
| 1 | Front & Back rise join | OL | 0.50 | 92 |
| 1 | Front & Back rise join | OL | 0.50 | 86 |
| 1 | Front & Back rise join | OL | 0.50 | 75 |
| 2 | Pocket opening piping make | OL | 0.20 | 333 |
| 3 | Pocket opening lace join | LSA | 0.32 | 115 |
| 3 | Pocket opening lace join | LSA | 0.32 | 115 |
| 4 | Pocket upper part join with front rise | OL | 0.32 | 130 |
| 4 | Pocket upper part join with front rise | OL | 0.32 | 111 |
| 5 | Pocket opening 1/16 top stitch | LSA | 0.30 | 150 |
| 5 | Pocket opening 1/16 top stitch | LSA | 0.30 | 95 |
| 6 | Pocket lower part join | LSA | 0.34 | 91 |
| 6 | Pocket lower part join | LSA | 0.34 | 100 |
| 6 | Pocket lower part join | LSA | 0.34 | 29 |
| 7 | Pocket bag overlock | OL | 0.32 | 143 |
| 7 | Pocket bag overlock | OL | 0.32 | 130 |
| 8 | Pocket waist & side close | LSA | 0.40 | 150 |
| 8 | Pocket waist & side close | LSA | 0.40 | 107 |
| 9 | Care label tack & cut | LSA | 0.15 | 333 |
| 10 | Care label attach at left seam & fold | LSA | | 273 |
| 11 | Side seam | OL | 0.70 | 61 |
| 11 | Side seam | OL | 0.70 | 56 |
| 11 | Side seam | OL | 0.70 | 60 |
| 11 | Side seam | OL | 0.70 | 60 |
| 12 | Inseam | OL | 0.50 | 150 |
| 12 | Inseam | OL | 0.50 | 75 |
| 13 | Waist fabric end point close | LSA | 0.20 | 300 |

| | | | | |
|---|---|---|---|---|
| 14 | Elastic end point close | LSA | 0.16 | 333 |
| 15 | Drawsting hole at waist | BH | 0.22 | 222 |
| 16 | Elastic & waist 4 point tack | LSA | 0.50 | 75 |
| 17 | Waist belt top stitch | Kansai | 0.50 | 100 |
| 17 | Waist belt top stitch | Kansai | 0.50 | 107 |
| 18 | Waist belt join | OL | 0.75 | 77 |
| 18 | Waist belt join | OL | 0.75 | 88 |
| 18 | Waist belt join | OL | 0.75 | 71 |
| 19 | Inseam & waist top stitch security tack | LSA | | 250 |
| 20 | Size lbl join at bk waist | LS | 0.18 | 250 |
| 21 | Leg opening hem | FL | 0.50 | 150 |
| 21 | Leg opening hem | FL | 0.50 | 94 |
| 22 | Leg hem security tack | LSA | | 300 |
| 23 | Main lbl join at bk waist | LSA | 0.20 | 250 |

**Table 3.1.1: Operation Bulletin for DENIM PANT**

| | |
|---|---|
| OP | 41 |
| E % | 66% |
| HOURS | 10 |

## 3.1.2 Description:

The process card of **Natural Denim Ltd**. to manufacture a denim pant (buyer: ZARA, Unit-02, Line-E) indicates that 42 the number of machines (different machineries present, OL-17, LSA-19, BH-1, Kansai-2, LS-2, FL-2) and 41 labor are employed. The planned target production is 2195 pieces and the total SMV is 7.7 and the production will be multiplied against 10 hours of different efficiency (66%, 70%, 75%, 80%).

### 3.1.3 The Calculation Process:

## TARGET CALCULATION:

Total worker = 41

SMV = 7.7

Working hours= 10
Efficiency = 66%,

= 41 × 10 × 66% × 7.7

= 2084

When efficiency = 70%,

Target = 41×10×70%×7.7

=2210

When efficiency = 75%,

Target = 41×10×75%×7.7

= 2368

When efficiency = 80%,

Target = 41×10×80%×7.7

= 2526

| Efficiency | 66% | 70% | 75% | 80% |
|---|---|---|---|---|
| Target per hour | 2084 | 2210 | 2368 | 2526 |

### 3.1.5 SMV Calculation:

Let, Average cycle time = 12 sec

Now observed time = 12/60 = 0.20

secRating = 80%,

So, Basic time = observed time × rating

= 0.20 × 0.80

= 0.16 sec

= 9.6 min

Let, Allowance 15%,

= 9.6 + 0.15

= 9.75 min

### 3.1.6 PITCH TIME:

Here,

No. of Operation

= 42Total SMV =

7.7

So, Pitch time = No of operation/SMV

= 42/7.7

= 5.45 min.

### 3.1.7 EFFICIENCY CALCULATION:

Total P. =2195

Standard minutes values = 7.7

man power =41

Working hour = 10

$$= \frac{2195 \times 7.7}{41x10x60} \times 100$$

$$= \frac{16901.5}{24600} \times 100$$

= 68.70

= 69%

## 3.1.8 LINE CAPACITY:

We know,

$$\text{Line capacity} = \frac{Total\ man\ power\ x\ Working\ hour\ x\ 60\ x\ efficiency\%}{Smv}$$

$$= \frac{41 \times 10 \times 60 \times .69}{7.7}$$

= 2204 pcs

| | |
|---|---|
| Target | 2084 |
| SMV | 9.75 |
| Pitch time | 5.45 min |
| Efficiency% | 69% |
| Line capacity | 2204 pcs |

# 3.2 Operation Bulletin for DENIM:

**Natural Denims Ltd.**

Buyer Name: ZARA

Item: DENIM

Style no: 16152

**OPERATION BULLETIN SHEET**
**[Sewing]**

Natural Denims Ltd.
Zara-H
Manual Elastic Waist Belt, 5th Busted Overlock, Denim Boys Shorts
2
25000 Units
02.07.19

| | |
|---|---|
| STYLE # | ZB-SS21-239 |
| SAM : | 19.23 |
| Pitch Time | 0.31 |
| Study By | HM Tareq |
| Initial Date | 15/03/2021 |
| Revised Date | 22/03/2021 |
| Print Date | 22/03/2021 |
| Costing SMV : | 22.00 |

(Revised)

| SL No | Process Code | Operations | M/C TYPE | M/C SMV SAM | M/C SMV @100% | REQ O/P TWS | REQ O/P AWS | MNL SMV SAM | MNL SMV @100% | REQ M/P TWS | REQ M/P AWS | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Front Part Operations** | | | | | | | | | | |
| 1 | FPBO-02A | Facing Attach To Pocketing By SNLS (Without Facing Iron) After Overlock | SNLS | 0.35 | 171 | 0.47 | 1.0 | | | | | |
| 2 | FPBO-04B | Mouth Panel Attach To Pocketing By SNLS (Without Facing Iron) After Overlock | SNLS | 0.35 | 171 | 0.47 | 1.0 | | | | | |
| 3 | FFIOL-12 | Pocket Bag Overlock (Round) | OL3 | 0.20 | 305 | 0.24 | 1.0 | | | | | |
| 4 | FFIOL-23A | Facing Attach Position Overlock With Thread Cut - Curve Overlock | OL3 | 0.30 | 200 | 0.36 | | | | | | |
| 5 | FFIOL-13 | Thread Cut (For Round Pocket) | MANUAL | | | | | 0.06 | 1000 | 0.07 | 1.0 | |
| 6 | FPSTIRN-03 | Pocket Bag Turn (Round) | MANUAL | 0.16 | 375 | 0.19 | | | | | | |
| 7 | FPBO-30 | Pocket Bag Top Stitch (Round) | SNLS | 0.20 | 300 | 0.24 | 1.0 | | | | | |
| 8 | FPAO-05 | Pocket Bag Attach To Body Straight **(With Panel)** | SNLS | 0.31 | 194 | 0.37 | 1.0 | | | | | |
| 9 | FPMTS-02 | Pocket Mouth Inside Top Stitch **(Straight Mouth)** | SNLS | 0.24 | 250 | 0.29 | 1.0 | | | | | |
| 10 | FPMTS-49 | Pocket Mouth Top Stitch **(With Straight Panel)** | DNLS | 0.33 | 182 | 0.40 | 2.0 | | | | | |
| 11 | FPMTS-57 | Thread Cut After Mouth Top Stitch By DNLS | MANUAL | 0.08 | 750 | 0.10 | | | | | | |
| 12 | FPRS-03 | Front Pocket Run Stitch (With Pocket Mouth Cross Stitch) | SNLS | 0.35 | 171 | 0.42 | 2.0 | | | | | |
| 13 | FFIOL-23B | Mouth Panel Attach Position Overlock With Thread Cut - Curve Overlock | OL4 | 0.30 | 200 | 0.36 | 1.0 | | | | | |
| 14 | JPATTACHG-01 | J-Panel And J-Stitch Attach Position Overlock With Thread Cut **(Lower Supporting)** | OL4 | 0.35 | 171 | 0.42 | | | | | | |
| 15 | ICINSTO-02 | Inside Tack On Hi-Crise Position With Thread Cut | SNLS | 0.20 | 300 | 0.24 | 1.0 | | | | | (SMV Add For Fusing) |
| 16 | SEFLATSO-10 | Single Fly Top Stitch For All Style | SNLS | 0.13 | 500 | 0.15 | | | | | | |
| 17 | ZIPATSF-06 | Single Fly Upper End Tack (Horizontal) | SNLS | 0.07 | 857 | 0.08 | 1.0 | | | | | |
| 18 | JSTMO-01 | J' Stitch Mark (Use Only For Button Fly Style) | MANUAL | 0.17 | 353 | 0.21 | | | | | | |
| 19 | JSTO-11 | J' Stitch With Thread Cut (For Needle 1 or 2 Or 3 Thread) | DNLS | 0.27 | 222 | 0.33 | 1.0 | | | | | |
| 20 | FCDSTO-02 | Fly Close With 1/4 Stitch (Upper Curve) | SNLS | 0.40 | 150 | 0.48 | 2.0 | | | | | |
| 21 | LCUT-04 | Caution Label Cut By Cutter | MANUAL | 0.03 | 2000 | 0.04 | | | | | | |
| 22 | LATTBO-02 | Caution Label Attach To Body With Poly and Thread Cut | SNLS | 0.25 | 240 | 0.30 | 1.0 | | | | | |
| 23 | LCUT-04 | Care Label Cut By Cutter | MANUAL | 0.03 | 2000 | 0.04 | | | | | | |
| 24 | LATTBO-02 | Care, Country And Shade Label Attach To Body With Poly | SNLS | 0.25 | 240 | 0.30 | 1.0 | | | | | |
| 25 | FLRT-02 | Front Part **(LR)**, Loop And **W/B** Tack Same Time | SNLS | 0.25 | 240 | 0.30 | 1.0 | | | | | |
| 26 | BFNM-01 | Front Part Fold For Assemble | MANUAL | 0.10 | 600 | 0.12 | | | | | | |
| | | **Front Part Total** | | 5.66 | | | 19.0 | 0.06 | | | 1.0 | |
| | | **Back Part Operation** | | | | | | | | | | |
| 27 | NDL-Ref-56 | Back Rise Folding Stitch **(Longi Stitch)** | SNLS | 0.35 | 171 | 0.42 | 1.0 | | | | | |
| 28 | ByRO-33 | Back Rise Top Stitch **(After Attach By SNLS)** | FOA | 0.18 | 333 | 0.22 | 1.0 | | | | | |
| 29 | BPKT-42 | Thread Cut | MANUAL | 0.10 | 600 | 0.12 | | | | | | |
| 30 | BPKT-47 | Back Pocket Hem | DNLS | 0.21 | 286 | 0.25 | 1.0 | | | | | |
| 31 | BPKT-48 | Thread Cut | MANUAL | 0.10 | 600 | 0.12 | | | | | | |
| 32 | BPKT-608 | Back Pocket Overlock (3 Side) **LR** | OL3 | 0.23 | 261 | 0.28 | 1.0 | | | | | |
| 33 | BPKT-102 | Thread Cut | MANUAL | 0.10 | 600 | 0.12 | | | | | | |
| 34 | BPKT-92 | Back Pocket Iron (Straight) | IRON | | | | | 0.35 | 171 | 0.42 | | |
| 35 | BPKT-33 | Back Pocket Hem Iron | IRON | | | | | 0.23 | 261 | 0.28 | 2.0 | |
| 36 | BPKT-190 | Back Pocket Corner Number Excess Scissoring (2 Point) | IRON | | | | | 0.11 | 545 | 0.13 | | |
| 37 | BPKT-289 | Back Yoke, Back Pocket Attach Position With Side Hip Stitch (Short Or Long) Mark (Together) | MANUAL | | | | | 0.53 | 113 | 0.64 | 1.0 | |
| 38 | BPKT-105 | Back Pocket Match To Body | MANUAL | 0.17 | 353 | 0.21 | | | | | | |
| 39 | BPKT-114 | Back Pocket Attach (Without Pattern) | SNLS | 0.70 | 86 | 0.85 | 2.0 | | | | | |
| 40 | BPKT-139 | Back Pocket **1/4** Top Stitch (Straight Normal)(Without Mark) | SNLS | 0.62 | 97 | 0.75 | 2.0 | | | | | |
| 41 | BFNM-02 | Back Part Fold For Assemble | MANUAL | 0.10 | 600 | 0.12 | | | | | | |
| | | **Back Part Total** | | 7.86 | | | 8.0 | 1.22 | | | 3.0 | |
| | | **Assembley** | | | | | | | | | | |
| 42 | BFNM-03 | Front & Back Number Check & Arrange For Inseam | MANUAL | | | | | 0.14 | 429 | 0.17 | 1.0 | (Non Value Added) |
| 43 | SSATO-11 | Side Seam Overlock (5 Thread)(Complete) Short Body With Thread Cut | OL5 | 0.38 | 158 | 0.45 | 2.0 | | | | | |
| 44 | SSTOPSO-19 | Side Seam Top Stitch (Denim-Complete)(After Overlock) | FOA | 0.45 | 133 | 0.54 | 1.0 | | | | | |
| 45 | ISO-19 | Thread Cut And Arrange | MANUAL | | | | | 0.10 | 600 | 0.12 | 1.0 | |
| 46 | ISO-20 | In-seam Overlock Complete (5 Thread)-Half Pant With Thread Cut | OL5 | 0.20 | 300 | 0.24 | 1.0 | | | | | |
| 47 | ISO-58 | In-seam Top Stitch Complete (By Folder)(Before or After Side Seam) (Without Hold) | FOA | 0.38 | 158 | 0.46 | 1.0 | | | | | |
| 48 | ISO-52 | Thread Cut And Arrange | MANUAL | 0.10 | 600 | 0.12 | | | | | | |
| 49 | LATTBO-18 | Main Label Attach To Belt **(2 Side With Pattern)** | SNLS | 0.25 | 240 | 0.30 | 1.0 | | | | | |
| 50 | WBO-32 | Waist Belt Two Panel Tack With Thread Cut | SNLS | 0.15 | 400 | 0.18 | 1.0 | | | | | |
| 51 | WBO-136 | Waist Belt Mark (Lower Side 5 Mark And Top Side 1 Mark) **3 Point Cut Mark** | MANUAL | | | | | 0.35 | 171 | 0.42 | 1.0 | |
| 52 | WBO-411 | Body Side Mark And Front Fly Mark For Waist Belt Attach | MANUAL | | | | | 0.25 | 240 | 0.30 | 1.0 | |
| 53 | WBO-45 | Waist Belt Match To Body **(Single)** | MANUAL | 0.15 | 400 | 0.18 | | | | | | |
| 54 | WBO-253 | Waist Belt Attach To Body **(Round Body And Round Belt)** | SNLS | 0.88 | 68 | 1.06 | 2.0 | | | | | |
| | Ref | Waist Belt Attach Position Flat Stitch | SNLS | 0.40 | 150 | 0.48 | 1.0 | | | | | |
| | ELERMACUTO-01 | Elastic**(WB)** Iron For Making Flat | IRON | | | | | 0.05 | 1200 | 0.06 | | |
| | WBO-119 | Elastic**(WB)** Size Numbering And Mark For Cut | IRON | | | | | 0.10 | 600 | 0.12 | 1.0 | |
| | WBO-120 | Elastic**(WB)** Cut | IRON | | | | | 0.07 | 857 | 0.08 | | |
| | WBO-413 | Elastic**(WB)** (Open Elastic) 2 Point Mark For Attach | MANUAL | | | | | 0.22 | 273 | 0.27 | 1.0 | |
| | WBO-100 | Elastic**(WB)** 2 End Tack For Make Round | SNLS | 0.15 | 400 | 0.18 | 1.0 | | | | | |
| | WBO-193 | Elastic**(WB)** Match With Waist Belt | MANUAL | 0.17 | 353 | 0.21 | | | | | | |
| | WBO-254 | Elastic**(WB)** Waist Belt False Tack **(6 Point To Adjustment Elastic)** | SNLS | 1.29 | 46 | 1.52 | 4.0 | | | | | |
| | WBO-106 | Waist Belt Lower Top Stitch With Thread Cut | K/S | 0.75 | 77 | 0.94 | 3.0 | | | | | |
| | WBO-101 | Thread Cut | MANUAL | | | | | 0.10 | 600 | 0.12 | 1.0 | |
| | WBO-419 | Waist Belt Top Stitch (Round Top Stitch) **(Upper Side)** | SNCS | 0.35 | 171 | 0.42 | 1.0 | | | | | |
| | WBO-243 | Thread Cut | MANUAL | 0.15 | 400 | 0.18 | | | | | | |
| | SSOTHERSD-11 | Body Turn | MANUAL | | | | | 0.15 | 400 | 0.18 | 1.0 | |
| | BHEMO-11 | Bottom Hem (Without Iron)**(1/2" Lock Stitch)** | SNLS | 0.60 | 100 | 0.72 | 2.0 | | | | | |
| | BAT-16 | J-Stitch Bartack **(2 Point)** | B/T | 0.15 | 400 | 0.18 | | | | | | |
| | BAT-04 | Back Pocket Bartack **(8 Point) With 4 Potty** | B/T | 0.55 | 109 | 0.66 | | | | | | |
| | BAT-11 | Front Pocket Mouth Bartack **(2 Point)** | B/T | 0.15 | 400 | 0.18 | 2.0 | | | | | SMV Add For Potty |
| | Ref | Waist Belt Chain Stitch End Point **(3 Point)** | B/T | 0.25 | 240 | 0.30 | | | | | | |
| | | **Assembley Total** | | 7.90 | | | 23.0 | 1.53 | | | 8.0 | |
| | | **Grand Total** | | 16.42 | | 19.85 | 50.0 | 2.81 | | | 12 | |
| | | | | | | 19.23 | | | | TTL MAN | | 62.0 |

**Natural Denims Ltd.**

Unit: 02 Line: I

Natural Denims Ltd.

Buyer Name: ZARA

Item: DENIM PANT

**OPERATION BULLETIN**

| SMV | Current Pics | Number of Worker | Production Capacity / Hr. | Production Capacity / Day (10 hr.) | Worker Efficiency |
|---|---|---|---|---|---|
| 4.96 | 200 | 29 | 214 | 2143 | 57% |

| No. | Operation | M/C | SMV | Capacity / hr. |
|---|---|---|---|---|
| 1 | Front part gathering | LSA | 0.15 | 250 |
| 2 | Yoke join at front part | OL | 0.23 | 167 |
| 2 | Yoke join at front part | OL | 0.23 | 150 |
| 3 | Bk part gathering & body fold | LSA | 0.15 | 300 |
| 4 | Mobilon tape attach at bk part | LSA | 0.14 | 375 |
| 5 | Yoke join at bk part | OL | 0.23 | 140 |
| 5 | Yoke join at bk part | OL | 0.23 | 100 |
| 6 | Shoulder join right side | OL | 0.14 | 353 |
| 7 | Nk binding | FL | 0.19 | 273 |
| 8 | Nk close tack & cut | LSA | 0.15 | 273 |
| 9 | Shoulder join left side & cut | OL | 0.14 | 286 |
| 10 | Arm hole binding | FL | 0.36 | 140 |
| 10 | Arm hole binding | FL | 0.36 | 136 |
| 11 | Arm hole binding fold top stitch | LSA | 0.50 | 60 |
| 11 | Arm hole binding fold top stitch | LSA | 0.50 | 80 |
| 11 | Arm hole binding fold top stitch | LSA | 0.50 | 88 |
| 12 | Care label tack | LSA | 0.14 | 400 |
| 13 | Care label attach at side seam | LSA | 0.15 | 375 |
| 14 | Side seam | OL | 0.46 | 107 |
| 14 | Side seam | OL | 0.46 | 107 |
| 15 | Arm hole close & chap tack | LSA | 0.26 | 33 |
| 15 | Arm hole close & chap tack | LSA | 0.26 | 182 |
| 16 | Elastic end point close tack | LSA | 0.15 | 300 |
| 17 | Elastic join at bottom | OL | 0.46 | 100 |
| 17 | Elastic join at bottom | OL | 0.46 | 95 |
| 18 | Nk binding 1/16 top stitch insert main & size lbl | LSA | 0.46 | 107 |

| | | | | |
|---|---|---|---|---|
| 18 | Nk binding 1/16 top stitch insert main & size lbl | LSA | 0.46 | 111 |
| 19 | Elastic join top stitch | FL | 0.20 | 273 |
| 20 | Elastic join top stitch security tack | LSA | 0.14 | 333 |
| 21 | Btn attach 1 point | BA | 0.15 | 400 |

**Table 3.2.1: Operation Bulletin for DENIM**

| | |
|---|---|
| WORKER | 29 |
| Fac. EFFICIENCY % | 57% |
| W. H. | 10 |

## 3.2.2 Description:

The **operation bulletin sheet** for **DENIM PANT** production at **Natural Denim Ltd.** details the manufacturing process for a **ZARA order** at **Unit-02, Line-I**. It outlines key production factors such as **total manpower, SMV (Standard Minute Value), efficiency, and hourly production targets.**

The sheet specifies that **30 machines** are used, operated by **29 workers**, with the following machine distribution:

- **10 OL (Overlock) machines**
- **15 LSA (Lockstitch with Automatic Trimmer) machines**
- **1 BA (Bartack) machine**
- **4 FL (Flatlock) machines**

The breakdown of various operations' SMVs leads to a **total SMV of 4.96**. The **planned production target** is **2,143 units**, with an **expected efficiency of 57%**. Additionally, the sheet provides efficiency calculations at **57%, 70%, 75%, and 80%** to estimate the total production output over a **10-hour shift**.

## 3.2.3 The Calculation Process:

## 3.2.4 TARGET CALCULATION:

Here, Total worker

= 29SMV = 4.96

Working hrs. =

10 Efficiency = 57%,

We

know

that,

Target = total man power × work hr. × efficiency % × SMV

= 29 × 10 × 57% × 4.96

= 810

When efficiency = 70%,

Target = 29×10×70%×4.96

=1007

When efficiency = 75%,

Target = 29×10×75%×4.96

= 1079

When efficiency = 80%,

Target = 29×10×80%×4.96

= 1151

| | | | | |
|---|---|---|---|---|
| Efficiency | 57% | 70% | 75% | 80% |
| Target per hour | 810 | 1007 | 1079 | 1151 |

## 3.2.5 SMV CALCULATION:

SMV = Basic time + Allowance of basic

Time Basic time = Observed time ×

rating Observed time = Average cycle

time/60

Here, I show SMV calculation for Front part gathering

Let, Average cycle time = 10 sec

Now observed time = 10/60 = 0.16

Rating = 80%,

So, Basic time = observed time × rating

= 0.16 × 0.80

= 0.128 sec

= 7.68 min

Let, Allowance 15%,

= 7.68 + 0.15

= 7.83 min

## 3.2.6 PITCH TIME:

Here, No. of Operation

= 30Total SMV = 4.96

So, Pitch time = No of operation/SMV

= 30/4.96

= 6.05 min.

## 3.2.7 EFFICIENCY CALCULATION:

Here,

Total production = 2143

SMV = 4.96

Total man power = 29

Working hour = 10

Efficiency % $= \frac{Total\ production \times SMV}{Total\ man\ power \times working\ hour \times 60} \times 100$

$= \frac{2143 \times 4.96}{29 \times 10 \times 60} \times 100$

$= \frac{10629.28}{174000} \times 100$

= 61.08 = 61%

## 3.2.8 LINE CAPACITY:

We know,

Line capacity$= \frac{Total\ man\ power\ x\ Working\ hour\ x\ 60\ x\ efficiency\%}{Smv}$

$= \frac{29 \times 10 \times 60 \times .61}{4.96}$

=2140Pcs

| | |
|---|---|
| Target | 810 |
| SMV | 7.83 |
| Pitch time | 6.05 min |
| Efficiency% | 61% |
| Line capacity | 2140 pcs |

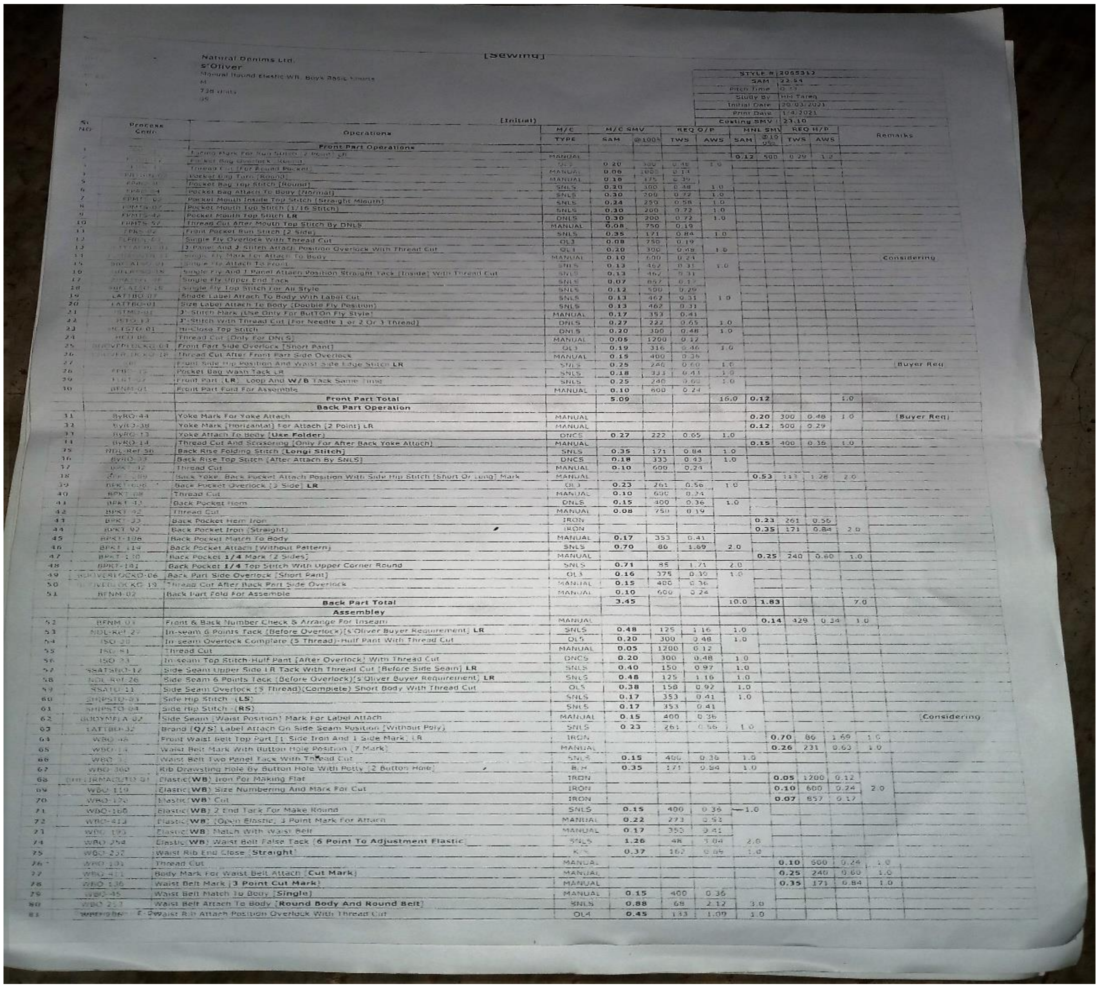
# 3.3 Operation Bulletin for GENTS PANT:

**Natural Denims Ltd.**

Buyer Name:S'OLIVER

Item: GENTS PANT

Style no: JTOPS-007



Natural Denims Ltd. [Sewing]
s'Oliver
Manual Round Elastic WB, Boys Basic Shorts
M
728 units
95

| | |
|---|---|
| STYLE # | 2065312 |
| SAM | 22.54 |
| Pitch Time | [illegible] |
| Study By | HH Tareq |
| Initial Date | 20/03/2021 |
| Print Date | 1/4/2021 |
| Costing SMV : | 23.10 |

[Initial]

| Sl NO | Process Code | Operations | M/C TYPE | M/C SMV SAM | M/C SMV @100% | REQ O/P TWS | REQ O/P AWS | MNL SMV SAM | MNL SMV @100% | REQ H/P TWS | REQ H/P AWS | Remarks |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | **Front Part Operations** | | | | | | | | | | |
| 1 | [illegible] | Facing Mark For Run Stitch (2 Point) LR | MANUAL | | | | | 0.12 | 500 | 0.29 | 1.2 | |
| 2 | [illegible] | Pocket Bag Overlock (Round) | OL3 | 0.20 | 300 | 0.48 | 1.0 | | | | | |
| 3 | [illegible] | Thread Cut (For Round Pocket) | MANUAL | 0.06 | 1000 | 0.14 | | | | | | |
| 4 | [illegible] | Pocket Bag Turn (Round) | MANUAL | 0.16 | 375 | 0.39 | | | | | | |
| 5 | [illegible] | Pocket Bag Top Stitch (Round) | SNLS | 0.20 | 300 | 0.48 | 1.0 | | | | | |
| 6 | [illegible] | Pocket Bag Attach To Body (Normal) | SNLS | 0.30 | 200 | 0.72 | 1.0 | | | | | |
| 7 | FPMTS-62 | Pocket Mouth Inside Top Stitch (Straight Mouth) | SNLS | 0.24 | 250 | 0.58 | 1.0 | | | | | |
| 8 | FPMTS-07 | Pocket Mouth Top Stitch (1/16 Stitch) | SNLS | 0.30 | 200 | 0.72 | 1.0 | | | | | |
| 9 | FPMTS-42 | Pocket Mouth Top Stitch **LR** | DNLS | 0.30 | 200 | 0.72 | 1.0 | | | | | |
| 10 | FPMTS-52 | Thread Cut After Mouth Top Stitch By DNLS | MANUAL | 0.08 | 750 | 0.19 | | | | | | |
| 11 | FPRS-02 | Front Pocket Run Stitch (2 Side) | SNLS | 0.35 | 171 | 0.84 | 1.0 | | | | | |
| 12 | [illegible] | Single Fly Overlock With Thread Cut | OL3 | 0.08 | 750 | 0.19 | | | | | | |
| 13 | [illegible] | J-Panel And J Stitch Attach Position Overlock With Thread Cut | OL3 | 0.20 | 300 | 0.48 | 1.0 | | | | | |
| 14 | [illegible] | Single Fly Mark For Attach To Body | MANUAL | 0.10 | 600 | 0.24 | | | | | | Considering |
| 15 | [illegible] | Single Fly Attach To Front | SNLS | 0.13 | 462 | 0.31 | 1.0 | | | | | |
| 16 | [illegible] | Single Fly And J Panel Attach Position Straight Tack (Inside) With Thread Cut | SNLS | 0.13 | 462 | 0.31 | | | | | | |
| 17 | [illegible] | Single Fly Upper End Tack | SNLS | 0.07 | 857 | 0.17 | | | | | | |
| 18 | [illegible] | Single Fly Top Stitch For All Style | SNLS | 0.12 | 500 | 0.29 | | | | | | |
| 19 | LATTBD-07 | Shade Label Attach To Body With Label Cut | SNLS | 0.13 | 462 | 0.31 | 1.0 | | | | | |
| 20 | LATTBD-01 | Size Label Attach To Body (Double Fly Position) | SNLS | 0.13 | 462 | 0.31 | | | | | | |
| 21 | [illegible] | J' Stitch Mark (Use Only For ButTOn Fly Style) | MANUAL | 0.17 | 353 | 0.41 | | | | | | |
| 22 | JSTO-13 | J'-Stitch With Thread Cut (For Needle 1 or 2 Or 3 Thread) | DNLS | 0.27 | 222 | 0.65 | 1.0 | | | | | |
| 23 | HCTSTO-01 | Hi-Close Top Stitch | DNLS | 0.20 | 300 | 0.48 | 1.0 | | | | | |
| 24 | [illegible] | Thread Cut (Only For DNLS) | MANUAL | 0.05 | 1200 | 0.12 | | | | | | |
| 25 | [illegible] | Front Part Side Overlock (Short Pant) | OL3 | 0.19 | 316 | 0.46 | 1.0 | | | | | |
| 26 | [illegible] | Thread Cut After Front Part Side Overlock | MANUAL | 0.15 | 400 | 0.36 | | | | | | |
| 27 | [illegible] | Front Side Hip Position And Waist Side Edge Stitch **LR** | SNLS | 0.25 | 240 | 0.60 | 1.0 | | | | | (Buyer Req |
| 28 | [illegible] | Pocket Bag Wash Tack LR | SNLS | 0.18 | 333 | 0.43 | 1.0 | | | | | |
| 29 | [illegible] | Front Part (**LR**) Loop And **W/B** Tack Same Time | SNLS | 0.25 | 240 | 0.60 | 1.0 | | | | | |
| 30 | BFNM-01 | Front Part Fold For Assemble | MANUAL | 0.10 | 600 | 0.24 | | | | | | |
| | | **Front Part Total** | | 5.09 | | | 16.0 | 0.12 | | | 1.0 | |
| | | **Back Part Operation** | | | | | | | | | | |
| 31 | ByRO-44 | Yoke Mark For Yoke Attach | MANUAL | | | | | 0.20 | 300 | 0.48 | 1.0 | (Buyer Req) |
| 32 | ByRO-38 | Yoke Mark (Horizantal) For Attach (2 Point) LR | MANUAL | | | | | 0.12 | 500 | 0.29 | | |
| 33 | ByRO-13 | Yoke Attach To Body (**Use Folder**) | DNCS | 0.27 | 222 | 0.65 | 1.0 | | | | | |
| 34 | ByRO-14 | Thread Cut And Scissoring (Only For After Back Yoke Attach) | MANUAL | | | | | 0.15 | 400 | 0.36 | 1.0 | |
| 35 | NDL-Ref 56 | Back Rise Folding Stitch (**Longi Stitch**) | SNLS | 0.35 | 171 | 0.84 | 1.0 | | | | | |
| 36 | ByRO-33 | Back Rise Top Stitch (After Attach By SNLS) | DNCS | 0.18 | 333 | 0.43 | 1.0 | | | | | |
| 37 | [illegible] | Thread Cut | MANUAL | 0.10 | 600 | 0.24 | | | | | | |
| 38 | [illegible] | Back Yoke, Back Pocket Attach Position With Side Hip Stitch (Short Or Long) Mark | MANUAL | | | | | 0.53 | 113 | 1.28 | 2.0 | |
| 39 | [illegible] | Back Pocket Overlock (3 Side) **LR** | OL3 | 0.23 | 261 | 0.56 | 1.0 | | | | | |
| 40 | BPKT-08 | Thread Cut | MANUAL | 0.10 | 600 | 0.24 | | | | | | |
| 41 | BPKT-13 | Back Pocket Hem | DNLS | 0.15 | 400 | 0.36 | 1.0 | | | | | |
| 42 | BPKT-42 | Thread Cut | MANUAL | 0.08 | 750 | 0.19 | | | | | | |
| 43 | BPKT-33 | Back Pocket Hem Iron | IRON | | | | | 0.23 | 261 | 0.56 | | |
| 44 | BPKT-92 | Back Pocket Iron (Straight) | IRON | | | | | 0.35 | 171 | 0.84 | 2.0 | |
| 45 | BPKT-106 | Back Pocket Match To Body | MANUAL | 0.17 | 353 | 0.41 | | | | | | |
| 46 | BPKT-119 | Back Pocket Attach (Without Pattern) | SNLS | 0.70 | 86 | 1.69 | 2.0 | | | | | |
| 47 | BPKT-130 | Back Pocket **1/4** Mark (2 Sides) | MANUAL | | | | | 0.25 | 240 | 0.60 | 1.0 | |
| 48 | BPKT-141 | Back Pocket **1/4** Top Stitch With Upper Corner Round | SNLS | 0.71 | 85 | 1.71 | 2.0 | | | | | |
| 49 | [illegible]VERLOCKO-06 | Back Part Side Overlock (Short Pant) | OL3 | 0.16 | 375 | 0.30 | 1.0 | | | | | |
| 50 | [illegible]VERLOCKO-19 | Thread Cut After Back Part Side Overlock | MANUAL | 0.15 | 400 | 0.36 | | | | | | |
| 51 | BFNM-02 | Back Part Fold For Assemble | MANUAL | 0.10 | 600 | 0.24 | | | | | | |
| | | **Back Part Total** | | 3.45 | | | 10.0 | 1.83 | | | 7.0 | |
| | | **Assembley** | | | | | | | | | | |
| 52 | BFNM-03 | Front & Back Number Check & Arrange For Inseam | MANUAL | | | | | 0.14 | 429 | 0.34 | 1.0 | |
| 53 | NDL-Ref 27 | In-seam 6 Points Tack (Before Overlock)(s'Oliver Buyer Requirement) **LR** | SNLS | 0.48 | 125 | 1.16 | 1.0 | | | | | |
| 54 | ISO-20 | In-seam Overlock Complete (5 Thread)-Half Pant With Thread Cut | OL5 | 0.20 | 300 | 0.48 | 1.0 | | | | | |
| 55 | ISO-81 | Thread Cut | MANUAL | 0.05 | 1200 | 0.12 | | | | | | |
| 56 | ISO-23 | In-seam Top Stitch-Half Pant (After Overlock) With Thread Cut | DNCS | 0.20 | 300 | 0.48 | 1.0 | | | | | |
| 57 | SSATSNO-12 | Side Seam Upper Side LR Tack With Thread Cut (Before Side Seam) **LR** | SNLS | 0.40 | 150 | 0.97 | 1.0 | | | | | |
| 58 | NDL-Ref-26 | Side Seam 6 Points Tack (Before Overlock)(s'Oliver Buyer Requirement) **LR** | SNLS | 0.48 | 125 | 1.16 | 1.0 | | | | | |
| 59 | SSATO-11 | Side Seam Overlock (5 Thread)(Complete) Short Body With Thread Cut | OL5 | 0.38 | 158 | 0.92 | 1.0 | | | | | |
| 60 | SHIPSTO-03 | Side Hip Stitch -(**LS**) | SNLS | 0.17 | 353 | 0.41 | 1.0 | | | | | |
| 61 | SHIPSTO-04 | Side Hip Stitch -(**RS**) | SNLS | 0.17 | 353 | 0.41 | | | | | | |
| 62 | BODYMFLA-02 | Side Seam (Waist Position) Mark For Label Attach | MANUAL | 0.15 | 400 | 0.36 | | | | | | (Considering |
| 63 | LATTBD-32 | Brand (**Q/S**) Label Attach On Side Seam Position (Without Poly) | SNLS | 0.23 | 261 | 0.56 | 1.0 | | | | | |
| 64 | WBO-46 | Front Waist Belt Top Part (1 Side Iron And 1 Side Mark) LR | IRON | | | | | 0.70 | 86 | 1.69 | 1.0 | |
| 65 | WBO-14 | Waist Belt Mark With Button Hole Position (7 Mark) | MANUAL | | | | | 0.26 | 231 | 0.63 | 1.0 | |
| 66 | WBO-[illegible] | Waist Belt Two Panel Tack With Thread Cut | SNLS | 0.15 | 400 | 0.36 | 1.0 | | | | | |
| 67 | WBO-300 | Rib Drawstring Hole By Button Hole With Petty (2 Button Hole) | B/H | 0.35 | 171 | 0.84 | 1.0 | | | | | |
| 68 | [illegible]IRMACUTO-01 | Elastic(**WB**) Iron For Making Flat | IRON | | | | | 0.05 | 1200 | 0.12 | | |
| 69 | WBO-119 | Elastic(**WB**) Size Numbering And Mark For Cut | IRON | | | | | 0.10 | 600 | 0.24 | 2.0 | |
| 70 | WBO-170 | Elastic(**WB**) Cut | IRON | | | | | 0.07 | 857 | 0.17 | | |
| 71 | WBO-160 | Elastic(**WB**) 2 End Tack For Make Round | SNLS | 0.15 | 400 | 0.36 | 1.0 | | | | | |
| 72 | WBO-413 | Elastic(**WB**) (Open Elastic) 3 Point Mark For Attach | MANUAL | 0.22 | 273 | 0.53 | | | | | | |
| 73 | WBO-193 | Elastic(**WB**) Match With Waist Belt | MANUAL | 0.17 | 353 | 0.41 | | | | | | |
| 74 | WBO-254 | Elastic(**WB**) Waist Belt False Tack (**6 Point To Adjustment Elastic**) | SNLS | 1.26 | 48 | 3.04 | 2.0 | | | | | |
| 75 | WBO-232 | Waist Rib End Close (**Straight**) | K/S | 0.37 | 162 | 0.89 | 1.0 | | | | | |
| 76 | WBO-101 | Thread Cut | MANUAL | | | | | 0.10 | 600 | 0.24 | 1.0 | |
| 77 | WBO-401 | Body Mark For Waist Belt Attach (**Cut Mark**) | MANUAL | | | | | 0.25 | 240 | 0.60 | 1.0 | |
| 78 | WBO-136 | Waist Belt Mark (**3 Point Cut Mark**) | MANUAL | | | | | 0.35 | 171 | 0.84 | 1.0 | |
| 79 | WBO-45 | Waist Belt Match To Body (**Single**) | MANUAL | 0.15 | 400 | 0.36 | | | | | | |
| 80 | WBO-257 | Waist Belt Attach To Body (**Round Body And Round Belt**) | SNLS | 0.88 | 68 | 2.12 | 3.0 | | | | | |
| 81 | [illegible] | Waist Rib Attach Position Overlock With Thread Cut | OL4 | 0.45 | 133 | 1.09 | 1.0 | | | | | |

**Natural Denims Ltd.**

Unit: 03

Line: 03

Buyer Name: NOVA

Item: GENTS PANT

**OPERATION BULLETIN**

| SMV | Current Pics | Number of Worker | Production Capacity / Hr. | Production Capacity / Day (10 hr.) | Worker Efficiency |
|---|---|---|---|---|---|
| 3.69 | 250 | 33 | 250 | 2500 | 47% |

| Sl. No. | OPERATION | M/C | SMV | Capacity / Hr. |
|---|---|---|---|---|
| 1 | Front placket binding | FL | 0.36 | 125 |
| 1 | Front placket binding | FL | 0.36 | 158 |
| 2 | Placket inner tack | LSA | 0.20 | 75 |
| 2 | Placket inner tack | LSA | 0.20 | 250 |
| 3 | Placket box stitch | LSA | 0.36 | 111 |
| 3 | Placket box stitch | LSA | 0.36 | 111 |
| 3 | Placket box stitch | LSA | 0.36 | 50 |
| 4 | Shoulder join both side | OL | 0.13 | 231 |
| 4 | Shoulder join both side & cut | OL | 0.13 | 111 |
| 5 | Care label attach at left seam | LSA | 0.16 | 300 |
| 6 | Main label attach at back nk | LSA | 0.18 | 167 |
| 6 | Main label attach at back nk | LSA | 0.18 | 167 |
| 7 | Nk binding | FL | 0.22 | 130 |
| 7 | Nk binding | FL | 0.22 | 86 |
| 7 | Nk binding | FL | 0.22 | 111 |
| 8 | Armhole binding | FL | 0.40 | 115 |
| 8 | Armhole binding | FL | 0.40 | 100 |
| 8 | Armhole binding | FL | 0.40 | 107 |
| 9 | Nk binding end fold tack | LSA | 0.18 | 300 |
| 10 | Side seam & exses placket cut | OL | 0.36 | 71 |
| 10 | Side seam & exses placket cut | OL | 0.36 | 71 |
| 10 | Side seam & exses placket cut | OL | 0.36 | 68 |

| | | | | |
|---|---|---|---|---|
| 10 | Side seam & exses placket cut | OL | 0.36 | 80 |
| 11 | Armhole close & chap tack | LSA | 0.26 | 150 |
| 11 | Armhole close & chap tack | LSA | 0.26 | 150 |
| 12 | Mobilon loop attach at both shoulder | LSA | 0.50 | 83 |
| 12 | Mobilon loop attach at both shoulder | LSA | 0.50 | 86 |
| 12 | Mobilon loop attach at both shoulder | LSA | 0.50 | 71 |
| 13 | Btm hem | FL | 0.20 | 250 |
| 14 | Btn hole at 3 point | BH | 0.20 | 150 |
| 14 | Btn hole at 3 point | BH | 0.20 | 125 |
| 15 | Btn attach at 3 point | BA | 0.20 | 120 |
| 15 | Btn attach at 3 point | BA | 0.20 | 150 |

## Table 3.3.1: Operation Bulletin for GENTS PANT

| | |
|---|---|
| WORKER | 33 |
| F. EFFICIENCY % | 47% |
| WORKING HOURS | 10 |

### 3.3.2 Description:

The **operation bulletin sheet** for **GENTS PANT** production at **Natural Denim Ltd.** documents the manufacturing process for a **buyer named "S Burys"** at **Unit-03, Line-03**. It provides essential details such as **total manpower, SMV (Standard Minute Value), efficiency, and hourly production targets.**

This sheet specifies that **33 machines** are used, with **33 workers** operating them. The machine distribution is as follows:

- **6 OL (Overlock) machines**
- **14 LSA (Lockstitch with Automatic Trimmer) machines**
- **2 BA (Bartack) machines**
- **2 BH (Buttonhole) machines**
- **9 FL (Flatlock) machines**

The breakdown of different operations' **SMVs results in a total SMV of 3.69**. The **planned production target** is **2,500 units**, with an **expected efficiency of 47%**. The sheet also includes efficiency calculations at **47%, 70%, 75%, and 80%** to estimate total production over a **10-hour shift**.

### 3.3.3 The Calculation Process:

### TARGET CALCULATION:

Here,

T.W. =33

SMV=3.69

W. H. = 10

eficiency % = 47%,

Target = total man power × work hr. × efficiency % × SMV

= 33 × 10 × 47% × 3.69

= 572

When efficiency = 70%,

Target = 33×10×70%×3.69

=852

When efficiency = 75%,

Target = 33×10×75%×3.69

= 913

When efficiency = 80%,

Target = 33×10×80%×3.69

= 974

| | | | | |
|---|---|---|---|---|
| Efficiency | 47% | 70% | 75% | 80% |
| Target per hour | 572 | 852 | 913 | 974 |

### 3.3.1 SMV CALCULATION:

### 3.3.2 PITCH TIME:

Here,

No. of Operation =33

Total SMV = 3.69

So, Pitch time = No of operation/SMV

= 33/3.69

= 8.94 min.

### 3.3.3 EFFICIENCY CALCULATIO:

Here,

T.P. =2500

Standard minutes

value = 3.69

Total M.P. = 33

W.H= 10

We know,

$$\text{Efficiency\%} = \frac{\text{Total production} \times \text{SMV}}{\text{Total man power} \times \text{working hour} \times 60} \times 100$$

$$= \frac{2500 \times 3.69}{33 \text{ x } 10 \text{ x } 60} \times 100$$

$$= \frac{9225}{198000} \times 100$$

= 46.59

= 47%

## 3.3.4 LINE CAPACITY:

We know,

$$\text{Line capacity} = \frac{Total\ man\ power\ x\ Working\ hour\ x\ 60\ x\ efficiency\%}{Smv}$$

$$= \frac{33 \times 10 \times 60 \times .47}{3.69}$$

=2521Pcs

| | |
|---|---|
| Target | 572 |
| SMV | 10.71 |
| Pitch time | 8.94 min |
| Efficiency% | 47% |
| Line capacity | 2521 pcs |

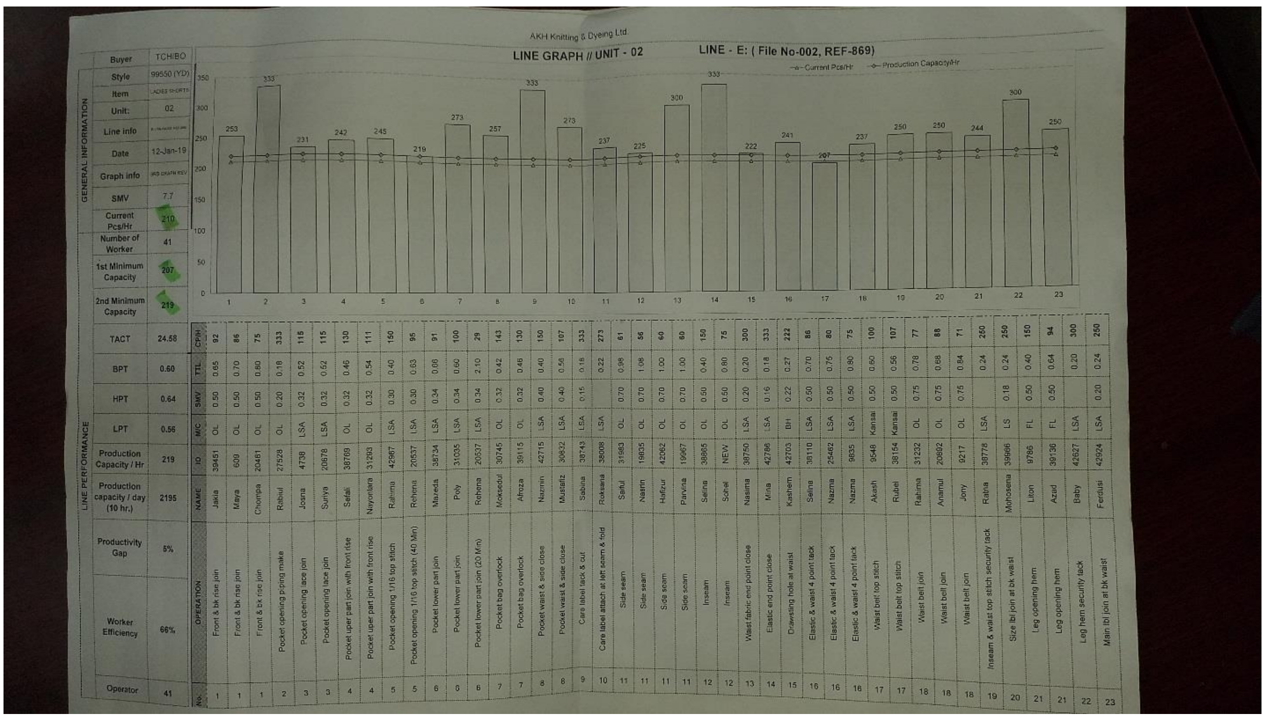
# 3.4 Operation Bulletin of LADIES SHORTS:

**Natural Denims Ltd.**

Name: TCHIBO

LADIESSHORTS

S.no: 99550 (YD)



AKH Knitting & Dyeing Ltd.

LINE GRAPH // UNIT - 02 LINE - E: ( File No-002, REF-869)

| | |
|---|---|
| Buyer | TCHIBO |
| Style | 99550 (YD) |
| Item | LADIES SHORTS |
| Unit: | 02 |
| Line info | |
| Date | 12-Jan-19 |
| Graph info | |
| SMV | 7.7 |
| Current Pcs/Hr | 210 |
| Number of Worker | 41 |
| 1st Minimum Capacity | 207 |
| 2nd Minimum Capacity | 219 |
| TACT | 24.58 |
| BPT | 0.60 |
| HPT | 0.64 |
| LPT | 0.56 |
| Production Capacity / Hr | 219 |
| Production capacity / day (10 hr.) | 2195 |
| Productivity Gap | 5% |
| Worker Efficiency | 66% |
| Operator | 41 |

| No. | OPERATION | NAME | ID | M/C | SMV | TTL | CP/H |
|---|---|---|---|---|---|---|---|
| 1 | Front & bk rise join | Jakia | 39451 | OL | 0.50 | 0.65 | 92 |
| 1 | Front & bk rise join | Maya | 609 | OL | 0.50 | 0.70 | 86 |
| 1 | Front & bk rise join | Chompa | 20461 | OL | 0.50 | 0.80 | 75 |
| 2 | Pocket opening piping make | Rabiul | 27528 | OL | 0.20 | 0.18 | 333 |
| 3 | Pocket opening lace join | Josna | 4738 | LSA | 0.32 | 0.52 | 115 |
| 3 | Pocket opening lace join | Suriya | 20678 | LSA | 0.32 | 0.52 | 115 |
| 4 | Pocket uper part join with front rise | Sefali | 38769 | OL | 0.32 | 0.46 | 130 |
| 4 | Pocket uper part join with front rise | Nayontara | 31293 | OL | 0.32 | 0.54 | 111 |
| 5 | Pocket opening 1/16 top stitch | Rahima | 42967 | LSA | 0.30 | 0.40 | 150 |
| 5 | Pocket opening 1/16 top stitch (40 Min) | Rehena | 20537 | LSA | 0.30 | 0.63 | 95 |
| 6 | Pocket lower part join | Mazeda | 38734 | LSA | 0.34 | 0.66 | 91 |
| 6 | Pocket lower part join | Poly | 31035 | LSA | 0.34 | 0.60 | 100 |
| 6 | Pocket lower part join (20 Min) | Rehena | 20537 | LSA | 0.34 | 2.10 | 29 |
| 7 | Pocket bag overlock | Moksedul | 30745 | OL | 0.32 | 0.42 | 143 |
| 7 | Pocket bag overlock | Afroza | 39115 | OL | 0.32 | 0.46 | 130 |
| 8 | Pocket waist & side close | Nazmin | 42715 | LSA | 0.40 | 0.40 | 150 |
| 8 | Pocket waist & side close | Mustafiz | 30832 | LSA | 0.40 | 0.56 | 107 |
| 9 | Care label tack & cut | Sabina | 38743 | LSA | 0.15 | 0.18 | 333 |
| 10 | Care label attach at left seam & fold | Roksana | 38008 | LSA | | 0.22 | 273 |
| 11 | Side seam | Saiful | 31983 | OL | 0.70 | 0.98 | 61 |
| 11 | Side seam | Nasrin | 19835 | OL | 0.70 | 1.08 | 56 |
| 11 | Side seam | Hafizur | 42062 | OL | 0.70 | 1.00 | 60 |
| 11 | Side seam | Parvina | 19967 | OL | 0.70 | 1.00 | 60 |
| 12 | Inseam | Selina | 38865 | OL | 0.50 | 0.40 | 150 |
| 12 | Inseam | Sohel | NEW | OL | 0.50 | 0.80 | 75 |
| 13 | Waist fabric end point close | Nasima | 38750 | LSA | 0.20 | 0.20 | 300 |
| 14 | Elastic end point close | Mina | 42786 | LSA | 0.16 | 0.18 | 333 |
| 15 | Drawsting hole at waist | Kashem | 42703 | BH | 0.22 | 0.27 | 222 |
| 16 | Elastic & waist 4 point tack | Selina | 38110 | LSA | 0.50 | 0.70 | 86 |
| 16 | Elastic & waist 4 point tack | Nazma | 25462 | LSA | 0.50 | 0.75 | 80 |
| 16 | Elastic & waist 4 point tack | Nazma | 9835 | LSA | 0.50 | 0.80 | 75 |
| 17 | Waist belt top stitch | Akash | 9548 | Kansai | 0.50 | 0.60 | 100 |
| 17 | Waist belt top stitch | Rubel | 38154 | Kansai | 0.50 | 0.56 | 107 |
| 18 | Waist belt join | Rahima | 31232 | OL | 0.75 | 0.78 | 77 |
| 18 | Waist belt join | Anamul | 20892 | OL | 0.75 | 0.68 | 88 |
| 18 | Waist belt join | Jony | 9217 | OL | 0.75 | 0.84 | 71 |
| 19 | Inseam & waist top stitch security tack | Ratna | 38778 | LSA | | 0.24 | 250 |
| 20 | Size lbl join at bk waist | Mohosena | 39966 | LS | 0.18 | 0.24 | 250 |
| 21 | Leg opening hem | Liton | 9786 | FL | 0.50 | 0.40 | 150 |
| 21 | Leg opening hem | Azad | 39136 | FL | 0.50 | 0.64 | 94 |
| 22 | Leg hem security tack | Baby | 42627 | LSA | | 0.20 | 300 |
| 23 | Main lbl join at bk waist | Ferdusi | 42924 | LSA | 0.20 | 0.24 | 250 |

Figure 3.1.1: Operation Bulletin for LADIES SHORTS

Natural Denims Ltd.

## OPERATION BULLETIN

| SMV | Current Pics | Number of Worker | Production Capacity / Hr. | Production Capacity / Day (10 hr.) | Worker Efficiency |
|---|---|---|---|---|---|
| 7.7 | 210 | 41 | 219 | 2195 | 66% |

| No. | Operation | M/C | SMV | Capacity / Hr. |
|---|---|---|---|---|
| 1 | Front & Back rise join | OL | 0.50 | 92 |
| 1 | Front & Back rise join | OL | 0.50 | 86 |
| 1 | Front & Back rise join | OL | 0.50 | 75 |
| 2 | Pocket opening piping make | OL | 0.20 | 333 |
| 3 | Pocket opening lace join | LSA | 0.32 | 115 |
| 3 | Pocket opening lace join | LSA | 0.32 | 115 |
| 4 | Pocket upper part join with front rise | OL | 0.32 | 130 |
| 4 | Pocket upper part join with front rise | OL | 0.32 | 111 |
| 5 | Pocket opening 1/16 top stitch | LSA | 0.30 | 150 |
| 5 | Pocket opening 1/16 top stitch | LSA | 0.30 | 95 |
| 6 | Pocket lower part join | LSA | 0.34 | 91 |
| 6 | Pocket lower part join | LSA | 0.34 | 100 |
| 6 | Pocket lower part join | LSA | 0.34 | 29 |
| 7 | Pocket bag overlock | OL | 0.32 | 143 |
| 7 | Pocket bag overlock | OL | 0.32 | 130 |
| 8 | Pocket waist & side close | LSA | 0.40 | 150 |
| 8 | Pocket waist & side close | LSA | 0.40 | 107 |
| 9 | Care label tack & cut | LSA | 0.15 | 333 |
| 10 | Care label attach at left seam & fold | LSA | | 273 |
| 11 | Side seam | OL | 0.70 | 61 |
| 11 | Side seam | OL | 0.70 | 56 |
| 11 | Side seam | OL | 0.70 | 60 |
| 11 | Side seam | OL | 0.70 | 60 |
| 12 | Inseam | OL | 0.50 | 150 |
| 12 | Inseam | OL | 0.50 | 75 |
| 13 | Waist fabric end point close | LSA | 0.20 | 300 |
| 14 | Elastic end point close | LSA | 0.16 | 333 |
| 15 | Drawsting hole at waist | BH | 0.22 | 222 |
| 16 | Elastic & waist 4 point tack | LSA | 0.50 | 75 |
| 17 | Waist belt top stitch | Kansai | 0.50 | 100 |
| 17 | Waist belt top stitch | Kansai | 0.50 | 107 |

| | | | | |
|---|---|---|---|---|
| 18 | Waist belt join | OL | 0.75 | 77 |
| 18 | Waist belt join | OL | 0.75 | 88 |
| 18 | Waist belt join | OL | 0.75 | 71 |
| 19 | Inseam & waist top stitch security tack | LSA | | 250 |
| 20 | Size lbl join at bk waist | LS | 0.18 | 250 |
| 21 | Leg opening hem | FL | 0.50 | 150 |
| 21 | Leg opening hem | FL | 0.50 | 94 |
| 22 | Leg hem security tack | LSA | | 300 |
| 23 | Main lbl join at bk waist | LSA | 0.20 | 250 |

## 3.4.1 Description:

The **operation bulletin sheet** for **LADIES SHORTS** production at **AKH Knitting & Dyeing Ltd.** details the manufacturing process for the **buyer "TCHIBO"** at **Unit-02, Line-E**. It provides key production data, including **total workforce, SMV (Standard Minute Value), efficiency, and hourly production targets.**

This sheet indicates that **42 machines** are used, operated by **41 workers**, with the following machine distribution:

- **17 OL (Overlock) machines**
- **19 LSA (Lockstitch with Automatic Trimmer) machines**
- **1 BH (Buttonhole) machine**
- **2 Kansai machines**
- **2 LS (Lockstitch) machines**
- **2 FL (Flatlock) machines**

The breakdown of various operations’ **SMVs results in a total SMV of 7.7**. The **planned production target** is **2,195 units**, with an **expected efficiency of 66%**. Additionally, efficiency calculations at **66%, 70%, 75%, and 80%** are included to estimate the total production output over a **10-hour shift**.

.

### 3.4.2 The Calculation Process:

## TARGET CALCULATION:

Here,

Total worker = 41

SMV = 7.7

Working hrs. = 10

Efficiency = 66%,

We know that,

Target = total man power × work hr. × efficiency % × SMV

= 41 × 10 × 66% × 7.7

= 2084

When efficiency = 70%,

Target = 41 × 10 × 70% × 7.7

=2210

When efficiency = 75%,

Target = 41 × 10 × 75% × 7.7

= 2368

When efficiency = 80%,

Target = 41 × 10 × 80% × 7.7

= 2526

| | | | | |
|---|---|---|---|---|
| Efficiency | 66% | 70% | 75% | 80% |
| Target per hour | 2084 | 2210 | 2368 | 2526 |

## 3.4.3 SMV CALCULATION:

We know that,

SMV = Basic time + Allowance of basic time

Basic time = Observed time × rating

Observed time = Average cycle time/60

Here, I show SMV calculation for Front & Back rise joint

This sheet is not contain rating and cycle time so I let the rating and cycle time and calculate the SMV

Let, Average cycle time = 12 sec

Now observed time = 12/60 = 0.20 sec

Rating = 80%,

So, Basic time = observed time × rating

= 0.20 × 0.80

= 0.16 sec

= 9.6 min

Let, Allowance 15%,

SMV = Basic time + Allowance of basic time

= 9.6 + 0.15

= 9.75 min

I can calculate other operation in same way.

## 3.4.4 PITCH TIME:

Here,

No. of Operation = 42

Total SMV = 7.7

So, Pitch time = No of operation/SMV

= 42/7.7

= 5.45 min.

## 3.4.5 CALCULATION OF EFFICIENCY:

Here,

Total production = 2195

SMV = 7.7

Total man power = 41

Working hour = 10

We Know,

$$\text{Efficiency\%} = \frac{\text{Total production} \times \text{SMV}}{\text{Total man power} \times \text{working hour} \times 60} \times 100$$

$$= \frac{2195 \times 7.7}{41 \times 10 \times 60} \times 100$$

$$= \frac{16901.5}{24600} \times 100$$

= 68.70

= 69%

## 3.4.6 LINE CAPACITY:

We know,

$$\text{Line capacity} = \frac{Total\ man\ power\ x\ Working\ hour\ x\ 60\ x\ efficiency\%}{Smv}$$

$$= \frac{41 \times 10 \times 60 \times .69}{7.7}$$

=2204 Pcs

| | |
|---|---|
| Target | 2084 |
| SMV | 9.75 |
| Pitch time | 5.45 min |
| Efficiency% | 69% |
| Line capacity | 2204 pcs |

# 3.5 Operation Bulletin for LADIES TOP:

**Natural Denims Ltd.**

Buyer Name: TCHIBO

Item: LADIES TOP

Style no: 16152

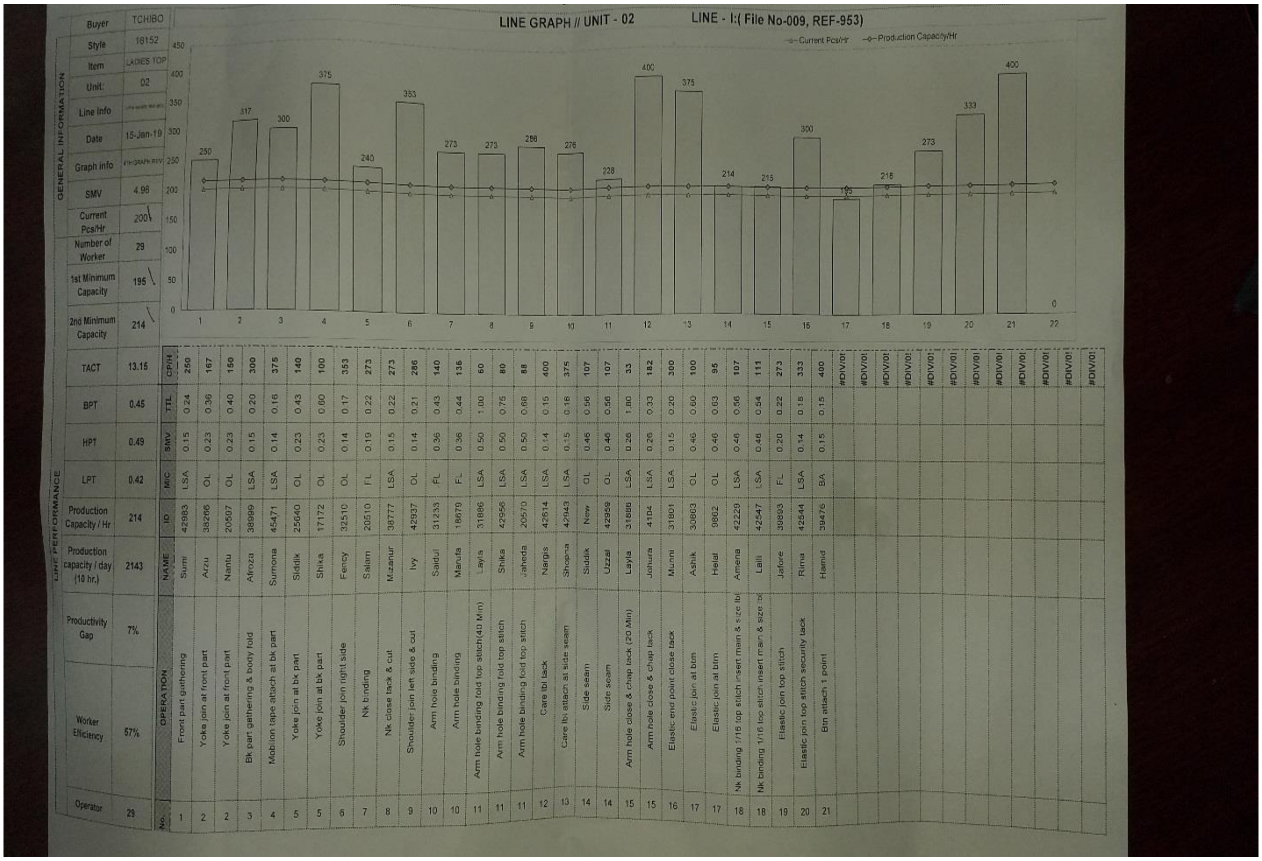



Figure 3.2.1: Operation Bulletin for LADIES TOP.

**Natural Denims Ltd.**

Unit: 02

Line: I

Buyer Name: TCHIBO

Item: LADIES TOP **OPERATION BULLETIN**

| SMV | Current Pics | Number of Worker | Production Capacity / Hr. | Production Capacity / Day (10 hr.) | Worker Efficiency |
|---|---|---|---|---|---|
| 4.96 | 200 | 29 | 214 | 2143 | 57% |

| No. | Operation | M/C | SMV | Capacity / hr. |
|---|---|---|---|---|
| 1 | Front part gathering | LSA | 0.15 | 250 |
| 2 | Yoke join at front part | OL | 0.23 | 167 |
| 2 | Yoke join at front part | OL | 0.23 | 150 |
| 3 | Bk part gathering & body fold | LSA | 0.15 | 300 |
| 4 | Mobilon tape attach at bk part | LSA | 0.14 | 375 |
| 5 | Yoke join at bk part | OL | 0.23 | 140 |
| 5 | Yoke join at bk part | OL | 0.23 | 100 |
| 6 | Shoulder join right side | OL | 0.14 | 353 |
| 7 | Nk binding | FL | 0.19 | 273 |
| 8 | Nk close tack & cut | LSA | 0.15 | 273 |
| 9 | Shoulder join left side & cut | OL | 0.14 | 286 |
| 10 | Arm hole binding | FL | 0.36 | 140 |
| 10 | Arm hole binding | FL | 0.36 | 136 |
| 11 | Arm hole binding fold top stitch | LSA | 0.50 | 60 |
| 11 | Arm hole binding fold top stitch | LSA | 0.50 | 80 |
| 11 | Arm hole binding fold top stitch | LSA | 0.50 | 88 |
| 12 | Care label tack | LSA | 0.14 | 400 |
| 13 | Care label attach at side seam | LSA | 0.15 | 375 |
| 14 | Side seam | OL | 0.46 | 107 |
| 14 | Side seam | OL | 0.46 | 107 |
| 15 | Arm hole close & chap tack | LSA | 0.26 | 33 |
| 15 | Arm hole close & chap tack | LSA | 0.26 | 182 |
| 16 | Elastic end point close tack | LSA | 0.15 | 300 |
| 17 | Elastic join at bottom | OL | 0.46 | 100 |
| 17 | Elastic join at bottom | OL | 0.46 | 95 |
| 18 | Nk binding 1/16 top stitch insert main & size lbl | LSA | 0.46 | 107 |
| 18 | Nk binding 1/16 top stitch insert main & size lbl | LSA | 0.46 | 111 |

| | | | | |
|---|---|---|---|---|
| 19 | Elastic join top stitch | FL | 0.20 | 273 |
| 20 | Elastic join top stitch security tack | LSA | 0.14 | 333 |
| 21 | Btn attach 1 point | BA | 0.15 | 400 |

TOTAL GARMENTS S.M.V = 4.96

Day TARGET = 2143

TARGET / HR. = 214

ABOVE ANALYSIS ASSUMPTION

| | |
|---|---|
| NO OF WORKER | 29 |
| FACTORY EFFICIENCY | 57% |
| NO OF WORKING HOURS | 10 |

### 3.5.1Description:

The **operation bulletin sheet** for the production of **LADIES TOP** at **AKH Knitting & Dyeing Ltd.** provides detailed insights into the manufacturing process for the **buyer "TCHIBO"** at **Unit-02, Line-I**. It includes key production details such as **total workforce, SMV (Standard Minute Value), efficiency, and hourly production targets.**

The sheet specifies that **29 workers** operate **30 machines**, distributed as follows:

- **10 OL (Overlock) machines**
- **15 LSA (Lockstitch with Automatic Trimmer) machines**
- **1 BA (Bartack) machine**
- **4 FL (Flatlock) machines**

The breakdown of various operations' **SMVs results in a total SMV of 4.96**. The **planned production target** is **2,143 units**, with an **expected efficiency of 57%**. Additionally, efficiency calculations at **57%, 70%, 75%, and 80%** are included to estimate total production over a **10-hour shift**.

### 3.5.2 The Calculation Process:

### TARGET CALCULATION:

All OP = 29 SMV = 4.96

W,H. = 10

Efficiency = 57%,

Target = total man power × work hr. × efficiency % × SMV

= 29 × 10 × 57% × 4.96

= 81

When efficiency = 70%, Target

= 29 × 10 × 70% × 4.96

=1007

When efficiency = 75%,

Target = 29 × 10 × 75% × 4.96

= 1079

When efficiency = 80%,

Target = 29 × 10 × 80% × 4.96

= 1151

| Efficiency | 57% | 70% | 75% | 80% |
|---|---|---|---|---|
| Target per hour | 810 | 1007 | 1079 | 1151 |

## 3.5.3 EFFICIENCY CALCULATION:

Total production = 2500

SMV (Standard minute

value) = 3.69

Total OP = 33

Working hour = 10 W

$$\text{Efficiency\%} = \frac{\text{Total production} \times \text{SMV}}{\text{Total man power} \times \text{working hour} \times 60} \times 100$$

$$= \frac{2500 \times 3.69}{33 \times 10 \times 60} \times 100$$

$$= \frac{9225}{19800} \times 100$$

= 46.59

= 47%

# CHAPTER – 4: RESULT & DISCUSSION

# 4.0 Result and Discussion:

### 4.1.1 Analysis of Capacity Study of Different Operation from Data 3.1

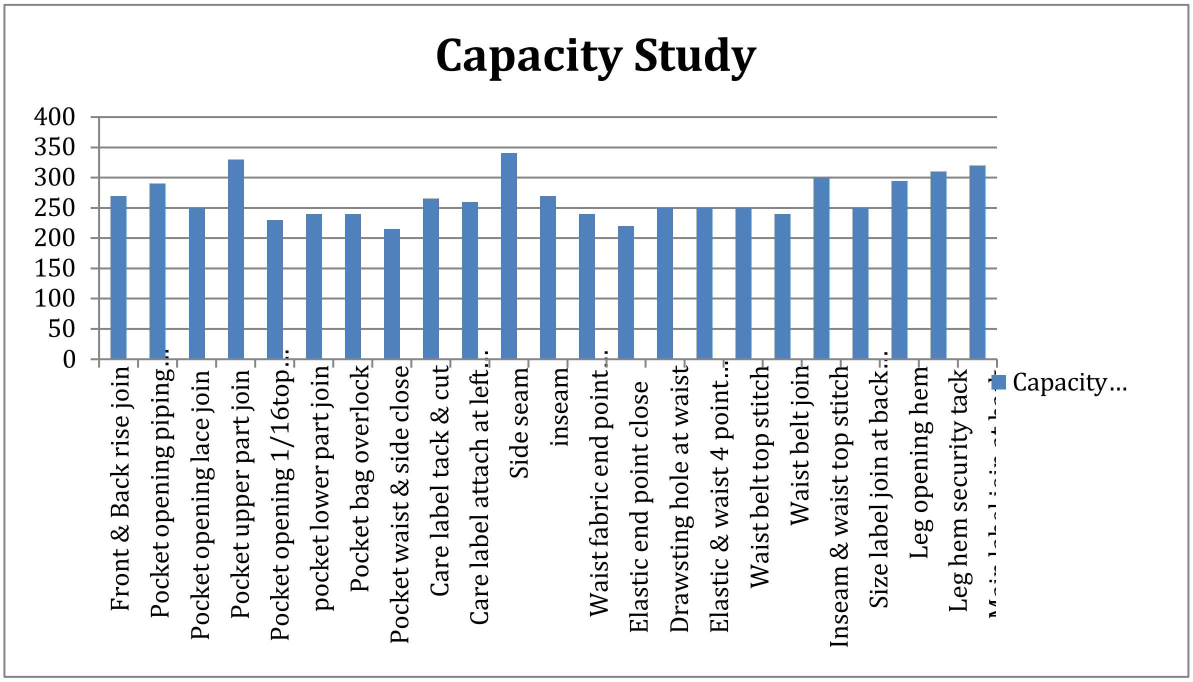



Chart 4.1.1: Analysis of capacity study for different operation of LADIES SHORTS from data

**Description:**

This chart illustrates the **hourly production capacity** of various operations, with efficiency calculated at **66%**. The data was initially gathered in **Chapter 03**, where production capacity was determined, and then used to create an **effective visual representation**.

The chart provides insights into **different types of operations** along the x-axis, while the **hourly production output** is displayed on the y-axis. The **highest production capacity** is observed in **Pocket Opening Piping Make, Care Label Tack & Cut, and Elastic End Point Close**, each reaching **333 units per hour**. Meanwhile, the **lowest production capacity** is recorded for **Waist Belt Top Stitch**, at **207 units per hour**. All other operations fall within an **average capacity range**.

### 4.1.2 Analysis of SMV of Different Operation from Data 3.1

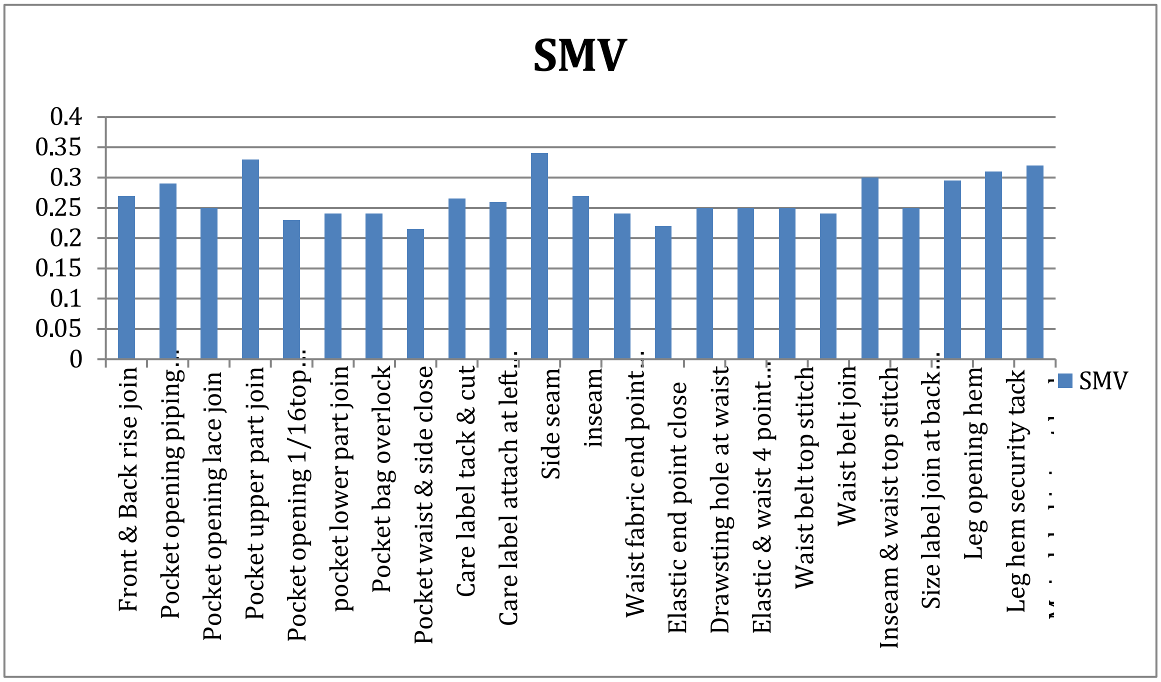



Chart 4.1.2: Analysis of SMV for Different Operation of LADIES SHORTS from Data

**Description:**

Its represents the **Standard Minute Value (SMV)** for different operations. Each operation's SMV was calculated and used to create a visual representation of the data.

The chart lists various operations along the **x-axis**, while their **corresponding SMV values** are displayed on the **y-axis**. The **highest SMV** recorded is for **Waist Belt Join**, with a value of **0.75**, indicating it requires the most time to complete. Conversely, the **lowest SMV** is for **Care Label Tack & Cut**, with a value of **0.15**, making it the quickest operation in the process. All other operations fall within a **moderate SMV range**.

### 4.2.1 Analysis of Capacity Study of Different Operation from Data 3.2

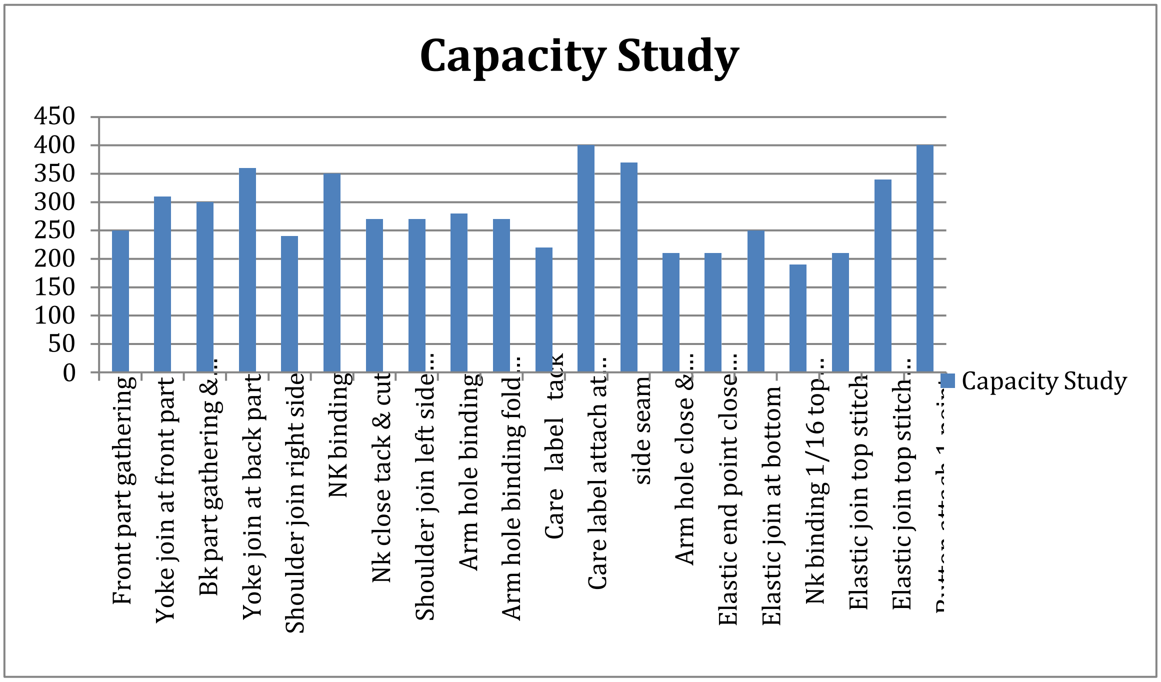



Chart 4.2.1: Analysis of Capacity Study for Different Operation of LADIES TOP from Data

**Description:**

That chart illustrates the **hourly production capacity** of various operations, calculated at **57% efficiency**. The production capacity was initially determined in **Chapter 03**, and the final results were used to create an **effective visual representation**.

The **x-axis** lists different types of operations, while the **y-axis** displays the **hourly production output**. The **highest production capacity** is observed in **Care Label Tack and Button Attach (1 Point),** reaching **400 units per hour**. Meanwhile, the **lowest capacity** is recorded for **Elastic Join at the Bottom**, at **195 units per hour**. All other operations fall within an **average capacity range**.

### 4.2.2 Analysis of SMV of Different Operation from Data 3.2

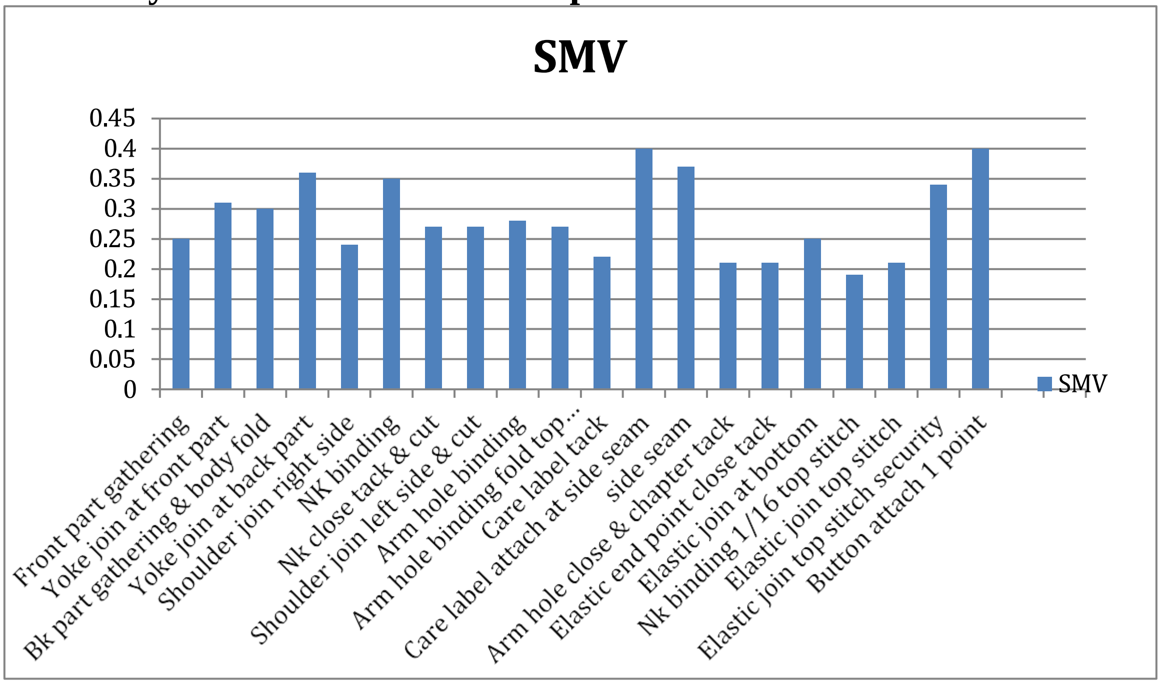



Chart 4.2.2: Analysis of SMV for Different Operation of LADIES TOP from Data

**Description:**

This chart represents the **Standard Minute Value (SMV)** for various operations. The SMV for each operation was calculated first, and the final results were used to create this **visual representation**.

The **x-axis** lists different types of operations, while the **y-axis** displays their respective **SMV values**. The **highest SMV** recorded is for **Armhole Binding Fold Top Stitch**, with a value of **0.50**, indicating it requires the most time. In contrast, the **lowest SMV** (0.14) is observed in **Mobilon Tape Attached at Back Part, Shoulder Join Right Side, Shoulder Join Left Side & Cut, Care Label Tack, and Elastic Join Top Stitch Security Tack**. The other operations fall within an **average SMV range**.

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### 4.3.1 Analysis of Capacity Study of Different Operation from Data 3.3

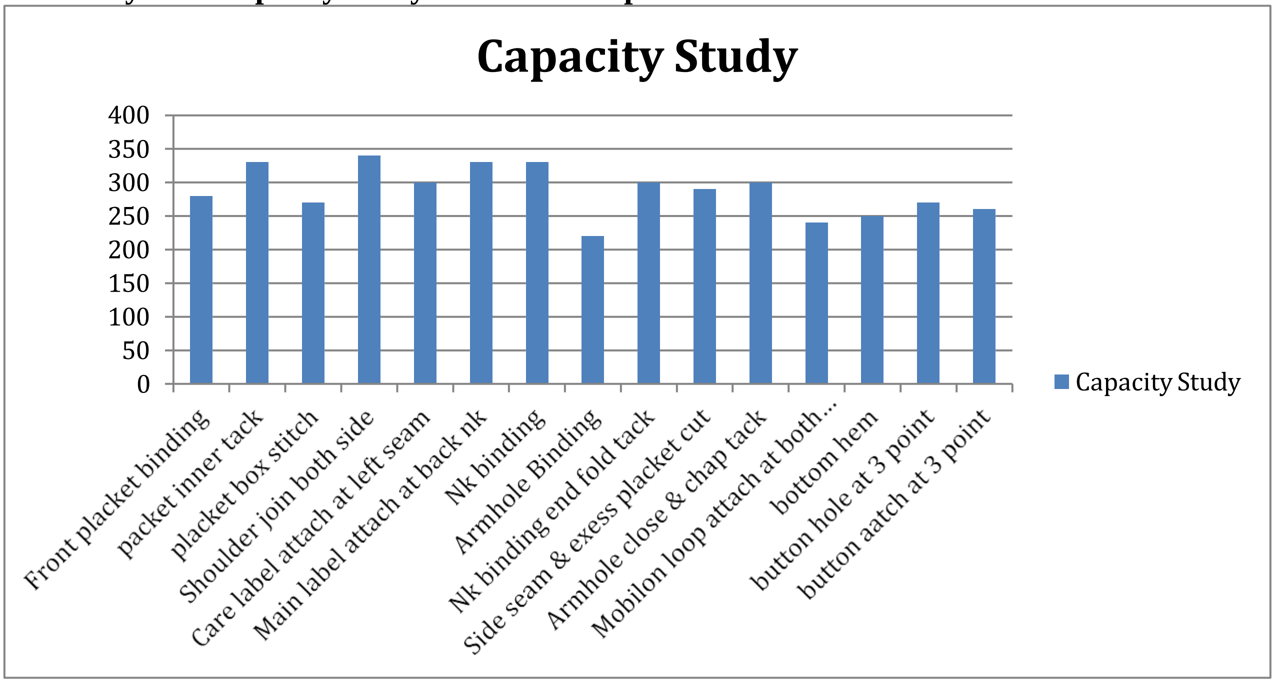


Chart 4.3.1: Analysis of Capacity Study for Different Operation of VEST from Data

**Description:**

This chart illustrates the **hourly production capacity** for various operations, calculated at **47% efficiency**. First, the production capacity was determined in **Chapter 03**, and the final results were used to create this **detailed representation**.

The **x-axis** lists different operations, while the **y-axis** displays their respective **hourly production capacity**. The **highest production capacity** is observed in **Shoulder Join Both Sides**, with **342 units per hour**, indicating it is the most productive operation. Conversely, the **lowest production capacity** is for **Mobilon Loop Attach at Both Shoulders**, with **240 units per hour**. The remaining operations fall within an **average production capacity range**.

### 4.3.2 Analysis of SMV for Different Operations (from Data 3.3)

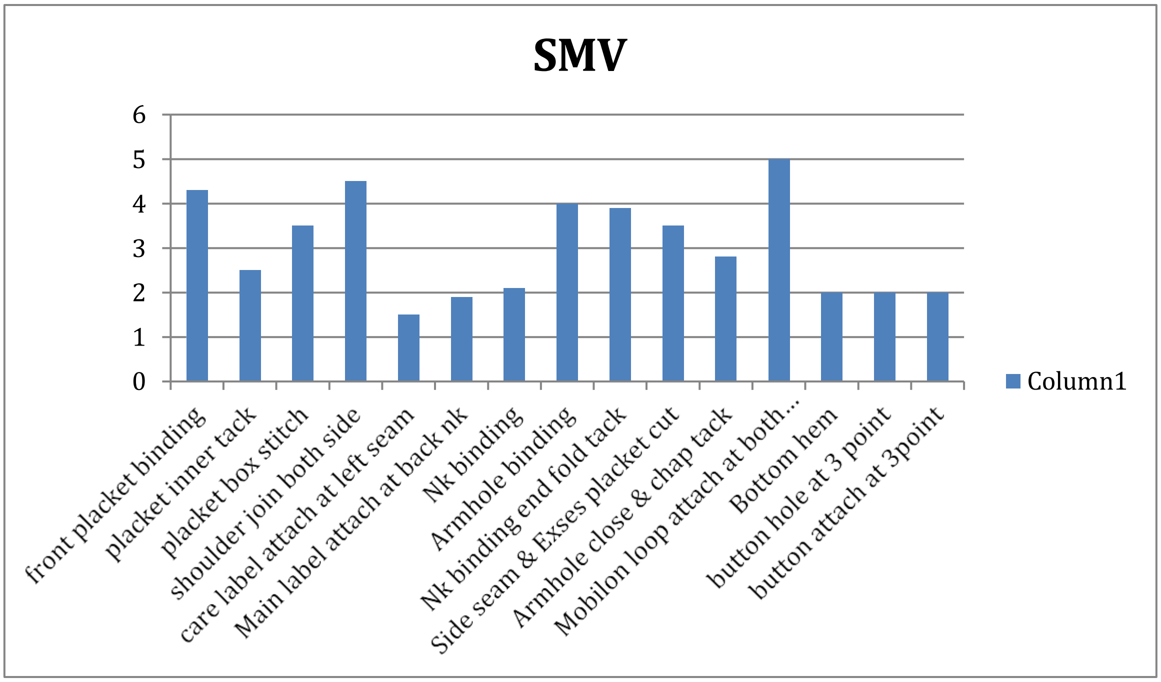


Chart 4.3.2: Analysis of SMV for Different Operation of VEST from Data

**Description:**

This chart illustrates the **Standard Minute Value (SMV)** for various operations. Initially, the **SMV for each operation** was calculated, and the results were used to create this **visual representation**.

The **x-axis** lists different operations, while the **y-axis** represents their **corresponding SMV values**. The **highest SMV** is recorded for **Mobilon Loop Attachment at Both Shoulders**, with a value of **0.50**, indicating it requires the most time per unit. Conversely, the **lowest SMV** is for **Shoulder Joint on Both Sides**, with a value of **0.13**, making it the fastest operation in the chart.

### 4.4 Analysis of Total SMV of Different Items (from Data 3.1, 3.2, 3.3)

| ITEM | TOTAL SMV |
|---|---|
| LADIES SHORTS | 7.7 |
| LADIES TOP | 4.96 |
| VEST | 3.69 |

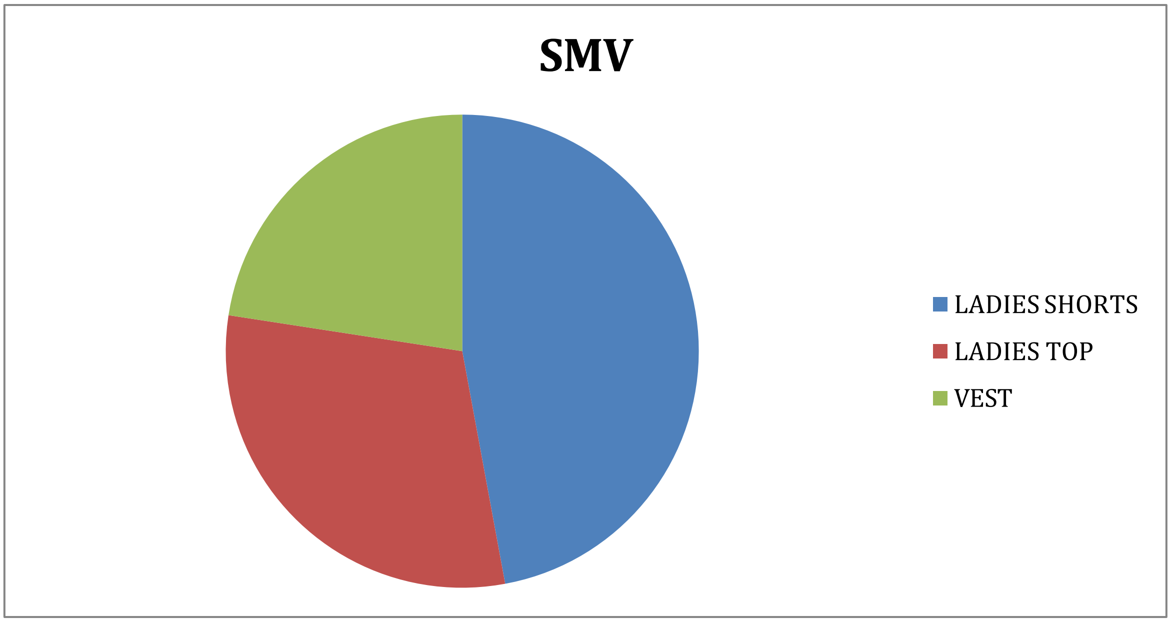


Chart 4.4.1: Analysis of Total SMV of Different Item LADIES SHORTS, LADIES TOP, VEST.

**Description:**

This **pie chart** visually represents the **total Standard Minute Value (SMV)** for different apparel items, which were calculated in **Chapter-03**. The chart analyzes three products:

- **LADIES SHORTS → SMV: 7.7**
- **LADIES TOP → SMV: 4.96**
- **VEST → SMV: 3.69**

From the chart, **LADIES SHORTS** has the **highest SMV (7.7)**, indicating it requires the most time for production. Conversely, **VEST** has the **lowest SMV (3.69)**, making it the least time-consuming item to produce.

**4.5 Analysis of Efficiency% of Different Items (from Data 3.1, 3.2, and 3.3.4)**

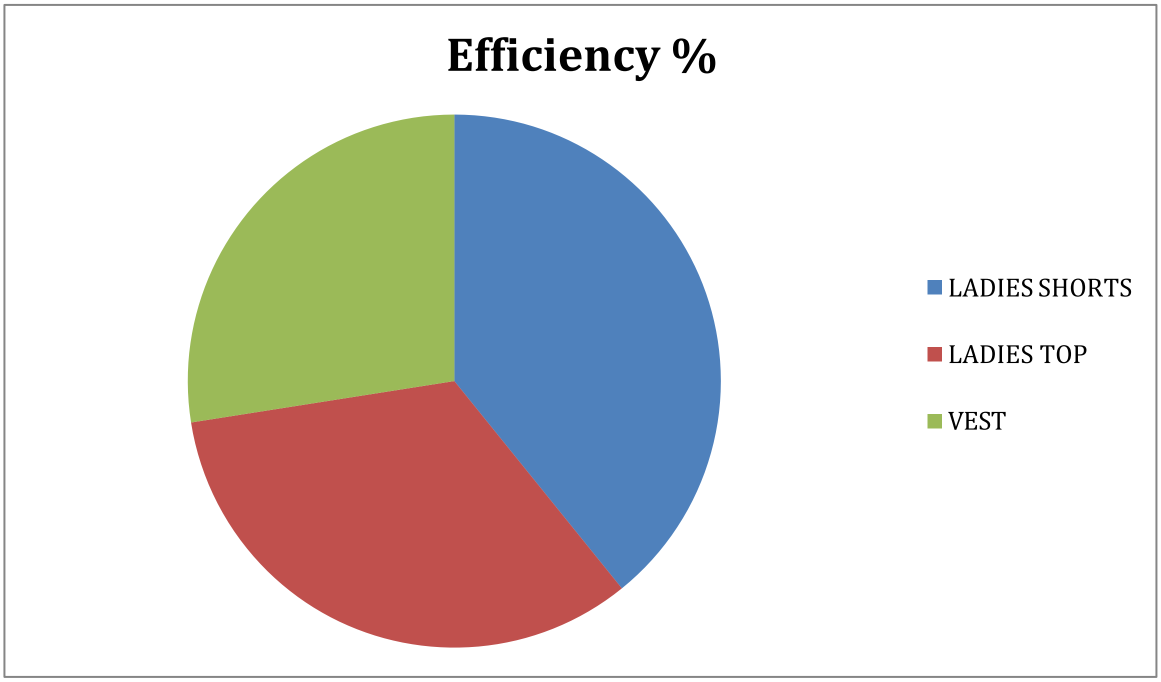


Chart 4.5.1: Analysis of Total Efficiency of Different Item LADIES SHORTS, LADIES TOP, VEST

## Description:

This pie chart shows the efficiency percentages of three items: Ladies Shorts (66%), Ladies Top (57%), and Vest (47%). The highest efficiency is for Ladies Shorts (66%), and the lowest is for Vest (47%).

# CHAPTER – 5: CONCLUSION

# Conclusion:

It was a project comprehensive study of Standard Minute Value (SMV), operation bulletins, and process improvements within Natural Denims Ltd. It works not only deepened my understanding of industrial engineering in the garment industry but also provided valuable insights into:

✅ **Production planning & efficiency improvement**
✅ **Time studies & SMV analysis**
✅ **Machinery usage & procurement**
✅ **Workplace adaptation & industry procedures**

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