

**A STUDY ON THE LEAN MANUFACTURING SYSTEMS PRACTICE IN
BANGLADESH AND KAIZEN IMPLEMENTATION**

BY

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This Report Presented in Partial Fulfillment of the Requirements for the Degree of
Masters of Science in Management Information System

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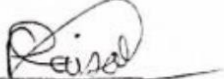
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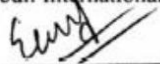
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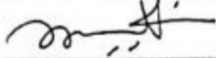
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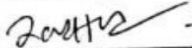
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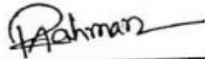
I hereby declare that this project has been done by me under the supervision of **Md Zahid Hasan, Associate professor, Department of CSE, Daffodil International University**. I also declare that neither this project nor any part of this project has been submitted elsewhere for the award of any degree or diploma.

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ABSTRACT

Lean Manufacturing systems have overcome the perception of being another management fantasy. An increasing number of organizations in developing countries are implementing lean production systems in order to generate improvements in performance and remain competitive. At present many manufacturing industries in Bangladesh have chosen to conduct the study. A field survey with semi-structured questionnaires, interviews, and site visits was conducted to gather necessary information from the companies. These companies were selected purposely to ensure the best possible scenario of lean management practice in Bangladesh.

The main thrust of this research is to examine the extent of lean practices in the Bangladeshi manufacturing industry to improve manufacturing performance and identify the factors for enabling the environment for practicing lean successfully. This study performs a comparative analysis to explore the association between the results of the present study with other global studies examining similar philosophies.

The research findings indicate that the selected companies have adopted a wide variety of lean tools, and techniques and gained many improvements. Findings also different kinds of factors as well as factors that hindered the lean implementation initiatives. It concludes with suggestions for further work.

ABBREVIATION

TPS- Toyota Production System

SWOT- Strength, Weakness, Opportunities, Threats

LP- Lean Production

VA-NVA- Value added VS Non-value added

VSM- Value Stream Mapping

TPM-Total Productive Management

OEE- Overall Equipment Effectiveness

KPI- Key Performance Indicator

TQM- Total Quality Management

5S- Seiri, Seiton, Seri, Seiso, Seiketsu, Shitsuki

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CHAPTER 1

Introduction

1.1 Introduction

The lean manufacturing systems analysis is the root cause analysis to improve the operating systems & elaboration. It doesn't matter if it is a manufacturing company, super shop, or others or does not depend on the company size. you can be applied lean manufacturing in any company and different sizes. The main goal of lean manufacturing to reduce waste by using lean tools which help to increase the organization's effectiveness.

Lean manufacturing comes from Japan where first used by Toyoda Motor Corporation by the founder of Saikichi Toyoda and industrial engineer Taiichi Ohno. Taiichi Ohno was American citizenship.

Taiichi Ohno wanted to first used lean manufacturing in America but America did not get it. Japan understands the process of lean manufacturing and they adopt.

The Toyota Production Systems developed by Taiichi Ohno, the artificial mastermind at Toyota. The Toyota Product Systems proposed as an unavoidable production system by the request of post-war Japan. Taiichi Ohno studied the American Fordist systems looking for a model that would be modify the post-war Japan bone. Taiichi Ohno leaned from the Fordist Systems to measuring and assaying the working times and create a standard model for working styles. Still now the American supermarket contributed most of the formation of TPS. Taiichi Ohno was struck by this supermarket model which is really excellent This model was the customer chooses the products singly, taken them from the shelves and singly go to the cashier to pay. Between 1950 to and 1980, inspired by this system that enhance the TPS. It believes that higher quality comes from lower costs and delivery faster.

1.2 Problem Statement

A problem statement refers to finding the problem and developing the problem identification to solve the problem. It can identify the gap between the current problem the and thinking process of

production and data. The problem statement should be based on the Five WH question. The first condition of the problem is understanding the problem which can be done by the way of the problem statement. The problem statement is extremely used to the organization to execute the process systems increase.

1.3 Research Objectives

1. To find research gaps using the tools and perfectly classify different systems.
2. To apply straight-forward technique to improve the productions, safety, quality, defect, and increase morality.

1.4 Research Questions

1. How can we define the gaps of research to using the tools & correctly classify the different categories of lean manufacturing systems?
2. How can we improve the tools & technique to improve the productions, safety, quality, defect, and morality?

1.5 Report Layout

Chapter 1 Represents the Introduction, Objectives, and research questions.

Chapter 2 Literature reviews of Lean Management System

Chapter 3 Concept of Lean Manufacturing

Chapter 4 Lean Tools & Kaizen Implemented

Chapter 5 Conclusion along with Future Work.

Chapter 2

LITERATURE REVIEW

2.1 Introduction

The lean manufacturing first establishes in Japan where Toyoda Production first started the lean manufacturing systems. Lean manufacturing helps to increase production from fewer resources and boosting the employees for job satisfaction. There are two manufacturing first is traditional manufacturing and another is lean manufacturing. Traditional manufacturing believes the inventory management where lean manufacturing believes that inventory management is a waste. But at first you have to understand the difference between lean manufacturing and traditional manufacturing which is very important for any organization. Traditional manufacturing think that the market more expensive any time so you have to understand the market dynamics. But lean manufacturing thinks that the customer will pay only valuable service or product. they will not pay for inventory or any mistakes. Today's people has different perspective on manufacturing process and in any lean manufacturing industries are straight-forward for their process. They believe that the value of product from the customer view not manufacture. So, most of the top company going to develop the lean manufacture for their company and their profit increase day by day.

Lean manufacturing focus on the increase production to reducing the waste. Lean tools SWOT(strength, weakness, opportunity, and threats) helps to reducing the waste from the organizations. When you implemented the lean in your organization and its continuous then outcome increase day by day. The ultimate goal is higher quality production to invest the lower possible cost.

2.2 Scope of the Problem

The consist of cross-function team increase the organization production which contribute the implementation of Total quality management, improve communication systems. most important things is builds the team bonding. Implementation of lean, the employee's confidence level increase more & improves the working method, and they learn how to set their own goals. This research papers suggest that involves the all members in team.

2.3 Challenges

1. **Data Collection:** The main challenge of the lean manufacturing process for data collection because implementing lean manufacturing needs previous data.
2. **Image procession:** Another challenge of image collection. Sometimes it is high or low contrast or noisy So image processing perfectly so tough.
3. **Employee Improvement:** Another challenge of employee improvement. Because they were habitual to the daily work regularly.

CHAPTER 3

CONCEPTUAL OF LEAN MANUFACTURING

3.1 Introduction

Many companies already applied lean manufacturing concepts in their organizations to get better utilization. After implementation, they get more output from fewer resources and increase their profit. World top companies (Like Toyoda, Nike) already applied the lean tools. As a result, they get more advantage over their competitor. Lean tools help to gain their goals:

- Element the waste
- Improve the quality
- Reduce the lead time
- Reduce the costs

Lean manufacturing is a continuous process. So, you will not get the result in one day. To get the result you need to positive mind & patience.

Here explain some important lean tools

3.2 First Priority of Customer Choice

Lean manufacturing goals should be customer-centric for which customers are willing to pay. The customer will not pay for extra production or for waste. So should be customer-centric to improve customer satisfaction.

A successful Lean organization company understands what customers want.

3.3 5s

5S methodology for organizing the workplace so that, work can be performed effectively, efficiently & safely.

Table-01: Steps of 5S

Steps	Japanese	English	বাংলা
1s	Seiri	Sort	বাছাই
2s	Seiton	Set in Order	সাজানো
3s	Seiso	Shine	পরিষ্কার
4s	Seiketsu	Standardize	মানসম্মত পদ্ধতি
5s	Shitsuke	Sustain	অভ্যাস

3.3.1 1st S -Sort

First S (Sort) means to remove unnecessary items which have no value added for you or your organization. There are some systems to remove unnecessary items:

- Red tagging
- Evaluate later
- Photography or list down

Before



Figure-1: Before 1s

After



Figure-2: After 1s

Before



Figure-3: Before 1s

After



Figure-4: After 1s

3.3.1.1 Methods of Sort

1. Identify the items are necessary for the workspace or not.
2. Remove items that are no longer needed.
3. Ask yourself to put red tags on items you think are no longer needed.
4. Also tag items that are difficult to classify.
5. Establish a “Red tag holding area” for tagging items to allow others to review, see if they are needed.

3.3.1.2 Red Tagging: Helpful Hints

1. Train all participants in proper 5S rationale and red tag procedures
2. Use a red tag registrar to track item disposition
3. No need multiple tags on any one item
4. Be reasonable about decorative items, family pictures, plants, people etc.
5. Items can be tagged for improvements are known or suggested
6. Be mindful that removing items can be emotional (radios, magazines, food, beverages, etc.)

3.3.1.3 Why is it needed?

- Eliminates Waste
- Streamline Work
- Optimize Efficiency
- Better Work Environment
- Quicker Changeover
- Improve Quality Performance
- Ensure Zero accident
- Improve morale and Staff Involvement

3.3.2 2nd S - Set in Order

Set in order means tidying up. After taking something from a place and leaving it there after work is called set in order.

Before



Figure-5: Before 1s

After



Figure-6: After 1s

3.3.2.1 Visual Management

Andon System: Andon lights are important visual tools that are installed on production machines to indicate their current status. Since they're visible from a distance, they're veritably useful in

bringing immediate attention to problems as soon as they appear. For illustration, a light may turn on to indicate a deficit of raw accouterments, anticipate a corridor, or the need for conservation. The Andon system can also include means to stop the process, so the issue gets resolved.



Figure-7: Andon System

Each color in an Andon system represents a particular state of the machine. The enhancement and effectiveness of the visual operation system should be estimated regularly. This can be achieved using a visual operation inspection roster which will help to describe abnormalities, buttressing norms, and icing stability and safety remain a top priority. It'll allow the bystander to more address compliance gaps and provides an occasion for nonstop enhancement. It's important that top operations and administrators share in these reviews as well. An effective inspection should also end up with a list of enhancement conduct

- **Kanban Board:** Kanban board can be used for the employees to understand which works is pending or which work is done. We can use red, green, or other color paper to note the work list. Kanban board first use for Toyota Production Systems.



Figure-8: Kanban Board

- **Score Board:** A plant without a display of performance criteria is like an auto without a break. You may know where you're going but you have no idea when you'll reach your destination. Performance criteria should be displayed in a visually mouthwatering way to allow people to get sapience into how the operation is performing. Performance should be meaningful, easy to understand, free of specialized terms, accurate and over- to- date.



Figure-9: Digital Dashboard

- **Labeling & Tagging:** Tags can exclude these exasperating and time-consuming internal exercises. With a couple of markers, you can classify and label lines for hassle-free quests down the road, and also find all of those lines again fluently no matter where you save them.

A file can only be in one brochure at a time, but it could have an unlimited number of markers. Suppose that you've made a design briefly for a customer and you want to save it in the specific design brochure and to the customer's main brochure. With these flyers, you'd have to pick one brochure or duplicate the train, which could beget issues. On the other hand, they are perfect for adding order data like this, since you can add as many markers as you want to a file.

You can tag the document with both the design's name and the customer's name, and also save the train just in the design folder. Tagging is the simplest way to add data to lines without dealing with endless layers of flyers. They are maybe your more flexible tools for organizing your files.



Figure-10: Labeling & Tagging



Figure-11: Labeling & Tagging

- **Display TV:** It comes from the Japanese word for “Paper Lantern”. Andon display boards visually broadcast the status of a line or machine for everyone in the factory to see. It works well that spare manufacturing expert will make this one of their top precedence’s for a shop bottom. The Internet provides a perfect dashboard result for machine data prisoner, analysis, and display. also, Machine product data can be converted into OEE and other KPIs, and also Web TVs can be used for the display.



Figure-12: Display TV

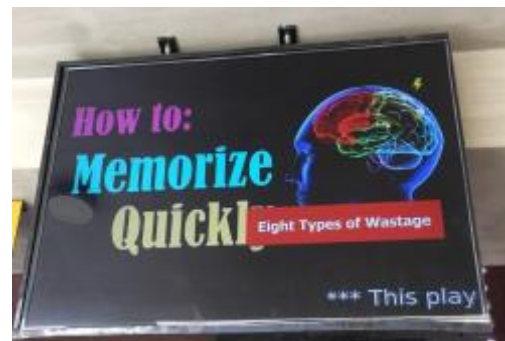


Figure-13: Display TV

- **Shadow Board:** You can use a shadow board to set the tools or equipment. It's good if the shadow is color because easy to find if any items are missing.



Figure-14: Shadow Board



Figure-15: Shadow Board

3.3.2.2 Benefits

- Searching time should be lower than 30s
- Arrange accouterments and outfit in a way that makes them easy to find, use, and put it back. adding effectiveness by keeping tools near to where they're most constantly used.
- Time savings for looking for effects, and putting them down, by easily labeling all storehouse areas.
- To reduce the stir & transportation of accouterments to operate them in their optimized position.
- Use color- coding, outlines, and other visual systems to show where everything belongs.

3.3.3 3rd S – Shine

Third S is shine which made the workstation net & clean. Workplace cleaning means improving the health & safety.



Figure-16: Shining



Figure-17: Shining

3.3.3.1 Growing Shining habit

Cleaning should become part of the daily job, not...

- Annually ✗
- Monthly ✗
- Done for guests ✗
- Done for Audits ✗

3.3.4 4th S - Standardized

The fourth S is standardized. There are no standard roles or regulations for standard. Because it's a continuous process. But you can note down everything. It's a new practice. After a few days, it will normally work that will be helpful for your organization.

3.3.5 5th S – Sustain

The Fifth S is sustained which means after implementing the first three S you have to continue the same things regularly. If you do the same thing for 21 days it will be habitual.

3.4 Forms of 7 Waste

The 7 wastes come from Toyoda production systems. The founder of Toyoda, his son, and industrial engineer Taiichi Ohno establish a model for the 7 wastes. The 7 wastes focus on the to reduce wastage for which customers will not pay.



Figure-18: 7 Wastes

3.5 Total Productive Maintenance (TPM)

The crucial element of spare operation Manufacturing, total productive conservation embraces a comprehensive strategy for optimizing installation conservation with the primary thing of barring resource waste, hand accidents, product blights, and unplanned time-out. These objects are achieved through preventative conservation, nonstop training, and effective collaboration between the product and conservation labor force. With outfit effectiveness at its core, total productive conservation empowers outfit drivers with chops training, visionary conservation programs, and productivity standard assessments, so that they can completely take charge of the conservation of means assigned to them. Advanced situations of pool autonomy drop over-dependence on breakdown/ reactive conservation.

3.5.1 Pillars of Total Productive Maintenance (TPM)

Total productive conservation is a process that's honored & used to keep the association well-equipped and in stylish shape, which adds value to the business. However, also this leads to no or veritably many blights, smaller accidents If this is achieved. When applying total productive conservation, just a little quantum of conservation is enough to produce a positive effect and bring down the cost. It also increases the productivity of the outfit and increases its lifetime. The entire installation, therefore, starts to operate more efficiently. The main idea of total product conservation is the overall outfit's effectiveness of OEE, which addresses three main factors, videlicet vacuity, performance, and volume.

Here are the 8 pillars of total productive maintenance:

- **Autonomous Maintenance:** This is the pillar that places the introductory conservation obligation into the hands of the driver of the outfit. The conservation staff is free to take over the expert tasks that bear further attention. The driver will be responsible for icing that introductory conservation is taken care of like lubrication and cleaning. time-out is reduced as there's no need to stay for any conservation.
- **Planned Maintenance:** This is where applicable scheduling of the conservation tasks is done when outfit is prognosticated to break down or fail. This lets the company plan on the keep and reduces any product needs from getting halted. This reduces the reactive time so

that problems can be stopped ahead there's any large-scale malfunction.

- **Quality of Maintenance:** This is where any crimes are detected and averted beforehand so that the disfigurement doesn't continue down to the product chain. It lets the drivers find out what the root cause of the problem is.
- **Focus on Improvement:** Focus on enhancement riveted enhancement is when the problem occurs, and this creates the need for the cross-functional platoon. With a range of skill sets and experience, it lets the platoon break the problem briskly
- **Early Maintenance of Equipment:** The coming pillar involves gathering the former knowledge of conservation from the once ministry and also using it on the new outfit. This allows for reaching the optimal position in a short time.
- **Training and Education:** All conservation labor force, drivers, and directors must be trained in total productive conservation. These can be the literacy ways to ensure proper conservation and be more apprehensive of how to exercise total productive conservation directly, which affects the company's productivity.
- **Healthy Safety and Environment:** Healthy Safety and Environment It ensures that all the workers get a safe condition to work in. Productivity is important, but that comes after safety. It's important that workers feel safe in the plant, which has a major effect on their station towards their organizational places.
- **Administration:** Administration Total productive conservation should be applied where it can be in the administration section of the company. It ensures that the entire total productive operation culture is understood by one and all.

3.5.2 The Goal of TPM

Total Productive conservation the main thing of total productive maintenance is the nonstop enhancement of outfit effectiveness through engaging those that impact it in little group enhancement conditioning. TPM and TQM are sacrificing the crucial functional conditioning of the operating process. The total Productive conservation to be effective, the full support of the total pool is needed.

OEE Calculation:

- **Performance x Availability x Quality x 100 = OEE**

*** Performance = Production Run Time / Total Run Time**

*** Availability = Actual Production / Total Production**

*** Quality = Finish Goods / Total Goods**

3.6 Single Minutes Exchange of Dies (SMED)

The SMED is an important tool of lean manufacturing. Another name is Quick change over. This tool use for to reduce the setup time from one process move to another process.

Now that the exact meaning of a Single-Minute Exchange of Dies has been bandied, another thing to clarify before considering a Single-Minute Exchange of Dies is how it's affiliated to outfit transfiguration time. Transfiguration is the transitioning of an outfit from recycling one product to recycling another. It's veritably analogous to the exchange of dies.

An intriguing thing about Single- Minute Exchange of Dies is that what it stands for(single-number nanosecond exchange of dies) describes the intended result of using Single- Minute Exchange of Dies more so than the factual process of how to make the exchange of dies take lower than 10 minutes.

3.6.1 Steps of SMED

Once these areas have been analyzed, you can move into the 6 steps of SMED implementation to begin reducing changeover times.

1. Record and Observe:

- **Establish a team:**

1. Know each other
2. One vision
3. Know the process

- **Observation**

1. Record Process

2. List Every Equipment
3. Measuring Walking Distance

2. Identify pilot area: Identify airman area A critical part of relating test airman area is icing your workers are confident and motivated to ameliorate performance. Fortunately, more complicated rudiments of homemade transfiguration can be made simpler using stoked reality technology. workers can follow step-by-step guided digital work instructions using 3D, spatially apprehensive visualizations that are overlaid onto their work surroundings. Access to simple, in-environment work instructions increases information retention among frontal-line workers. This dramatically improves their understanding of each step of the transfiguration process and reduces crimes performed in scrap or rework.

3. Identify internal and external components: Identify internal and external factors Once you have linked your test area, you must understand the internal and external factors of the transfiguration. You must have both an understanding of the work that's going on, and knowledge of the quantum of time it took. The SMED system is made up of two main rudiments during the transfiguration process.

- **Internal rudiments:** These are the processes that must be completed while the outfit is stopped.
 - **External rudiments:** These are the processes that can be completed while the ministry is running. One of the focuses of external factors requires having the applicable tools and inventories at- the-ready for a transfiguration.
4. **Convert as many internal components to external:** Convert as numerous internal factors to external The SMED process focuses on making as numerous rudiments external as possible. Each element should be anatomized to see if transfiguration can be worked on while the machine is still running. The IIoT captures enterprise-wide data into means, processes, and procedures to inform the conversion from internal to external factors, which will reduce overall Changeover.



Figure-19: PDCA Board

Streamline internal & external is plan on PDCA (Plan, Do, Check, Action) Methodology

5. Streamline internal elements: Once you have linked your external rudiments, you must streamline your remaining internal rudiments. A smart connected plant powered by IIoT results can make this process flawless — streamlining operations to increase productivity and reduce inefficiencies.

6. Develop new SOP: Standard Operation Procedures (SOP) are the proven processes for any company to ensure the produce and delivery.



Figure-20: SOP procedure

7. Sustain Improvement:



Figure-21: Sustain Process

3.6.2 Benefits of SMED



Figure-22: SMED Benefits

3.7 Kaizen

Kai+Zen- Good for Change + Change for better

Kaizen is a continuous process to improve the better organizations. You will not get the kaizen result in a day. Kaizen improves the production process, operator satisfaction, reduces downtime, & ensures safety.

3.7.1 Process



Figure-23: Kaizen Process

3.7.2 Team Formulation

- Area-based
- Who knows the process
- Third Eye
- Team members should be a maximum of 6-10

3.7.3 Working procedure

- Take permission from top management
- Inform the area leader
- Kaizen process should be a maximum of 5 days
- Before starting the process need training
- First day observe the area
- Second day record the process and implement lean tools
- Third day data analysis
- Fourth day data implementation
- Fifth day improvement preparation & celebration.

Chapter 4

Lean Tools and Kaizen Implementation

4.1 Introduction

From previous chapters, already we know about the tools & techniques of lean manufacturing. In this chapter, we will discuss the data collection or observation & data implementation which have many questions & discussions to implement the lean tools & kaizen. There are 30 employees taking the training to implement the lean tools & kaizen implementation. Other employees were helpful & positive minded to implement the kaizen.

4.2 Implementation of Lean tools

Implemented lean manufacturing on the factory of Akij Resources Ltd. Different kinds of tools and techniques (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) are followed to implement lean management in the factory. Already discussed lean tools (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) previous chapter.

Now let's discuss the various kaizen that has been implemented in the factory from which the company and the employees are benefiting.

4.2.1 Kaizen-1

1. Quick Changeover in Rx 6.0 Machine

Before Kaizen was Implemented, Lean tools and techniques (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) were implemented on the machine.

4.2.1.1 Observation

No.	Description	Before	After	Difference	Time Saved
01	Tool Ready	10	10	0	
02	Machine Ready	10	10	0	
03	Material Ready	10	10	0	
04	Machine Setup	10	10	0	
05	Material Setup	10	10	0	
06	Machine Start	10	10	0	
07	Material Start	10	10	0	
08	Machine Stop	10	10	0	
09	Material Stop	10	10	0	
10	Machine Ready	10	10	0	
11	Material Ready	10	10	0	
12	Machine Start	10	10	0	
13	Material Start	10	10	0	
Total Time saved = 53 minutes					

Figure-24: Observation Sheet

4.2.1.2 Kaizen Charter

Kaizen Charter Form							
Kaizen Name:		Brand Change at Weaving Machine					
Scope	Process Name:	Amari 84 cm to 86 51 cm					
	Start Point:	Output from StarEx1400.					
	End Point:	Finished Fabric.					
Does VSM Exist?		No	VSM Owner or Eval. Sponsor:		Md Masdur Rahman		
Value Stream Name:		Not Available					
Leaders	Charter Author:	Md Arifur Rahman	Sponsor:	Md Masdur Rahman			
	Date Created:	07.02.2021	Champion:	Nirmalendu Sharma			
	Current Revision:	1st Time, No Revision	Facilitator:	Md Akkat Ali			
		Team:	Dr. Debdip				
Strategy	Problem Statement:						
	Corporate Strategy/Goal improved by this kaizen			Notes:			
	1	Increasing Line speed towards to Manufacturer Design.					
2	Reducing Cycle time than Takt time.		With Time Management Overview.				
Overview	Kaizen Summary:		Key Deliverables (in order of importance):				
			1) Productivity Increase				
			2) Low maintenance cost				
Metrics			3) Morality Increase				
			4) Production Increase				
	1	QDCSM	Metric	Units	Current	Goal	% Δ
	2						
	3						
4							
Resources	Name		Job Title		Training Needs		
	1	Md Arifur Rahman	Officer	Yes			
	2	Md Ammar Rahman	Engineer				
	3	Md Mohamad Islam	Officer				
	4	Md Kaffi Uddin	Officer				
	5	Md Mohiatur Rahman	Sr. Officer	Special Equipment/Materials		Date Arranged	
	6	Said Hossain Sazal	Engineer	1	Operator Training	04.02.2021	
	7			2	Operator Training	05.02.2021	
	8			3	Necessary Equipment	06.02.2021	
	9			4			
10			5				
Resource Team		On-Call Dates		Schedule			
1	Maintenance			Duration (Days)	02 Days		
2	Production			Start Date:	7/2/2021		
3				End Date:	8/2/2021		
4				Daily Start Time:	9:10		
5				Report Out Date/Time:	08/02/2021 16:00		
				Attachments?			

Figure-25: Kaizen Charter

4.2.1.3 Benefits

Process time saved 33 minutes: Previous =213 min. Present=180 min.

Increase Productivity: 33 min x 3.2 meter/min=106 meter.

4.2.2 Kaizen-2

2. Motor installed for Panel AC in Dynaflex-4 printing Machine

Before Kaizen was Implemented, Lean tools and techniques (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) were implemented on the machine.

4.2.2.1 Kaizen Charter

Kaizen Charter Form						
Kaizen Name:		Motor Installed for panel AC in Dynaflex-4 Printing Machine				
Scope	Process Name:	Motor Installed for panel AC in Dynaflex-4 (Printing-2) Machine				
	Start Point:	Dynaflex-4 (2) unwinder section				
	End Point:	Dynaflex-4 (2) Main AC panel section				
Value Stream Name:		N/A				
Leaders	Charter Author:		Sponsor :	Md. Hasanuzzaman		
	Date Created:		Champion :	Md Nazmul Hasan		
	Current Revision:		Team Leader :	Nirmolendu Sharma		
Name of Kaizen Team:		Team - 4				
Strategy	Problem Statement:					
	Corporate Strategy/goals improved by this kaizen			Notes		
	1					
Overview	Kaizen Summary		Key Deliverables (in order of importance)			
			1 Productivity Increase			
			2 Less Maintenance Cost			
Metrics			3 Drive Longevity			
			4 Morality Increase			
	Benefits	Types		Legend	Tick <input checked="" type="checkbox"/>	
		Tangible		1) Revenue Increase (RI)	<input checked="" type="checkbox"/>	
		2) Cost Reduction (CR)		<input checked="" type="checkbox"/>		
		Intangible				
		1) Cost Avoidance (CA)				
		2) Risk Reduction (RR)		<input checked="" type="checkbox"/>		
Resources	Name		Job Title	Training Needs		
	1	Nirmolendu Sharma	Team Leader	55, 7 waste		
	2	Md Al-amin Sorder	Co-team Leader			
	3	Md Nazmul Hasan	Member			
	4	Md Aminur Rahman	Member			
	5	Chowdhury Sabbir Hussain	Third Eye			
	6	Md Jahid Hasan	Third Eye	Special Equipment/Materials		
	7	Md Belal Hossen	Third Eye	Date Arranged		
	8	Sohel Mia	Member	1	Motor	16/2/2022
				2	Clamp	16/2/2022
			3	Hose Pipe	16/2/2022	
			4	Tools		
			5			
			6			
Recourse Team		On-Call Dates		Schedule		
1	Md Abdul Mannan	Electrical	Duration (Days):	2 days		
2	Md Torikul Islam	Electrical	Start Date:	16.02.2022		
3	Shoriatullah	Mechanical	End Date:	17.02.2022		
4			Daily Start Time:	10.00 AM		
5			Report Out Date/Time:	5.00 PM		
Attachments?						

Figure-26: Kaizen Charter

4.2.2.2 Kaizen Progress

Before Motor Installation



Figure-27: Before motor Installation

After Motor Installation



Figure-28: After Motor Installation

4.2.2.3 Investment

AC pump motor 1.5 kw from safety stock.

4.2.2.4 Benefits

1. Saving 2,20,000 taka for 5 years by installing AC pump motor
2. Productivity Increase
3. Less Maintenance time & cost.
4. Main Drive Longevity
5. Morality Increase

4.2.3 Kaizen-3

3. Wastage Reduction Roll to Roll Printing & Paper Slitting Machine.

Before Kaizen was Implemented, Lean tools and techniques (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) were implemented on the machine.

4.2.3.1 Kaizen Charter

Kaizen Charter Form						
Kaizen Name:		Wastage reduction Roll to Roll Printing & Paper slitting machine				
Scope	Process Name:	Roll to Roll printing machine 3rd floor				
	Start Point:	Paper slitting machine 3rd floor				
	End Point:	Paper slitting machine 3rd floor				
Labels	Value Stream Name:	N/A				
	Charter Author:	Sponsor:	Md. Hossainuzzaman			
	Date Created:	Champion:	Md. Nazimul Hasan			
	Current Revision:	Team Leader:	Nirmolendu Sharma			
Strategy	Name of Kaizen Team:	Team - 4				
	Problem Statement:					
	Corporate Strategy/goals improved by this kaizen	Notes				
Overview	1					
	2					
	Kaizen Summary		Key Deliverables (in order of importance)			
	1					
Metrics	Types		Legend		Tick ✓	
	Tangible		1] Revenue Increase (R I)	✓		
	Intangible		2] Cost Reduction (CR)			
			3] Cost Avoidance (CA)			
Resources	Name		Job Title		Training Needs	
	1	Nirmolendu Sharma	Manager Production			
	2	Aj Amin Sarker	Dy. Manager Electrical			
	3	Naymul Hossain	Asst. Manager Production			
	4	Chowdhury Sabir Hossain	Sr. Officer HR (Shipping)			
	5	Amimur Rahman	AE Electrical (APPL)		Special Equipment/Materials	
	6	Md. Jahid Hasan	Officer (Fire & Safety)		Date Arranged	
	7		SAE Civil (ACC)		1	
	8				2	
	9				3	
10				4		
11				5		
12				6		
13				7		
Recourse Team		On-Call Dates		Schedule		
1	Hridoy	Roll to Roll Printing		Duration (Days):	30 days	
2	Dalim	Roll to Roll Printing		Start Date:	10/12/2023	
3	Sannu	Paper Slitting machine		End Date:	11/12/2023	
4	Antar	Paper Slitting machine		Daily Start Time:	10:00 AM	
5	Nasrul	Paper Slitting machine		Report Out Date/Time:	4:00 PM	
Attachments?						

Figure-29: Kaizen Charter

Side cutting paper before 7 mm after kaizen 4 mm paper cut. Before we were using 100 GSM paper now using 80 GSM.

4.2.3.2 Kaizen Progress

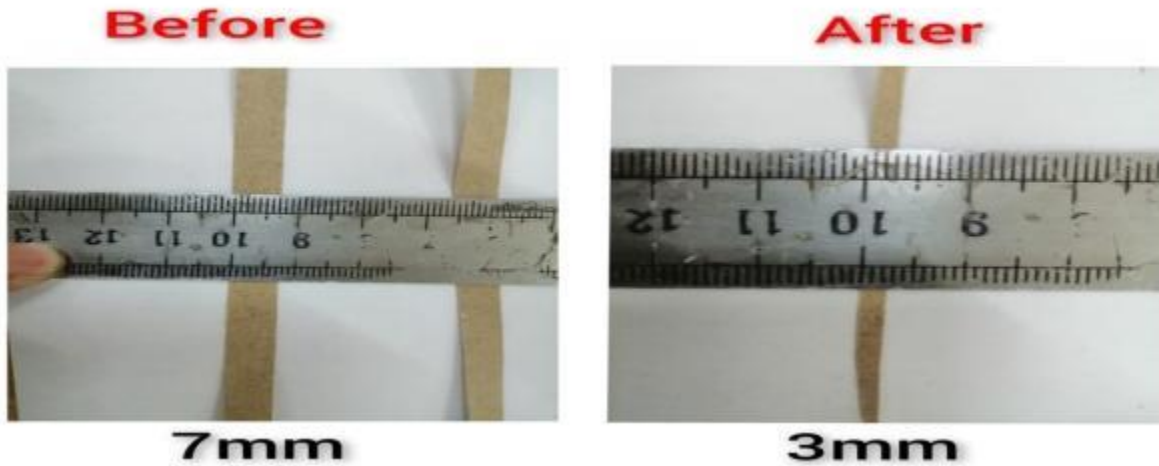


Figure-30: Before & After Kaizen Process

Before				
Month	Slitted paper Production (kg)	Wastage (kg)	G.Total (kg)	Wastage %
July,21	20,254.00	271.00	20,525.00	1.320
August,21	30,052.00	309.00	30,361.00	1.018
September,21	31,827.00	251.00	32,078.00	0.782
Target wastage % July,2021		0.850%		
Actual wastage % July,2021		1.320%		
Target wastage % August,2021		0.850%		
Actual wastage % August,2021		1.018%		
Target wastage % September,2021		0.850%		
Actual wastage % September,2021		0.782%		

Figure-31: Kaizen Progress

After				
Month	Slitted paper Production (kg)	Wastage (kg)	G.Total (kg)	Wastage %
October,21	31,900.00	256.50	32,156.50	0.798
November,21	28,330.00	203.00	28,533.00	0.711
Target wastage % October,2021		0.850%		
Actual wastage % October,2021		0.798%		
Target wastage % November,2021		0.850%		
Actual wastage % November,2021		0.711%		

Figure-32: After Kaizen Progress

Progress report				
Month	Slitted paper Production (kg)	Wastage (kg)	G.Total (kg)	Wastage %
July,21	20,254.00	271.00	20,525.00	1.320
August,21	30,052.00	309.00	30,361.00	1.018
September,21	31,827.00	251.00	32,078.00	0.782
October,21	31,900.00	256.50	32,156.50	0.798
November,21	28,330.00	203.00	28,533.00	0.711
Target wastage %		0.850		
Actual wastage November %		0.711		
Reduce wastage %		0.139		

Figure-33: Kaizen Progress

4.2.3.3 Benefits

Before			After		
Month	Wastage (kg)	Wastage price	Month	Wastage (kg)	Wastage price
July	271.00	13,821.00	October	256.50	13,081.50
August	309.00	15,759.00	November	203.00	10,353.00
September	251.00	12,801.00			
Before kaizen maximum wastage (Taka)			15,759.00		
After kaizen minimum wastage (Taka)			10,353.00		

Figure-34: Kaizen Result

4.2.4 Kaizen-4

4. Loom Machine winding motor's rotor shaft modification

Before Kaizen was Implemented, Lean tools and techniques (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) were implemented on the machine.

4.2.4.1 Kaizen Charter

Kaizen Charter Form						
Kaizen Name:		Loom machine winding motor's rotor shaft modification				
Scope	Process Name:	Loom				
	Start Point:	loom machine winding motor's rotor shaft modification: 13/10/2021				
	End Point:	loom machine winding motor's rotor shaft modification: 13/10/2021				
Leaders	Value Stream Name:	N/A				
	Charter Author:	Sponsor:	Md. Masruruzzaman			
	Date Created:	Champion:	Md. Miftahul Islam			
	Current Revision:	Team Leader:	Md. Akbar Ali			
Strategy	Name of Kaizen Team:	Team - 5				
	Problem Statement:					
	Corporate Strategy/Goals improved by this kaizen	Notes				
Overview	Kaizen Summary		Key Deliverables (in order of importance)			
	1		1			
	2		2			
	3		3			
Measures	Benefits	Type	Legend	Tick- <input checked="" type="checkbox"/>		
		Tangible	1) Revenue Increase (RI)	<input checked="" type="checkbox"/>		
		Intangible	2) Cost Reduction (CR)	<input checked="" type="checkbox"/>		
Resources	Name		Job Title	Training Needs		
	1	Md. Akbar Ali	Team leader			
	2	Md. Ziaur Rahman	Co-Team Leader			
	3	Md. Zubair Hossain	Member			
	4	Md. Arifur Rahman	Area Based			
	5	Miftahul Islam	Third Eye			
	6	Md. Rafiqul Islam	Third Eye	1	Rotor shaft helical gear 10 teeth	13.10.2021
	7	Rezaul Alam	Member	2	Helical gear 53 teeth	13.10.2021
	8	Miftahul Hossain	Member	3	Oil seal	13.10.2021
				4		
			5			
			6			
Resource Team		On-Call Dates	Schedule			
1	Babul miah	13.10.21 To 17.10.21	Duration (Days):	3 days		
2	Delfower hossain		Start Date:	13.10.2021		
3			End Date:	17.10.2021		
4			Daily Start Time:	10:00 AM		
5			Report Out Date/Time:	5:00 PM		
Attachments:						

Figure-35: Kaizen Charter

4.2.4.2 Kaizen Progress

Before Teeth- 65



Figure-36: Before Kaizen

After Teeth- 53



Figure-37: After Kaizen

4.2.4.3 Offer from manufacturing Company



AKIJ POLY FIBRE INDUSTRIES
LTD
Akij Chamber 73, Dilkusha
Commercial Area, Fact address:
304/3, Wilson Road, Nabigonj, Kada
Dhaka - 1000
BANGLADESH

Customer Service Center
Starlinger & Co. Gesellschaft m.b.H.
Hauptstrasse 43
2564 Weissenbach
AUSTRIA

Jeremic Martina
Tel: +43 2674 800-2239
Fax: +43 2674 86128
E-mail: service.jer@starlinger.com
E-mail: service@starlinger.com

Place / Date of issuance:
Vienna, 16-02-2022

Pre-Shipment Information No.: EK2025599 int. no.:
3060086

Free of charge
acc. to Mr. Ziggerhofer Jakob

SPARE PARTS FOR POLYFIBRE INDUSTRIES

WE ARE PLEASED TO INFORM YOU THAT FOLLOWING PARTS WILL BE SENT FREE OF CHARGE:

Item	Quantity	Description	Unit price EUR	Total price EUR
<i>RX 6.0, 18-03266-06-CN</i>				
1	15 pcs.	ARDS-02561 THREE PHASE MOTOR - HELICAL GEAR MOTOR 0,22kW CHFA42 TS63C4 DREHSTROMM. +STIRNRADGETR. 0,25kW CHA42F TH63D4 IE2 m/c no 18-03266-06-CN	402,76	6.041,40
2	15 pcs.	Z3I-14396 MOTOR CONSOLE MOTOVARIO CHFA42 MOTORKONSOLE MOTOVARIO CHFA42 m/c no 18-03266-06-CN	27,14	407,10
3	120 pcs.	ANCS-05005 (NCS-5005) WASHER M8 SCHEIBE M8	0,02	2,40

Pre-Shipment Information No EK2025599 / JER / 16-02-2022, Page 1/2

Figure-38: Offer from Manufacturing Company

4.2.4.4 Benefits

1. Ensure zero accidents in this area.
2. Save approx. 42600 Taka.
3. Increase Lifetime.
4. Increase productivity.

4.2.5 Kaizen-5

5. Transfer chute making for receiving empty bags from bag store to the packer floor

Before Kaizen was Implemented, Lean tools and techniques (5s, 7 waste, TPM, TQM, VA-NVA, Pareto Chart, Kaizen) were implemented on the machine.

4.2.5.1 Kaizen Charter

Kaizen Charter Form							
Kaizen Name:		Transfer chute making for receiving empty bag from bag store to packer floor					
Scope	Process Name:	Packer 4 & 5 area					
	Start Point:	Bag store					
	End Point:	Packing floor					
Value Stream Name:							
Leaders	Charter Author:			Sponsor :	Md.Hassanuzzaman		
	Date Created:			Champion :	Md.Golam Kibria		
	Current Revision:			Team Leader :	Md.Sahabul Alam		
	Name of Kaizen Team:	Team 02					
Strategy	Problem Statement:		Receiving empty bag more easier way from bag store to packer floor				
	1	Corporate Strategy/goals improved by this kaizen		Notes			
	2						
Overview	Kaizen Summary			Key Deliverables (in order of importance)			
	1						
	2						
	3						
Metrics	Benefits	Types		Legend		Tick ✓	
		Tangible		1) Revenue Increase (RI)		✓	
		Intangible		2) Cost Reduction (CR)		✓	
				1) Cost Avoidance (CA)		✓	
Resources	Name		Job Title		Training Needs		
	1	Md.Sahabul Alam	Team Leader				
	2	Md.Golam Kibria	Co-Team Leader				
	3	Md. Shahjaman Ali	Member				
	4	Md. Saifuzzaman Shah	Third Eye				
	5	Md. Yeanur Hossain Khan	Member		Special Equipment/Materials: Date Arranged		
	6	Md. Abdur Rahman Palash	Area Based		1	Welding Items	01.02.2022
	7	Md. Firoz Mahmud	Area Based		2	Cutting items	01.02.2022
	8	Md. Rubel Mozumder	Member		3	MS plate,Angle,Round pipe	01.02.2022
	9	Md.Zakir hossain	Third Eye		4	Colour	01.02.2022
10				5			
Recourse Team		On-Call Dates		Schedule			
1	Masud Rana(Senior Enginner)			Duration (Days):	5 days		
2	Khorsed(Jr.Mecahncs)			Start Date:	02.02.2022		
3	Al amin(Jr.Mechanics)			End Date:	06.02.2022		
4				Daily Start Time:	9:00		
5				Report Out Date/Time:			
Attachments?							

Figure-39: Kaizen Charter

4.2.5.2 Kaizen Progress

Before Kaizen



Figure-40: Before Chute Making

After Kaizen



Figure-41: After Chute Making

4.2.5.3 Benefits

1. Time-saving for carrying an empty bag from the Bag store to Packer
2. Saving Labor hour
3. Reduce extra processing time
4. Remove excess motion & Transportation
5. Reduce the chance of accidents in labor
6. Get maximum efficiency through machinery due to increased operation time, where we lose more than 1 minute each time before making this transfer chute.
7. We get 1-hour extra time for operation after kaizen.

1 hour = 1920 Bags

Yearly $1920 \times 353 = 677760$ Bags

CHAPTER 5

CONCLUSION AND FUTURE WORK

5.1 Conclusion

Continuous improvement (CI) goals to improve customer satisfaction by reducing costs. Not only customer satisfaction, but it is also working to improve product quality, increase production, and employees' morality. Moreover, it is focused on the current situation of any organization.

Before lean manufacturing, there were many disorders that made the difficulties for the production floor, maintenance departments, operators, or storage. After using lean manufacturing consider the 5S, 7 Waste, Kaizen, SQDE board, and Kanban board has achieved more improvement which was unavailable.

Another achievement is preventive maintenance. If you maintain preventive maintenance properly you will get more outcomes from the machine. So, preventive maintenance is more important for better outcomes. Another thing is not to wait until the last minute when you see something happen, immediately you will take action. As a result, you will get more working hours that added value, and product quality will be good & increase production.

Finally, we say that applying for lean methodology considering the 5s, 7 Waste, SMED, and kaizen improve production & reduce the problem to implement Kaizen.

5.2 Future Work

Already, I'm working with 5S, 7 waste, SMED, and Kaizen but I believe that, if we implement the OEE, six sigma, Total quality management will get the more benefit for better production. The systems or approach will be different for different organizations but the tools are the same.

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Lean Management System

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