CHAPTER I
INTRODUCTION

This chapter contains the background of problem, problem formulation, research objective, scope of problem, and outline of the final project.

1.1 Background

The existence of industry is very strategic in contributing to Gross Domestic Product (GDP), employment, foreign exchange, and technology transfer (Jeshika, 2019). The role and contribution of the manufacturing industry turns out to be very important in the Indonesian economy as the foundation of job creation, the creation of added value in controlling the domestic market, generating tax revenues and foreign exchange, and supporting sustainable development (Brodjonegoro, 2019).

The pulp and paper industry is one of the strategic manufacturing sectors in Indonesia that plays an important role in the national economy. Pulp and paper products, such as printing paper, packaging, tissue and other derivative products, are in high demand in both domestic and international markets (PTF-ESRS, 2022). This industry consists of three main segments, namely the upstream sector (pulp), the middle sector (paper), and the downstream sector (paper products) (Sritaba, 2021). The sector is supported by the presence of vast forest resources and strong industrial capacity development.

Major players in this industry in Indonesia include several large companies such as PT Indah Kiat Pulp and Paper, PT Pabrik Kertas Tjiwi Kimia, dan PT Fajar Surya Wisesa (Anggraini et al., 2022). These companies not only dominate the domestic market, but also have extensive distribution networks to various countries. Indonesia's position as one of the world's leading producers of pulp and paper means it plays a significant role in meeting the global demand for paper products and their derivatives (Natalia et al., 2024).

In 2023, the Gross Domestic Product (GDP) growth of the paper and paper products industry reached 5.49% year-on-year (yoy), higher than the national manufacturing industry growth of 4.94% yoy and the national economic growth of 5.20% yoy (Pardede et al., 2024). This represents a significant recovery as demand for paper and pulp products has increased again, following a period of instability during the COVID-19 pandemic. GDP growth of paper and paper products can be seen in **Figure 1. 1**.

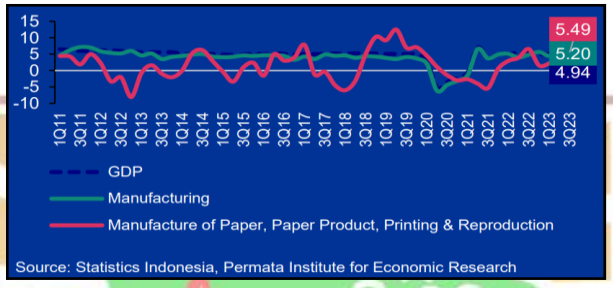

Figure 1. 1 GDP Growth of Paper and Paper Products (%yoy)

PT ABC is one of the major players in the pulp and paper industry in Indonesia. Located in Banten Province, the company focuses its operations on the production of various types of paper. This company applies the rule of 3 production shifts on its production floor, namely shift 1 (07.30-15.30), shift 2 (15.30-23.30), and shift 3 (23.30-07.30). PT ABC has one finishing unit to process its own paper rolls from paper mills into various paper products, namely Business Unit 18 (BU 18) which focuses on printed paper products such as soap, food, and other product packaging. An example of BU 18 product can be seen in **Figure 1. 2**.

Figure 1. 2 An Example of BU 18 Product

In BU 18, there is a paper printing machine called an offset machine. There are 6 machines in total, namely offset machines 1, 2, 3, 10, 11, and 12. On offset machine 10, the brand of this machine is KBA RAPIDA 130 R Lithography Machine. This machine can be seen in **Figure 1.3**. Offset machine 10 has 11 units of constituent components, namely Feeder, Feedtable, Printing Unit 1 (White), Printing Unit 2 (Black), Printing Unit 3 (Magenta), Printing Unit 4 (Yellow), Printing Unit 5 (Pearl), Printing Unit 6 (Cyan), Coating, Delivery, and Utility. The process details of each printing unit can be seen in **Figure 1. 4**.

Figure 1. 3 Offset Machine 10

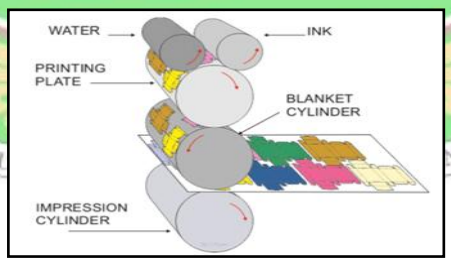

Figure 1. 4 Detail Process of Printing Unit

(Source: Ryan, 2018)

The flow of the production process at BU 18 involves several stages, which can be seen in **Figure 1. 5**. From the figure, it can be seen that the offset machine has a very important role because the production process begins on this machine. If this machine is delayed in the production process, it will definitely have a late impact on the next process.

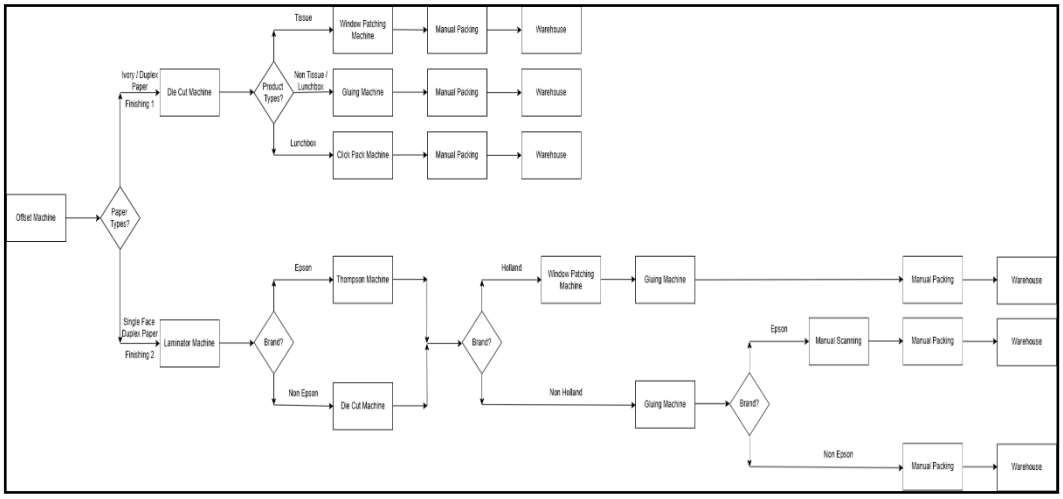

Figure 1. 5 Production Process Flow of BU 18

Currently, there is a problem in the production process of this machine, namely the lost time on this machine which is very high. Lost time is the time when the machine is not running due to many main problems such as schedule shutdown, unschedule shutdown, brandchange (BC) process, etc. The **Figure 1.6** is a visualization of the daily report of offset machine 10 from 23 to 30 September 2024 to see the main problem of the high lost time problem. According to the time duration of each main problem lost time, from these various factors, the BC process is the highest contributor to this lost time problem.

The BC process is a changeover process that is carried out when the production of a product is completed before proceeding to the production of the next product. Therefore, every time there is an exchange of products (orders) to be produced on offset machine 10, the BC process must be carried out. If in one shift there is no occurrence of the BC process, it means that in that shift there is no product exchange (order) on the machine. This can happen because the product (order) being produced in that shift is a product with a very large demand, for example 150 thousand sheets, but the maximum speed of the offset machine 10 to produce only 8 thousand sheets per hour. So, it is impossible to reduce the number of occurrences of this BC process because its occurrence is in accordance with the production schedule issued by the PPIC division.

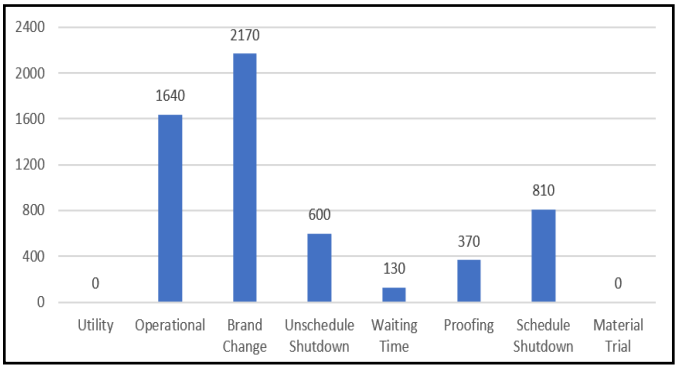

Figure 1. 6 Time Duration of Each Main Problem Lost Time (Minute)

(Source: Data Processed from PT ABC)

Based on information obtained from the Production Supervisor, only offset machine 10 has the best performance compared to the other five offset machines. Because, based on field observations made on September 17-20, 2024, offset machine 10 never experienced problems such as sudden shutdown compared to the other 5 offset machines that experienced the problem. Therefore, offset machine 10 was selected as the object of study to address the high lost time caused by this BC process. Then, based on the Production Manager's explanation, the maximum time limit allowed for each BC process is 80 minutes. The following is a visualization of the daily report of offset machine 10 from 23 to 30 September 2024 on each shift which can be seen in **Figure 1.7**.

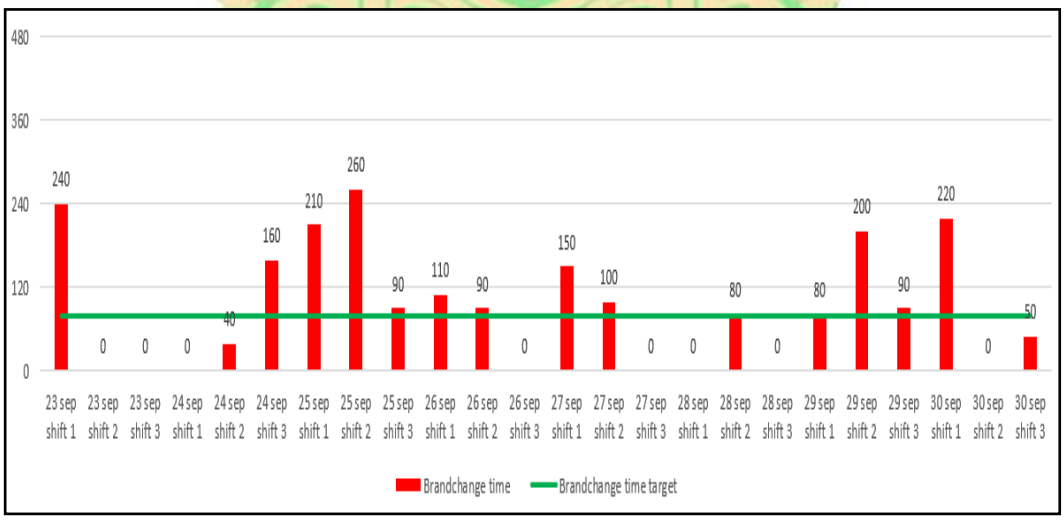

Figure 1. 7 Time Duration of Brandchange Time per day and per shift (Minute)

(Source: Data Processed from PT ABC)

From the figure above, it can be seen that the duration of brandchange time fluctuates greatly on each shift and every day. One important information that can be obtained from the figure above is the number of brandchange events that exceed the maximum allowed limit of 80 minutes, which is 12 times. This certainly had a very significant impact on the production process that occurred on offset machine 10. The direct impact that can occur from this high BC process time is a decrease in the number of products that can be produced on offset machine 10 and also a decrease in the overall equipment effectiveness (OEE) value of the machine. As a result, many products that had been scheduled to be produced on this machine were also delay in starting their production process. The following is a visualization of the daily production schedule on offset machine 10 from 17 to 30 September 2024 which can be seen in **Figure 1.8**.

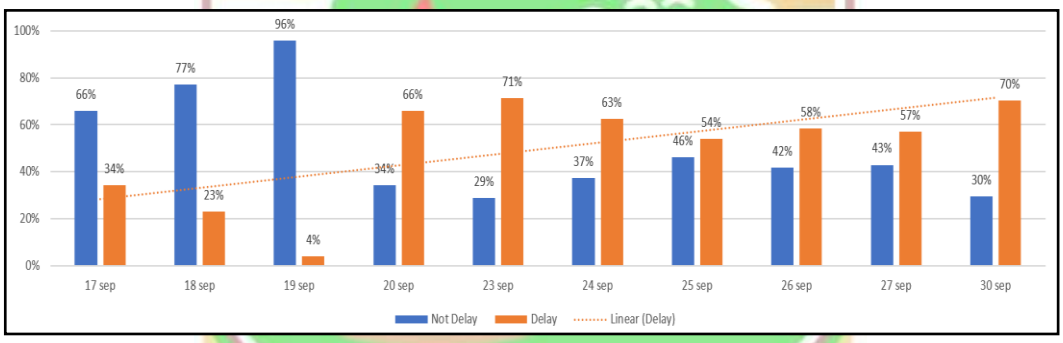

Figure 1. 8 Percentage of Not Delay and Delay Products per day (%)

(Source: Data Processed from PT ABC)

From the figure above, it can be seen that the percentage of delayed products increases linearly starting on September 20, 2024. These delays not only impact the company's internal efficiency but also reduce the level of customer satisfaction. Customers who experience delays in product delivery can lose trust in PT ABC, which in turn can cause them to switch to other printing service providers that are faster in responding to their requests.

Based on the explanation above, it is necessary to improve the changeover process on offset machine 10 of business unit 18 PT ABC. Therefore, this research focuses on reducing the changeover process time, so that the production of offset

machines 10 can increase and the OEE value of the machine can increase as well. And also, that products that have been scheduled to be produced next do not experience delays, and in the end, the level of customer satisfaction can be maintained.

1.2 Problem Formulation

Based on the background of the problems previously described, the problem formulations are:

1. What is the current condition of the changeover process?
2. What are the improvements implemented in the changeover process?
3. What are the results of the improvements that have been implemented in the changeover process?

1.3 Research Objective

The purposes of this study are:

1. Evaluate and analyze the current condition of the changeover process.
2. Improve the changeover process by implementing several improvements.
3. Determine the average improvement rates (percentage reduction in changeover process time).

1.4 Scope of Problems

The problem limitations in this research are:

1. This research was conducted within the scope only in Business Unit 18 PT ABC.
2. Observations and data collection were only conducted from September to December 2024.

3. Changeover process time data is taken every 1st shift for each team due to the provisions of the production supervisor.

1.5 Outline of Report

The outline of the final project is as follows:

CHAPTER I INTRODUCTION

This chapter contains the background of problem, problem formulation, research objective, scope of problem, and outline of the final project.

CHAPTER II LITERATURE REVIEW

This chapter contains theory related to problem in this research such as downtime, changeover, the 3 ups, lean manufacturing, single minute exchange of dies (SMED), fishbone diagram, failure modes and effects analysis (FMEA), cycles in study, and previous research.

CHAPTER III RESEARCH METHODOLOGY

This chapter contains preliminary study, problem identification, problem formulation, method selection, data processing, analysis, conclusion and recommendation, and flowchart of this research.

CHAPTER IV DATA PROCESSING

This chapter contains data processing related to this research.

CHAPTER V ANALYSIS

This chapter contains analysis of the results of the data processing that has been done.

CHAPTER VI CONCLUSION AND RECOMMENDATION

This chapter contains conclusions from the research that has been done and recommendation for further.