CHAPTER I
INTRODUCTION

This chapter contains the research background, objectives, problem formulation, problem boundaries, and systematics of writing research reports on the MineFeeds feed industry problems.

1.1 Background

Food is the most important basic human need. Its fulfillment is part of human rights guaranteed in the 1945 Constitution of the Republic of Indonesia as an essential component for realizing quality human resources. (Republik Indonesia, 2012). Beef and dairy cattle are primary food commodities in Indonesia, especially in West Sumatra, where meat increases yearly. That is shown by the increase of cattle slaughtered in West Sumatra. Based on statistical data from the Directorate General of Livestock and Animal Health (Badan Pusat Statistik Republik Indonesia, 2020), the population of cattle slaughtered in West Sumatra can be seen in **Figure 1.1**

Figure 1.1. West Sumatera Cattle Population 2017-2020

Looking at BPS statistics for 2017-2020, cattle slaughtered in West Sumatra every year is still low compared to cattle killed on the island of Java, especially East Java, with the highest number of slaughters in 2020, as many as 4.815.300 cattle. Of course, the high demand for cattle in the market must also be supported by the availability of supplies. Efforts to increase production mean expanding fodder areas, which will reduce the effectiveness of livestock production if not implemented. Efforts are needed to obtain an additional alternative meal for cows that have good nutritional quality and are cheap and easy to get.

Many previous studies have been conducted to optimize beef cattle fattening and have produced various national and international publications regarding this cattle feed supplement. The innovative product that researchers have launched at Andalas University is "GPS (Growth Promoting Supplement)" to increase livestock productivity and cattle fur by Rusmana WSN (Ningrat, 2021). This supplement stimulates the growth of rumen microbes to increase the digestibility and consumption of food substances from local feed ingredients so that livestock productivity can be improved.

MineFeeds is a company that answers the need for feed supplements with Urea Molasses Block (UMB) products currently being produced and marketed under Growth Promoting Supplement (GPS). MineFeeds company is shaded by CV. Kreasi Cipta Mulia started making animal feed in 2013, having its address at Jln. Dr. M. Hatta no.111 Kapalo Koto Pauh, Padang City, West Sumatra.

Figure 1.2. GPS Block that MineFeeds manufacture
(Source: MineFeeds)

After nine years of operation, MineFeeds has experienced and made many developments, ranging from product development, product quality improvement, and increasing production volume to cooperation with the livestock industry. In 9 years, there has been an increase in production from 80-100 blocks every week until now to 280 blocks every week, of which the GPS blocks are sold to 5 small-medium farm companies and several individual farmers in the Padang Panjang, Solok, and Payakumbuh areas. MineFeeds has a roadmap that can be seen in **Figure 1.3**, with the main goal being commercial sales to the general public in 2023.

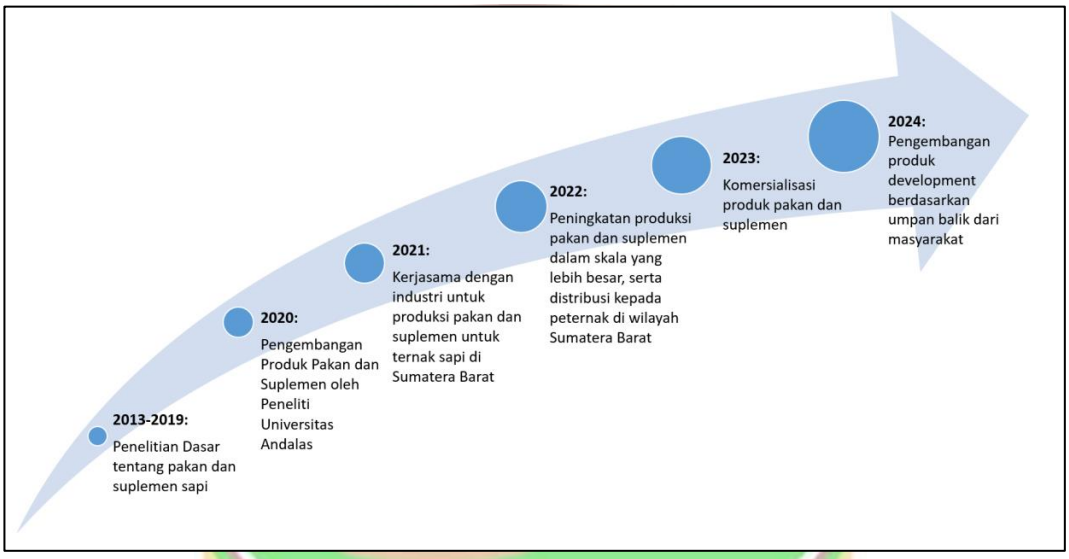

Figure 1.3. MineFeeds Production Roadmap
(Source: MineFeeds Pitching Proposal)

Until now, sales are still using the word-of-mouth method, with plans to increase sales through collaboration with farms outside West Sumatra, then medium-large farms, and online sales. The commercialization of this product must also be supported by production capabilities to meet future demands. Production activities at MineFeeds are carried out each day with two cycles of production, with each production amount being 20kg of material with an output of 20 Blocks/Cycle with a Total production of 40 Blocks per day.

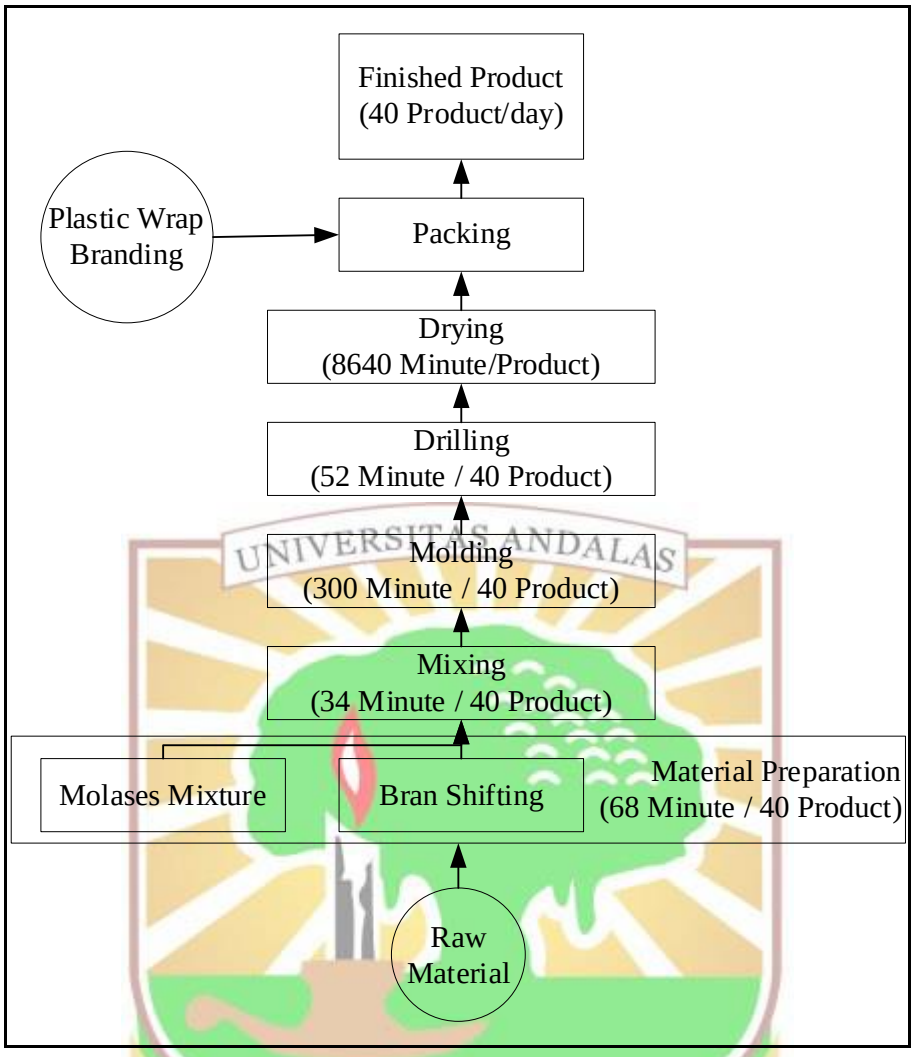

Figure 1.4. Block Supplement's production process from raw materials to prepared for sale (Source: MineFeeds)

Figure 1.4 shows the Block Supplement's production process, from raw materials to preparation for sale. In the production process of this supplement block, it can be seen that there is a process that takes a long time, namely between the drying process with a time of 8640 minutes or three days per product. The long process is because the drying process is carried out slowly at a stable temperature of 50 Celsius to acquire evenly distributed product dryness from the outside into the product. Even so, this drying process does not affect the daily production process because it is still running during the daily production process. Then It can be seen that the molding stage took around 300 minutes or a 5-hour process from an 8-hour production time every day. The molding stage itself consumes 65% of daily production time each day.

Table 1.1. Machine used in MineFeeds production line

Stage	Machine Name	Machine		
		Amount	Capacity	Operator
Material Preparation	Shifter	1	500 grams	1 Person
	Stove and Pot	1	10 liters	1 Person
Mixing	Custom-made Mixing Machine	1	35 kg	1 Person
	Sprayer	1	500 liters	1 Person
Molding	Custom made Molding Machine	1	1 pc	Two persons
	Cast & die	1	1 kg	
Drilling	Hand Drill	1	1 pc	1 Person
	Custom Ejector Machine	1	1 pc	1 Person
Drying	Drying machine	1	150-300 pcs	1 Person

Table 1.1 shows the stages of the supplement manufacturing process in MineFeeds, where all of these activities are carried out at five Work Stations with two operators for all MineFeeds activities. With each workstation having different tools and machines, based on the results of initial data observation and interviews with operators, there are differences in production capacity at each workstation, where the mixing process can produce 10 kg up to 35kg of dough each cycle. However, with the current production line, the mixing workstation is not operating to its full potential because the molding stage can only process 40kg of material per day, disrupting the smooth production flow and affecting productivity. Identifying the bottleneck that occurs on the work floor can then be optimized. **Table 1.2** below shows each time taken in the overall operation for each stage and each stage workload with 40 Block/day capacity production.

Table 1.2. The workload of 40 Block/day Production

Activities	Standard Time/Product (Minute)	Working Hour / Day (Minute)	Capacity Available (Minute)	Capacity Required (Minute)	Workload Weight (%)
Material Preparation	1,70	480,00	388,80	252,47	35%
Mixing	0,85	480,00	345,60	277,40	20%
Molding	7,52	480,00	345,60	44,93	87%
Drilling	1,30	480,00	345,60	293,60	15%

The term bottleneck describes a situation where the workstation has a smaller capacity than the production requirement. Bottleneck workstations will cause production delays. The bottleneck workstation becomes busy, while a non-bottleneck occurs if the existing machine capacity exceeds the demand (Rianto, 2009). In this condition, no bottleneck occurs because the mixing workstation only operates with 55% of its maximum capacity. Table 1.3 shows that the workload occurs assuming that Mixing works by its 100% capacity daily production be 70 blocks/day.

Table 1.3. The Workload of 70 Block/day Production

Activities	Standard Time/Product (Minute)	Working Hour / Day (Minute)	Capacity Available (Minute)	Capacity Required (Minute)	Workload Weight (%)
Material Preparation	0,97	480,00	388,80	136,33	35%
Mixing	0,49	480,00	345,60	68,20	20%
Molding	7,52	480,00	345,60	526,17	152%
Drilling	1,30	480,00	345,60	91,00	26%

Table 1.3 shows that the Molding stage has a high workload that goes over 100%, and the molding stage becomes the constraint in the system. Based on an interview with the owner of MineFeeds, it is known that the machine used in the molding process is a self-modified tool that comes from a tire patch tool which is then given a holder for a cylindrical block mold shown in **Figure 1.5**. This tool is manually operated by two operators where the operator still has to compress it outside and consumes much energy when operated. Workers at the MineFeeds Factory also often complain of pain and muscle tension after work because this tool requires more energy when operating.

Figure 1.5. Molding machine used by MineFeeds**.**

Following problems, such as bottlenecks, repeated activity, and operator posture that are not ergonomic, it is necessary to redesign the machine used in the pressing process to increase the production lot, reduce workloads, and shorten the cycle time to make the production process more efficient. Therefore, it is necessary to study product redesign related to molding machines for MineFeeds. The study obtains a molding machine design following production needs by reducing the existing impacts as best as possible.

1.2 Problem Formulation

Based on the explanation of the background above, it can be seen that the formulation of the problem in this study, particularly "How to redesign a tool that can increase production capacity in the Supplement Block molding process."

1.3 Research Objectives

This research aims to redesign molding machines to increase daily production capacity in the MineFeeds production company.

1.4 Research Scope

The limitations of the problems carried out in this study, particularly:

1. The product is a molding machine used in the Supplement Block molding process.
2. Cost calculations in this research were not considered.

1.5 Outline of Report

The outline of writing this report is as follows:

CHAPTER I INTRODUCTION

This chapter contains the background of the research, the problem formulation, the research objectives, the scopes, and the final project report outline.

CHAPTER II LITERATURE REVIEW

This chapter contains theories and methods that support this research. The theories used in this research are product knowledge, engineering design, quality function deployment, production planning, and ergonomics.

CHAPTER III RESEARCH METHODOLOGY

This chapter contains the steps in conducting research. This research methodology consists of a preliminary study, objectives, method selection, data collection, data processing, analysis, and closing.

CHAPTER IV DATA COLLECTING AND PROCESSING

This chapter contains the data that has been collected. Data in the form of numeric and non-numeric data are obtained from various sources. Then The data is processed according to the rational engineering design method.

CHAPTER V ANALYSIS

This chapter contains the analysis carried out on the collection and data processing that has been done. This chapter is expected to solve the problem that can be found.

CHAPTER VI CLOSING

This chapter contains conclusions from the results of research that has been carried out and suggestions for further research.