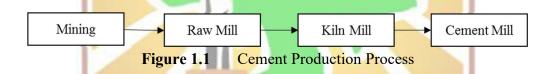# CHAPTER I

INTRODUCTION

1.1 Background

One of the cement companies in Indonesia is PT Semen Padang, which supplies cement to Sumatra and Java regions. PT Semen Padang has six factories, likely Indarung I (inactive) Factory, Indarung II / III Factory, Indarung IV Factory, Indarung V Factory, and now Indarung VI Factory. PT Semen Padang produces several types of cement, namely Portland Cement Type I, Portland Cement Type II, Portland Cement Type V, Super Masonry Cement, Oil Well Cement, and Portland Pozzolan Cement (PPC) (semenpadang.co.id). OPC, PCC, and PCC produce all day, but for another make to order.

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Mining  →  Raw Mill  →  Kiln Mill  →  Cement Mill
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Figure 1.1   Cement Production Process

The production process requires spare parts for each process because spare parts are something used by companies to support the production process, including for maintenance and repair of equipment. Unavailability of spare parts can hamper the production process and repair production facilities. Therefore, the spare part should be controlled by inventory management. The idea of reasonable control from the company is to reduce the possibility of the inability to meet the demand for parts for the process of repairing and replacing parts. Thus, the cement production process can be carried out optimally with the fulfillment of these needs.

Inventories management is goods stored for use or sale in a future period (Ristono. 2009). Another opinion says that inventory is a general term that shows everything or organizational resources stored in anticipation of fulfilling demand (Handoko, 1911). From these definitions, it concluded that inventory is goods

stored by companies in the form of raw materials, semi-finished materials, and finished products that are used for future needs to facilitate the company's production process.

On the other hand, inventory control is an activity related to planning, implementation, and supervision, determining material needs in such a way that, on the one hand, Operational requirements are met on time. Investment in material inventory will be optimally suppressed (Indrajit, 2003). The process of controlling spare parts inventory is one of the tasks of Unit Pemeliharaan dan Pengawasan Persediaan. One of the roles of the Inventory Maintenance and Supervision Unit is to manage the procurement of spare parts inventory to meet the maintenance and repair needs of facilities at several work stations to ensure the availability of spare parts at the required time with the required quantity and type.

According to an interview with the head of *Unit Pemeliharaan dan Pengawasan Persediaan*, PT Semen Padang evaluates the inventory management policy. Evaluation is needed to determine the optimal inventory level and manage inventory based on the component policy at the minimum and maximum levels. This condition is necessary because there are conditions where the user's demand for spare parts cannot be fulfilled by procurement. The data in **Table 2.1** can strengthen this condition.

Table 1.1   The Demand for Spare Part

Material	Description	UOM	Min (unit)	Max (unit)	2015 Total	2016 Total	2017 Total	2018 Total	2019 Total
631-100-0422	BOLT,HEX HD:M16;50M	EA	250	500	1800	4610	5050	2020	4210
641-400-0851	HOUSING BRG:SNL 516	EA	7	15	38	105	52	0	57
641-400-1041	BEARING,RLR,SP:2223	EA	1	1	2	6	0	4	1
641-503-0064	INSERT,COUPLING:BUS	EA	10	25	132	72	125	0	45
641-503-0066	INSERT,COUPLING:BUS	EA	80	120	196	168	438	0	52
641-503-0068	INSERT,COUPLING:28M	EA	24	48	80	62	302	0	64
651-200-0134	CONTACTOR:DILM25-10	EA	10	20	20	40	32	17	21
651-200-0155	CONTACTOR:LS 15K.10	EA	3	6	4	6	13	5	6
651-200-0166	CONTACTOR:DILEM-10;	EA	15	25	40	20	35	40	15
651-200-0168	CONTACTOR:DILM17-32	EA	4	8	6	16	4	5	23
651-200-0184	CONTACTOR:LC1D09 M7	EA	2	4	16	8	8	6	7
651-200-0194	CONTACTOR RELAY:DIL	EA	2	5	8	8	19	0	12
651-200-0233	CONTACTOR:3RT10 66-	EA	1	1	2	2	1	4	2

Source: PT Semen Padang

Table 1.1 it is known that some spare parts have a fluctuating demand quantity value for each year. These conditions indicate that the demand for spare parts is not stable. Also, it is known that several spare parts have the same min-max value. These conditions need to be reviewed and re-evaluated because the same min-max amount is unknown for the order quantity.

Table 1.2   Frequency of Failure

No	Machine	Total Failure per Year		
		2016	2017	2018
1	Lime Stone Crusher II	**38**	**69**	39
2	Lime Stone Crusher IIIA	26	26	34
3	Lime Stone Crusher IIIB	36	38	**50**
4	Mosher II	4	11	11
5	Secondary Sizer	1	4	1

Source: Yuzakki, Gozi Adli. 2020

Based on **Table 1.2**, the frequency of breakdown to one of the cement production facilities at PT Semen Padang has occurred more than one repair in 1 year. Therefore, for the repair process to occur correctly, it is necessary to repair spare parts inventory. This condition is needed so that the demand for spare parts is always fulfilled when repairs are required. So that the production process is more optimal and the facility maintenance process is smoother.

The maintenance process also requires spare parts to support plant facilities. Elements commonly used in manufacturing companies are MRO (Maintenance, Repair, and Operation) materials (Indrajit, 2003). Existing spare parts and equipment at PT Semen Padang are divided into emergency parts, construction materials, and chemicals. Emergency parts consist of three types, namely the V1 part, PD parts, and ND parts. PD will be purchased when there is a request from the user and do not have a min-max value. V1 is the item to be controlled based on the max value. ND is a type of material that will no longer be purchased and only spent stock. The criteria for determining the product category based on the needs and frequency of use during the production process. The need for help, in this case, can be interpreted that when the spare parts are needed, then the goods must be

immediately available because they are related to critical equipment. This condition can affect the performance of PT Semen Padang, especially in the aspect of production.

The problem could be solved by designing and determining a new inventory system policy in the supervision of emergency spare parts inventory at PT Semen Padang. Therefore, this study was conducted to determine the optimal safety stock, reorder point, and order quantity of production machine parts based on demand uncertainty and lead time that occurs, where uncertainty is modeled using an appropriate distribution. The improvement is expected to improve the quality of cement production at PT Semen Padang.

1.2   Problem Formulation

The problem to be studied in this research is what suitable inventory policy of spare parts to be applied at PT Semen Padang to reduce the shortages or stock out.

1.3   Research Objective

This research aims to determine the inventory policy used for emergency parts using an optimal service level and min-max value for each spare part.

1.4   Research Scopes

Research scopes in this study include:
1.   Inventory data used in this research (demand, lead time, Purchase Request, Purchase Order, etc.) is the data during 1915-1919.
2.   The emergency part being studied is the V1 (spare part stock) category at PT Semen Padang.

1.5   Outline of Research

The outline of this final project consists of five chapters with the system as follows:

CHAPTER 1   INTRODUCTION

This chapter introducing the subject to be discussed that contains background problem formulation, objectives, scope, and outline of the research.

CHAPTER 2   LITERATURE REVIEW

The literature review provides an overview of all the theoretical bases related to the subject of the final project. This chapter defines the eight inventory, such as definition, types and function, inventory control, etc.

CHAPTER 3   RESEARCH METHODOLOGY

This chapter discusses the research methodology that is used in this final project. Research methodology describes the systematic step to solve the problem of this research from the beginning until the end of the study.

CHAPTER 4   DATA COLLECTING AND PROCESSING

Data collecting and processing to get the result of this research

CHAPTER 5   ANALYSIS

Result and analyze data processing.

CHAPTER 6   CONCLUSION AND RECOMMENDATION

This chapter contains the end of the research and the recommendation for the next research