

CHAPTER I

INTRODUCTION

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

1.1 Background

Companies must increase their efficiency and productivity due to developments, competition, and limited resources. The company must be able to manage all of its assets as efficiently as possible to ensure that the company's operational activities run smoothly. One asset that affects a company's smooth production is the machine. The company's machine quality must always be maintained. The condition of the production machine must always be considered so that there is no damage to the machine, resulting in poor product quality or production cessation. Spare parts must be prepared because if one of the components is damaged and replacement parts are not available, the machine will not operate (Heizer, 2014). To overcome this, companies must design spare parts inventory management for this production machine component.

Inventory management is an essential issue for the ongoing production process in a company. Inventory is an idle resource whose existence is intended to wait for further processing. Further processes can be in the form of production activities at manufacturing companies, marketing activities at distribution companies, and consumption activities for household systems, offices, and others (Bahagia, 2006). Inventory exists to align supply from suppliers and customer demand (Tersine, 1994).

Production will be disrupted if there is a shortage of inventory (stock out), while production costs will rise if there is an excess of inventory (over stock). Inventory can be considered a waste and a burden on operational costs. As a result,

its existence must be minimized while ensuring that demand for its use is met smoothly. On the other hand, if the amount of available inventory is insufficient and there is a shortage of inventory, it can lead to user dissatisfaction and cause users to seek out better companies (Bahagia, 2006). Of course, inventory issues arise in various companies, including PT Semen Padang.

PT Semen Padang, founded on March 18, 1910, under the name NV Nederlansch Indische Portland Cement Maatschappij (NV NIPCM), is the oldest cement factory in Indonesia. PT Semen Padang is one of Indonesia's largest cement companies with an extensive distribution network. The cement production process at PT Semen Padang is carried out using three primary machines: The Raw Mill, the Kiln, and the Cement Mill. These three machines are "critical units," meaning that if they fail or are damaged, it will impact the cement's continued production. PT Semen Padang performs maintenance activities to ensure its production machines' performance reliability. One of the maintenance activities' performance factors is machine spare parts availability.

PT Semen Padang classifies spare parts into mechanical goods, electrical goods, and casting goods based on their usage. Mechanical spare parts are spare parts used in manufacturing machines. Electrical goods spare parts are spare parts associated with electrical goods. Casting goods spare parts are obtained from casting various metals and their supporting materials. Furthermore, spare parts in PT Semen Padang's System Application and Processing (SAP) are classified into four types of MRP (Material Requirements Planning), namely V1, PD, ND, and Avfal items, see **Figure 1.1**.

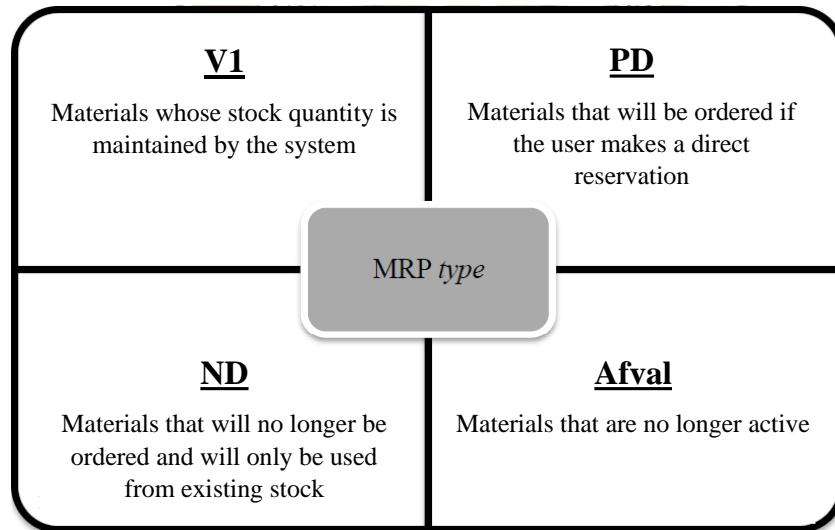


Figure 1.1 MRP Type at SAP PT Semen Padang
(Source: PT Semen Padang)

Based on the material classification at PT Semen Padang described in **Figure 1.1**, it is known that the spare parts that are carried out for inventory control are only spare parts of type V1 because this type is the only type that stock quantity is maintained. The V1-type spare parts in the PT Semen Padang spare parts warehouse consist of several types of spare parts: bearings, circuit breakers, contactors, idlers, fuses, relays, sensors, solenoids, and modules. The spare parts used in this study are spare parts that have a fairly high usage rate with uncertain consumer demand. The uncertain use of spare parts causes the demand for each spare part to fluctuating every month. This, of course, impacts the amount of inventory available in the warehouse at a certain period. The graph of the fluctuating spare parts demand is shown in **Figure 1.2**.

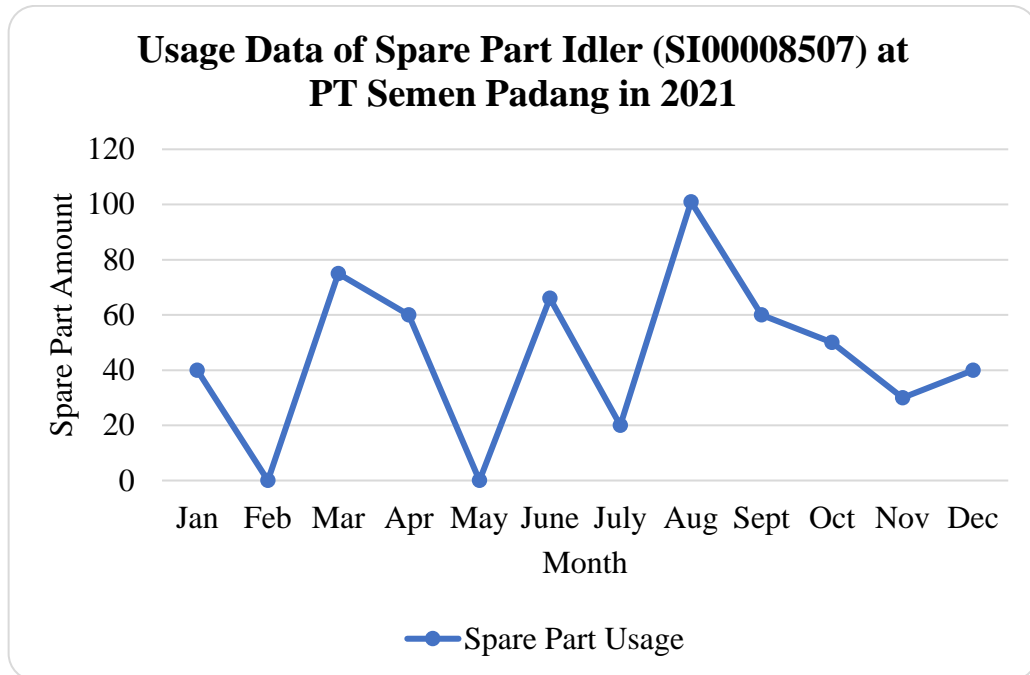


Figure 1.2 Usage Data of Idler (SI00008507) in 2021
(Source: PT Semen Padang)

It can be seen in **Figure 1.2** that the use of spare parts idler-type with the code SI00008507 fluctuates every month. Therefore, it can be said that the use of these spare parts cannot be determined with certainty or is probabilistic. In addition to the SI00008507 spare parts, this is also experienced by other V1 spare parts. According to interviews with the head of spare parts warehouse affairs, PT Semen Padang uses the min-max method in spare parts inventory planning, particularly for V1 MRP-type materials. However, based on the current situation and field data, there is still an excess stock of some spare parts stored in the spare parts warehouse that far exceeds the amount of safety stock set. This leads to overstock issues, resulting in a large amount of capital being stored. **Figure 1.3** depicts overstock data for one of the spare parts with the part number H209 (SI0001061).

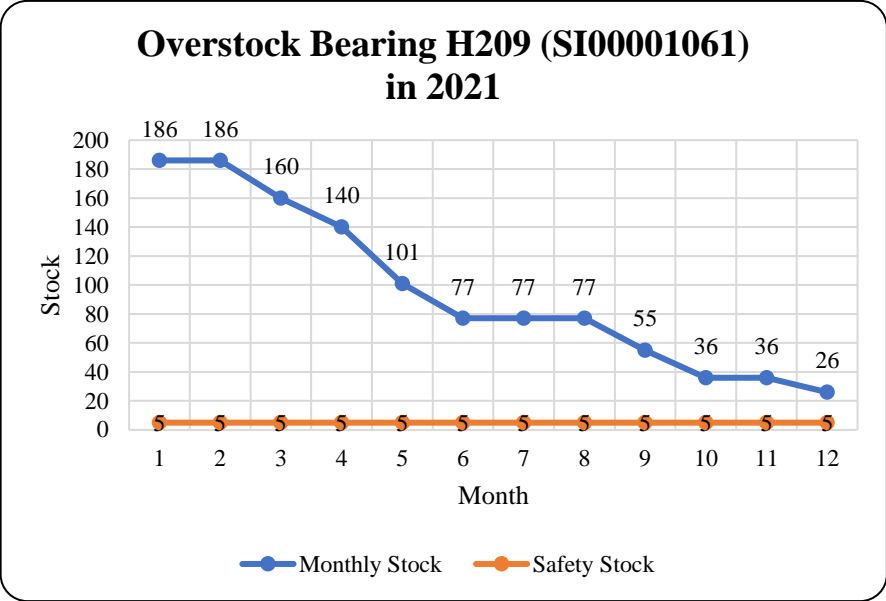


Figure 1.3 Overstock Problem on Bearing H209
(Source: PT Semen Padang)

According to **Figure 1.3**, the number of H209 bearing stock in 2021 far exceeds the safety stock set by PT Semen Padang, resulting in overstock. Following interviews with the head of spare parts storage, it was learned that this occurred due to an imbalance between spare parts inventory in the warehouse and the use of spare parts by users from each factory at PT Semen Padang, which was little or none at all in one month. The recapitulation of the material moving data for spare parts inventory at PT Semen Padang can be seen in **Table 1.1**.

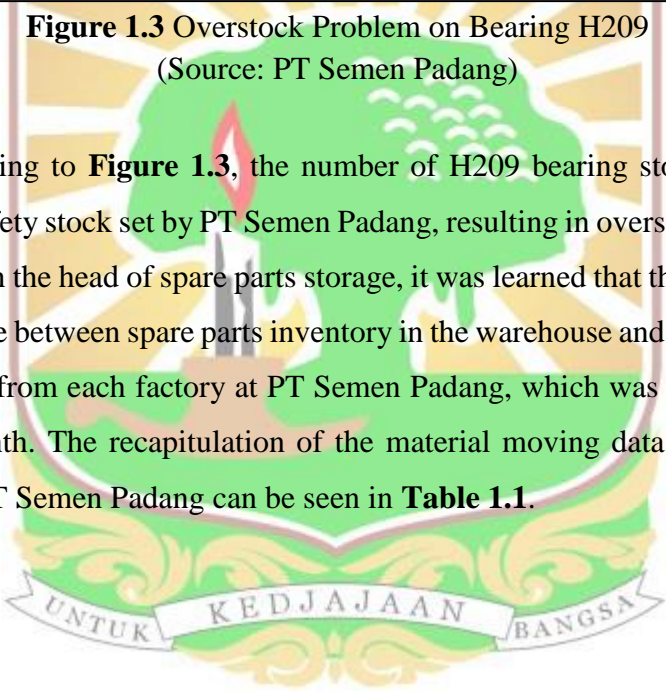


Table 1.1 Recapitulation of Spare Parts Inventory at PT Semen Padang in 2021

No.	Materials Number	Descriptions	Inventory Data	Safety Stock	Unit	2021											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
1	SI00007742	BEARING,DGBB:6205;2xZ;C3;STEEL;S TD;PN	Initial Inventory	6	EA	36	0	0	0	37	0	0	46	0	0	0	66
			Goods Receipt			0	0	86	248	6	0	112	0	0	0	172	70
			Demand			36	0	86	211	43	0	66	46	0	0	106	136
			Finale Stock			0	0	0	37	0	0	46	0	0	0	66	0
2	SI00007966	BEARING,DGBB:6206;2xZ;C3;STEEL;S TD;PN	Initial Inventory	30	EA	86	23	17	0	0	0	0	97	74	49	0	0
			Goods Receipt			0	0	10	0	0	0	198	0	0	0	0	644
			Demand			63	6	58	69	0	0	101	23	25	64	36	126
			Finale Stock			23	17	-31	-69	0	0	97	74	49	-15	-36	518
3	SI00008507	IDLER:BC;CARRIE R;159X670X25X678 MM;FL18	Initial Inventory	90	EA	64	24	24	79	19	19	729	901	800	740	690	660
			Goods Receipt			0	0	130	0	0	776	192	0	0	0	0	0
			Demand			40	0	75	60	0	66	20	101	60	50	30	40
			Finale Stock			24	24	79	19	19	729	901	800	740	690	660	620
4	SI00007969	BEARING,DGBB:6207;2xZ;C3;STEEL;S TD;PN	Initial Inventory	27	EA	132	132	132	119	148	108	110	68	48	0	0	373
			Goods Receipt			0	0	4	68	0	2	0	0	0	0	428	206
			Demand			0	0	17	39	40	0	42	20	48	0	55	63
			Finale Stock			132	132	119	148	108	110	68	48	0	0	373	516
5	SI00008249	IDLER:BC;CARRIE R;114X295X20X301 MM;MT20	Initial Inventory	10	EA	185	155	133	133	95	95	583	538	488	488	473	473
			Goods Receipt			0	0	0	0	0	550	0	0	0	0	0	0
			Demand			30	22	0	38	0	62	45	50	0	15	0	42
			Finale Stock			155	133	133	95	95	583	538	488	488	473	473	431

(Source: PT Semen Padang, 2021)

Table 1.1 Recapitulation of Spare Parts Inventory at PT Semen Padang in 2021 (Continued)

No.	Materials Number	Descriptions	Inventory Data	Safety Stock	Unit	2021											
						Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
6	SI00008305	IDLER:BC;RTN-RD;140X950X20X10 16MM;IF14	Initial Inventory	20	EA	204	162	162	139	89	89	69	9	9	0	274	464
			Goods Receipt			0	0	0	0	0	0	10	0	292	200	0	
			Demand			42	0	23	50	0	20	60	10	9	18	10	42
			Finale Stock			162	162	139	89	89	69	9	9	0	274	464	422
7	SI00008252	IDLER:BC;CARRIE R;114X380X20X406 MM;FL14	Initial Inventory	5	EA	88	30	30	102	102	72	52	52	121	101	232	232
			Goods Receipt			0	0	104	0	0	0	88	10	176	0	0	
			Demand			58	0	32	0	30	20	0	19	30	45	0	43
			Finale Stock			30	30	102	102	72	52	52	121	101	232	232	189
8	SI00008310	IDLER:BC;RTN-RD;159X2000X25X2 008MM;IF18	Initial Inventory	10	EA	318	288	268	258	238	198	418	653	756	716	706	696
			Goods Receipt			0	0	0	0	0	240	240	118	0	0	0	0
			Demand			30	20	10	20	40	20	5	15	40	10	10	30
			Finale Stock			288	268	258	238	198	418	653	756	716	706	696	666
9	SI00008351	IDLER:BC;CARRIE R;114X360X20X402 MM;MT20	Initial Inventory	10	EA	130	90	90	90	71	50	294	294	259	251	229	391
			Goods Receipt			0	0	0	0	0	304	0	0	0	0	162	0
			Demand			40	0	0	19	21	60	0	35	8	22	0	40
			Finale Stock			90	90	90	71	50	294	294	259	251	229	391	351
10	SI00000317	BEARING,BALL:D G;1R;45MM ID;6209;2SHLD;C3	Initial Inventory	7	EA	0	0	0	0	0	0	0	30	3	3	3	48
			Goods Receipt			0	0	0	28	0	0	100	0	0	0	90	0
			Demand			0	0	18	28	27	19	70	27	0	0	45	10
			Finale Stock			0	0	-18	0	-27	-19	30	3	3	3	48	38

(Source: PT Semen Padang, 2021)

The movement of spare parts materials from January to December 2021 can be seen in the data recapitulation shown in **Table 1.1**. Recapitulation of the overall spare parts inventory, see **Appendix A. Table 1.1** depicts the inventory data of spare parts each month in 2021, consisting of the initial inventory, the number of incoming goods, the number of uses, the number of safety stock, and the finale stock. The relatively large amount of ending inventory is also shown in **Table 1.1**. For example, the stock of the ninth spare part, SI00008310 spare part, is quite large compared to the safety stock, which is only ten units. It indicates an inventory overstock. The stock of the second spare part, SI00007966 spare part with the name "bearing 6206", on the other hand, has some ending stock that is below zero, despite the high demand for this material. It indicates an inventory stockout.

Based on the description above, it can be stated that PT Semen Padang requires a re-evaluation of the spare parts inventory control. Inventory control can help companies minimize the total cost of inventory and the need for storage space, preventing the buildup of spare parts. In addition, with good inventory control, the company can fulfill customer requests promptly. Therefore, it is necessary to conduct research to analyze and evaluate the company's previous inventory control and propose appropriate inventory control method to minimize stockout and overstock problems to reduce spare parts' buildup and total inventory cost.

1.2 Problem Formulation

PT Semen Padang is still experiencing problems in the inventory control of spare parts in the form of overstock and stockouts. This problem impacts the increasing total inventory costs of PT Semen Padang's inventory system.

1.3 Research Objective

Based on the formulation of the problem, the objective of the research on this Final Project is to evaluate the inventory control of spare parts at PT Semen

Padang and propose a new inventory control method that is better to minimize stockout and overstock problems to reduce total inventory cost.

1.4 Problem Scopes

The limitations of the problems used in this study include the following:

1. In this study, it is assumed that there is no change or discount in the price of spare parts.
2. All ordered components are assumed to come in good condition.

1.5 Outline of The Research Proposal

The outlines of the research proposal used in this final project report are as follows:

CHAPTER I INTRODUCTION

This chapter contains the research background, problem formulation, objectives, limitations of research problems, and the research outline.

CHAPTER II LITERATURE REVIEW

This chapter contains materials related to the problems discussed, consisting of literature related to problems in research and several formulas used to solve problems.

CHAPTER III RESEARCH METHODOLOGY

This chapter contains the steps taken in completing this research which consists of preliminary studies, literature review, problem identification, problem formulation, data collection, data processing, discussion, conclusions, and suggestions for further research.



CHAPTER IV DATA COLLECTING AND PROCESSING

This chapter contains the stages of data collecting and processing in controlling the spare parts inventory of PT Semen Padang.

CHAPTER V ANALYSIS

This chapter contains the analysis of data processing that has been carried out, including analysis of FNS classification, probabilistic Q model inventory control analysis, and comparative analysis of actual and proposed inventory control.

CHAPTER VI CLOSING

This chapter contains conclusions of the research and suggestions for future research.

