CHAPTER I
INTRODUCTION

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

1.1 Background

Inventory is a crucial component for any organization, whether it is a small organization or a huge one. It plays a key role in supporting business or operational activities by ensuring that items are stored and managed to meet varying demands. This necessity arises from the inherent variability and unpredictability of supply and demand, both in terms of quantities and timing (Waters, 2003). Therefore, optimal inventory control is needed in every company.

Inventory tied up capital for many organizations. Based on Tersine (1994), many businesses have 20-40% of their assets tied up in inventory. Additionally, based on Heizer and Render (2012), inventory often represents a significant financial investment, accounting for up to 50% of total invested capital in many companies. So, cost associated with inventory is quite economically significant (Silver, 1998). Cast that invested in inventory could be used somewhere else for profit making, debt servicing, or dividend distribution. Consequently, effective inventory management must ascertain the optimal quantity and timing for each item purchased by the organization (Tersine, 1982).

PT X is one of the manufacturing companies that establishes in the West Sumatra Province. This company is concerned in the plantation and processing of palm oil. The company is supported by 120,000 hectares of palm oil plantations in Pesisir Selatan, Dharmasraya, and Pasaman Barat (West Sumatra), and one of the factories that operates to process those palm oil is located in Padang, West Sumatra, with one of the main products being is cooking oil.

Similar to other manufacturing companies, PT X also needs inventory management to support their business activity. This company has implemented an inventory system to regulate its inventory, such as for goods ordering activities, the company has a system called Oracle, where this system connects each branch office with the head office in ordering goods needed. Due to the wide range of items that can be categorized as inventory, several main types of inventories are widely recognized. These inventories consist of four primary types: raw materials, work in process, Maintenance, Repair, and Operations supplies (MROs), and finished goods (Heizer & Render, 2012). Raw material inventory is material that has been purchased but not processed. Work-in-process inventory is material that has undergone some change but is not completed. MRO supplies are materials that keep machinery and processes in a company productive. Finished-goods inventory is completed product waiting shipment (Heizer & Render, 2012). The percentage values for these types of inventory at PT X are for raw material, work in process, and finished group about 80% of inventory and MRO is 20% of inventory as can be seen in **Figure 1.1**,

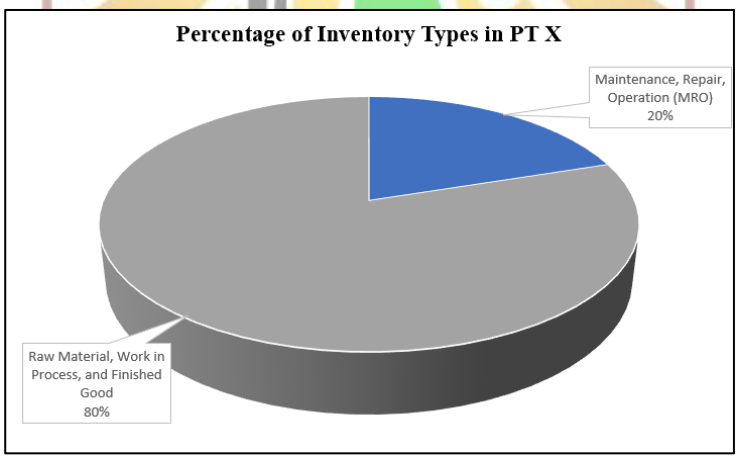

Figure 1.1 Percentage of Inventory Types in PT X

According to **Figure 1.1**, then it is known that one of the inventory types is MRO with a value is about 20% of all the inventory types. This value is about 20 billion in a year. Based on this investment value, the company needs a good inventory policy. MRO plays an important role in maintaining the productivity of the company. MROs constitute inventory items essential for the regular functioning

of an organization but are not integrated into the final product (Tersine, 1982), such as cleaning supplies or plant upkeep supplies such as lubricants (Johnson, 2010). Therefore, to make sure that the factory can operate properly, MRO must be maintained in a certain amount. However, as is often the case in manufacturing companies, inventory control of MRO is still done without a suitable strategy to handle the complexity (Johnson, 2010).

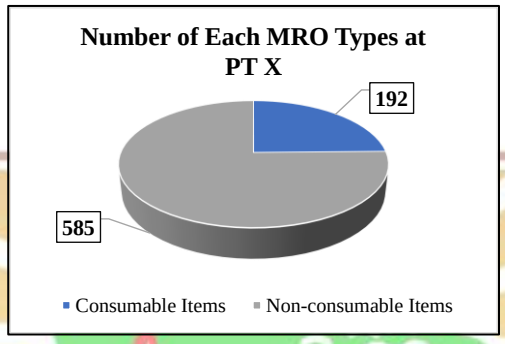

Figure 1.2 Number of Each MRO Type in PT X

According to the head of inventory at PT X, the MRO supplies can be distinguished based on their use. That is divided into two categories, namely consumable items and non-consumable items. The number of each type of MRO can be seen in **Figure 1.2**. Consumable items are products intended to be used up during normal operation and require regular replacement, for example, cleaning supplies, office supplies, safety equipment, and some maintenance supplies that are used regularly. Non-consumable items are items that are not used up through regular use. They typically have a longer lifespan and are intended to be maintained or repaired rather than discarded after a single use such as pumps, valves, bearings, or other spare parts as well as some electric equipment and some general hardware equipment.

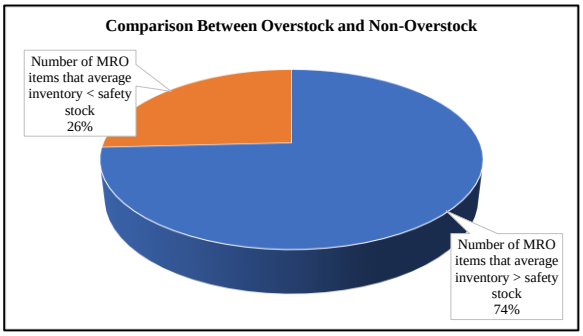

Figure 1.3 Comparison Between Overstock and Non-Overstock

Based on interviews with the company, the inventory system, especially MRO supplies, is still experiencing some problems in the procurement of inventory. First, orders are typically placed for individual items as needed, resulting in a high order frequency and increased ordering costs. Meanwhile, some items come from the same supplier. To reduce ordering costs, all required items from the same supplier should be ordered together in a single purchase. Second, procurement is still carried out even when there is still a large stock in the warehouse. Additionally, many orders are placed in large quantities. Warehouse administration does not determine control parameters using a specific method but relies solely on estimates from the warehouse division. Because of those factors, the main problem in MRO inventory in PT X is overstock. **Figure 1.3** shows a comparison of items that experience overstock and not overstock, where items are said to overstock in this section when the number of average inventory in a year is higher than the safety stock value set by the company.

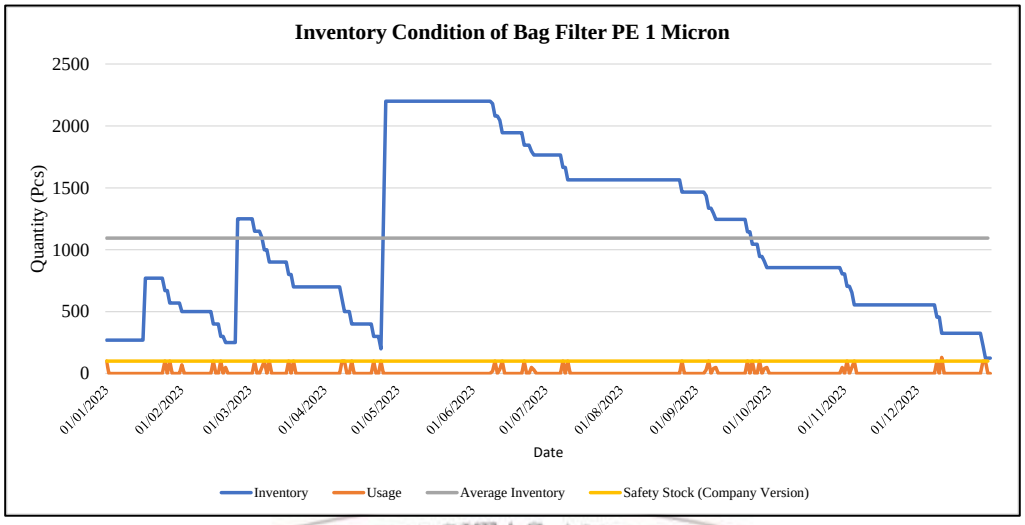

Figure 1.4 Inventory Condition of Bag Filter PE 1 Micron in 2023 at PT X

Table 1.1 Inventory Condition Per Month of Bag Filter PE 1 Micron in 2023

No BC	Item Code	Item Name	Specification	Standard Unit	Safety Stock	Inventory	Period												Average
							1	2	3	4	5	6	7	8	9	10	11	12	
35055	SPR.34.02246	Bag Filter PE 1 micron		pcs	100	Initial Inventory	370	570	1250	700	2200	2200	1765	1565	1465	855	805	555	1093
						In	500	1000	0	2000	0	0	0	0	0	0	0	0	
						Out	300	320	550	500	0	435	200	100	610	50	250	430	
						Final Inventory	570	1250	700	2200	2200	1765	1565	1465	855	805	555	125	

The inventory condition of one of the existing MRO goods is shown in **Figure 1.4**. The graph shows inventory condition data during 2023, the number of usage data, safety stock data, and average inventory data of Bag Filter PE 1 Micron. The function of Bag Filter is to filter out fine particles remaining in the oil, ensuring the quality and purity of the final product. The safety stock value is set by the company itself. It can be seen that the average inventory (1093,3356 pcs) is above the safety stock (100 kg). Known that, the average single use of the welding wire is 100 pcs then the safety stock that company sets, which is 100 pcs, is expected to cover the fluctuation number of uses only 1 time before the new order arrives. However, the average amount of inventory stored is 1093,3356 kg, which means that there is a considerable accumulation of goods before a new order comes, because the goods stored exceed the number of goods actually needed, so that when a new order comes, the number of goods will be even larger. This causes inventory to experience overstock.

Another problem that can be identified based on **Figure 1.4** is the ordering of large quantities of goods, namely 2000 pcs in April, but after that time no use of goods was made, precisely in May and June, before finally the goods were used in the following months. This indicates again, that there is a considerable accumulation of goods that exceeds the amount that is needed. This results in a buildup of storage costs that the company could have utilized for other purposes.

Based on the problems faced by the company's inventory, it is necessary to evaluate the MRO inventory system to improve operational efficiency, reduce storage costs, and ensure that working capital is used more effectively.

1.2 Problem Statement

Based on the issues outlined in the background, the problem statement of this research is 74% of MRO items that experience overstock which causes a high amount of tied-up capital at PT X.

1.3 Research Objective

This research aims to propose suitable MRO inventory planning and control to minimize total inventory costs at PT X.

1.4 Problem Scopes

The limitations of the problems made in this study are:

1. There are no changes or discounts in the prices of MRO items.
2. Data processing is only carried out for MRO items in the consumable item category.

1.5 Outline of The Research Proposal

The structure of the research proposal presented in this final project report is outlined as follows:

CHAPTER I INTRODUCTION

This section includes an overview of the research background, the problem statement, objectives, limitations of the research problems, and the overall research plan.

CHAPTER II LITERATURE REVIEW

This section provides relevant materials about the discussed issues, including literature related to research problems and several formulas utilized for problem-solving.

CHAPTER III RESEARCH METHODOLOGY

This section outlines the steps undertaken in completing this research, including preliminary studies, literature review, problem identification, problem formulation, data collection, data processing, discussion, conclusion, and suggestions for further research.

CHAPTER IV PROPOSED INVENTORY PLANNING

This section discusses data collection and data processing related to the MRO inventory at PT X to determine the proposed inventory planning.

CHAPTER V RESULTS AND DISCUSSIONS

This section explains a discussion of the results from the proposed inventory planning that has been done previously.

CHAPTER VI CLOSING

This section presents the conclusions of the research and gives suggestions for future research.