ABSTRACT

Amidst increasingly fierce competition in the manufacturing industry, supply chain management efficiency has become a key pillar for the financial sustainability of companies, particularly in the electronic component manufacturing sector, which faces highly dynamic fluctuations in demand. PT XYZ, a manufacturer of cooling fans for industrial use, currently faces a major challenge in balancing the availability of finished products with operational cost efficiency. The main problem identified is internal uncertainty in production lot size determination policies, which often results in stockouts. The urgency of this research is based on the fact that the stockout rate in the warehouse has reached 21%, a condition that not only hinders the timely fulfilment of customer orders but also triggers cost inflation. It was noted that the company's total actual inventory costs were 0.3% above the target costs, or a difference of approximately IDR 203.123.582,78.. Without standardised policies, production planning has been heavily dependent on human intuition rather than measurable data calculations. Therefore, a quantitative approach is needed that can provide optimal solutions in reducing operational costs while ensuring the availability of goods in the warehouse.

The problem formulation in this study focuses on how to design an appropriate finished product inventory policy using scientific methods to minimise the total inventory costs at PT XYZ in line with the company's budget targets. In line with this problem, the main objective of this final project is to design an inventory management policy by determining the most optimal production quantity and machine setup frequency for the company's 12 leading products.

The solution method chosen to address this challenge is the Multi-Item Economic Production Quantity (EPQ). This method was selected based on the characteristics of the production system at PT XYZ, where inventory replenishment is carried out gradually (not instantly) and involves the simultaneous production of various types of products using the same machine facilities. The use of EPQ Multi Item is considered highly appropriate due to its ability to synchronise production cycles between items while considering available production capacity constraints. This model works by balancing three main cost components, namely production costs,

setup costs (machine preparation), and warehouse storage costs, to achieve the lowest total cost point.

Based on the results of data analysis, it is known that the company's actual total inventory costs before implementing the method reached IDR 60,378,681,928.15. This figure reflects inefficiency caused by the actual setup frequency reaching 7.3 times per month, while the size of the production lot produced has not been able to cover the demand rate in a stable manner. After processing the data using the EPQ Multi Item model, the optimal production lot size for the 12 products was obtained in the range of 5,120 to 5,707 units per cycle. The recommended production frequency became more efficient, namely 2.6 cycles per month, with an average production duration of approximately 5.1 to 5.7 days per cycle. Furthermore, the sensitivity analysis results prove that this policy has a good level of stability against fluctuations in setup and storage costs due to their relatively small impact on total costs. However, this policy was found to be very responsive to changes in production costs and demand quantities, indicating that production volume control and demand data accuracy are key to the company's cost-saving efforts.

In conclusion, the application of the Multi-Item Economic Production Quantity (EPQ) method has been empirically proven to be effective in minimising inventory costs at PT XYZ. Through this proposed policy, the company was able to reduce its total annual expenditure to IDR 60,036,134,264.12. This is equivalent to a cost reduction of 0.6% or a potential saving of IDR 342,547,664.04 compared to the previous actual conditions. Thus, this study recommends the use of the Multi-Item EPQ model as a new standard in medium-term production planning to improve the company's operational efficiency.

Keywords: Inventory, Multi-Item Economic Production Quantity (EPQ), Setup Costs, Storage Costs, Production Costs, Stockouts.