ABSTRACT

PT XYZ, a leading refined sugar producer in Indonesia, faces significant challenges in managing its sack inventory, a vital component in its product packaging process. The primary issue lies in the imbalance between existing stock levels and actual usage. The company experiences an Overstock of 25 Kg sacks, while simultaneously encountering stockouts for 50 Kg and 1000 Kg sacks. This imbalance profoundly impacts both operational efficiency and financial performance. The Overstock of 25 Kg sacks leads to unnecessary accumulation, directly increasing storage costs, including warehousing fees, insurance, maintenance, and potential losses from prolonged storage. Conversely, stockouts of 50 Kg and 1000 Kg sacks necessitate emergency accidental buying at prices significantly higher than normal due to time constraints and limited supplier options. This inflates sack procurement costs, consequently burdening the company's total inventory expenditure.

Financially, PT XYZ's current actual inventory cost totals Rp 41,227,341,533, substantially exceeding the company's target of Rp 37,238,976,960. This translates to an excess cost of Rp 3,988,364,553, or 10.7% above the target. The magnitude of this discrepancy underscores the urgent need for fundamental improvements in inventory management policies to maintain a balanced total inventory cost.

To address these issues, this research focuses on designing an optimal inventory control policy using continuous review (s, S) and (s, Q) models. The primary objective is to significantly minimize the total cost of sack inventory. Furthermore, these improvements are expected to automatically enhance the service level (ensuring sack availability) and reduce the risks of both Overstock and stockout. Consequently, PT XYZ's operations are anticipated to run more smoothly and efficiently.

The research methodology involves a systematic approach. It begins with collecting historical sack usage data for each size (25 Kg, 50 Kg, 1000 Kg) throughout 2024 as the basis for analysis. Subsequently, a Kolmogorov-Smirnov normality test is performed on the sack usage data to ensure compliance with the assumptions of

probabilistic inventory models. Initial calculations indicate that the existing total inventory cost is Rp 41,174,410,283.

The methodological process continues with ABC classification to categorize sack types based on their consumption value or financial impact. High-value (Category A) sacks will be managed using a stricter continuous review (s, S) model, while medium/low-value (Category B/C) sacks can utilize the simpler (s, Q) model. Following classification, the Hadley-Whitin model is applied to determine key parameters for the proposed inventory policy: optimal order quantity (q), reorder point (r), safety stock (SS), and maximum lot size (S) specifically for Category A sacks. Once optimal parameters are derived, the proposed total inventory cost is calculated and compared with the existing condition. To test the model's robustness, a sensitivity analysis is conducted by varying input parameters (purchase cost, holding cost, ordering cost, shortage cost, and demand) by 5-25%, ensuring the policy remains effective amidst operational fluctuations. As a culmination of the research, the implementation results are presented in an interactive dashboard, serving as a real-time visual tool for PT XYZ's management to monitor inventory performance and facilitate quick, informed decision-making.

The results of the proposed policy implementation show a significant reduction in total inventory cost. Based on calculations with the new continuous review model, PT XYZ's inventory cost was successfully reduced by Rp 2.284.126.332, equivalent to 5.46%. This reduction brought the existing inventory cost from Rp 41.172.729.683 down to Rp 38.924.603.352. This figure demonstrates the effectiveness of the proposed model in optimizing inventory management, even amid increased demand. This cost reduction represents a significant step forward for PT XYZ in optimizing inventory costs and enhancing profitability. Implementing this policy will not only alleviate financial burden but also improve stock availability, reduce the risk of production stoppages, and ultimately support the overall smooth operation of PT XYZ.

Keywords: ***Probabilistic Inventory Control, Overstock , Stockout*****, Accidental Buying,** ***Continuous Review (s, S), (s, Q), Hadley-Whitin Model***