Dashboard Development for Analyzing Minimum Order Quantity and Safety Stock Based on Usage and Shelf Life

Author : Atsaya Changkham Advisors : Associate Professor Lampang Saenchan and Acting Capt. Dr. Chalermrat Nontapa
Department of Statistics, Faculty of Science, Chiang Mai University, Chiang Mai, 50200, Thailand
E-mail : atsaya_c@cmu.ac.th

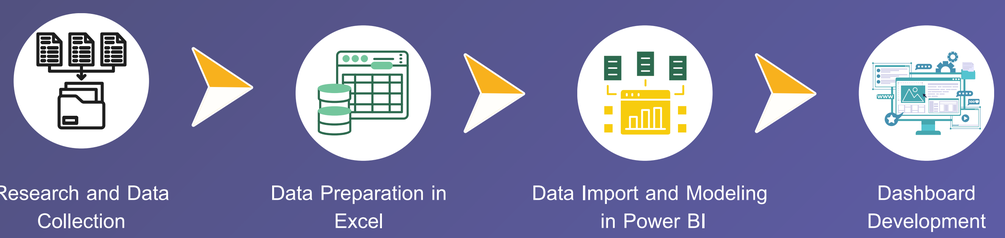
ABSTRACT

Effective inventory management of raw materials with minimum order quantity and expiration constraints is critical for cost control in manufacturing industries, particularly for chemical materials with limited shelf life. This study develops an analytical dashboard to evaluate the appropriateness of Minimum Order Quantity (MOQ) and Safety Stock levels based on material usage and expiration constraints. The analysis utilizes actual procurement data from an electronic components manufacturing company collected between March and August 2025, covering 401 chemical raw material parts. Loss values from excess inventory and MOQ constraints were calculated, and material demand was compared with predefined Safety Stock levels. The results indicate that 180 parts (44.89%) incurred losses from excess inventory, while 9 parts (2.24%) were affected by MOQ constraints. The dashboard provides a data-driven decision support tool to improve inventory management efficiency.

INTRODUCTION

Suppliers often set minimum order quantities higher than actual usage, while unused inventory may still remain in the factory. This leads to excess stock and a higher risk of expiration, especially for materials with limited shelf life, such as chemicals. At the same time, inappropriate safety stock levels may cause stockouts when demand increases or deliveries are delayed. Therefore, this project develops a dashboard to analyze usage and shelf-life data to support appropriate minimum order quantity and safety stock decisions for greater efficiency.

METHODOLOGY



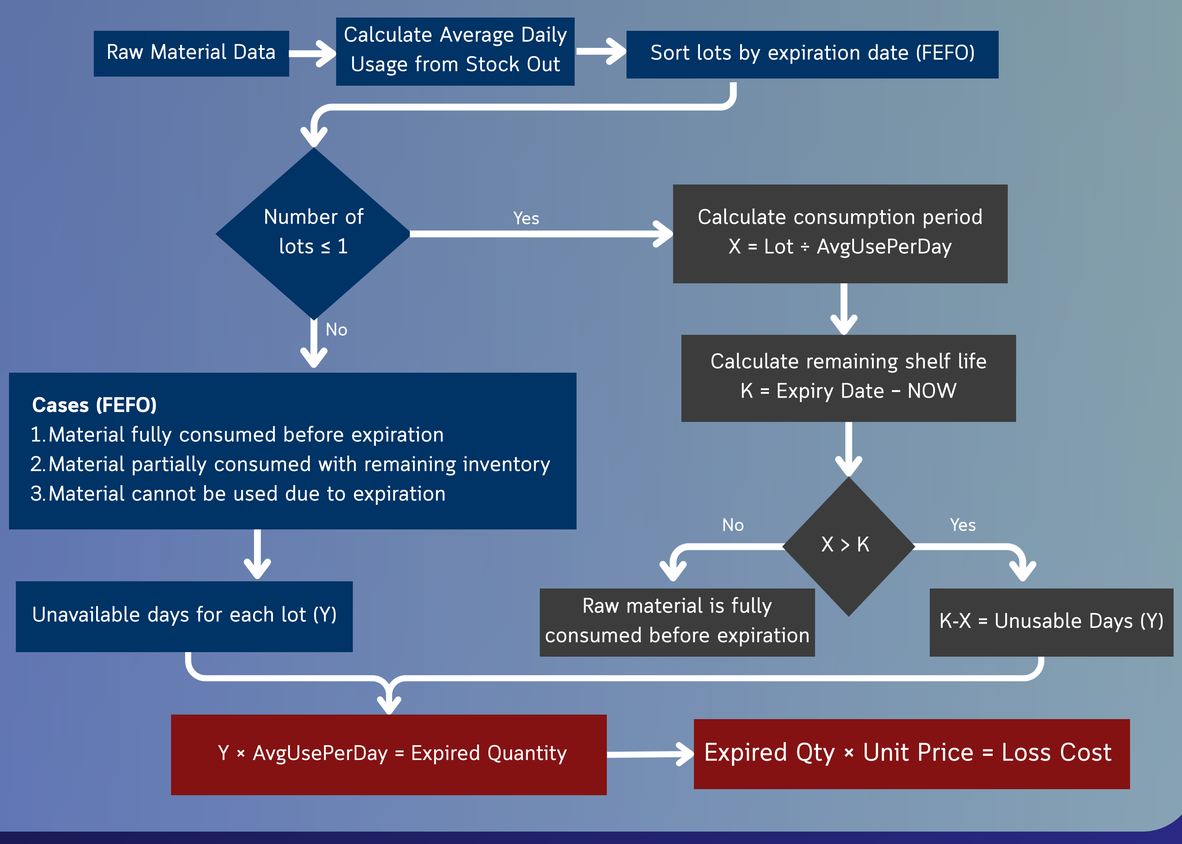
OBJECTIVES

To analyze inventory suitability by identifying materials with potential loss costs from MOQ, excess inventory, and differences between usage demand and safety stock levels.

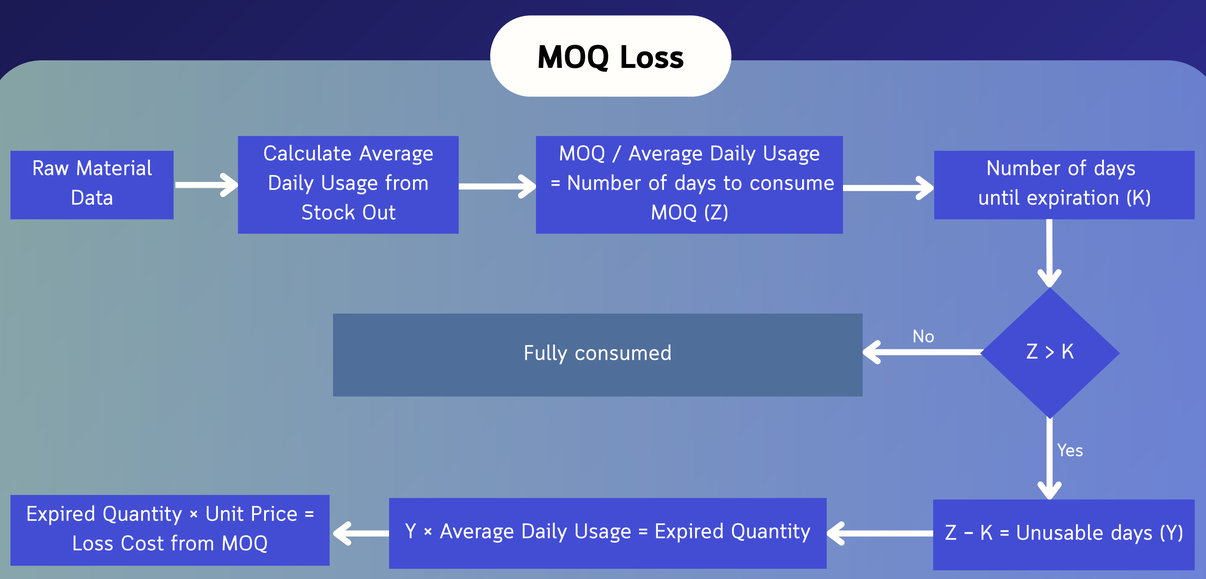
To develop a dashboard that visualizes loss costs and compares material usage with safety stock to support effective inventory decision-making.

ANALYTICAL FLOW

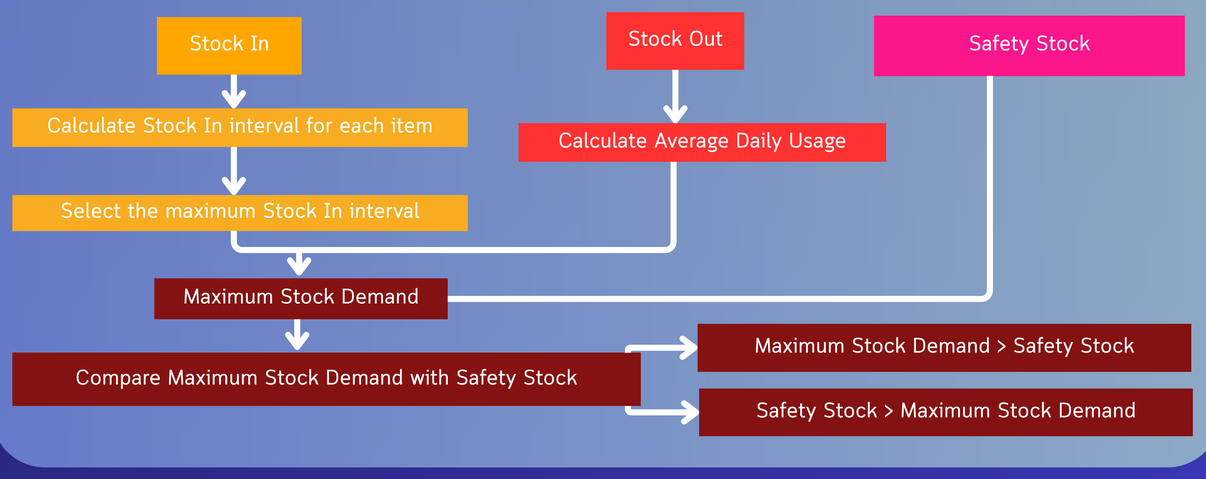
Remaining Inventory Loss



MOQ Loss



Demand vs Safety Stock

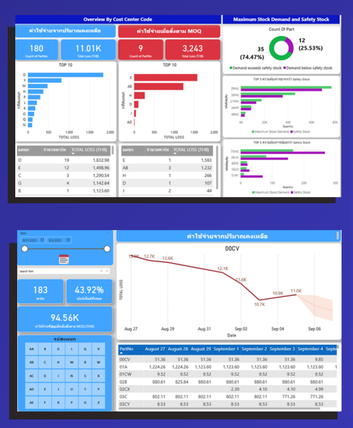


RESULTS

The analysis highlights inventory inefficiencies caused by high MOQ and inappropriate Safety Stock levels, providing quantitative and financial performance insights.

- Identified excess inventory and associated loss costs
- Detected gaps between actual usage and Safety Stock levels
- Revealed items with high expiration risk
- Generated data-driven recommendations for MOQ and Safety Stock optimization
- Enabled real-time decision support through a Power BI dashboard

Category	Number of Parts	Percentage (%)
Remaining Inventory Loss	180	44.89
MOQ Loss	9	2.24
Demand > Safety Stock	35	8.73
Demand < Safety Stock	12	2.99



Power BI



DISCUSSION & CONCLUSION

The study results align with the research objectives. The developed dashboard systematically analyzes loss costs from MOQ and excess inventory, identifies high-impact materials, and detects imbalances between material demand and Safety Stock levels. With tabular and graphical visualization, the dashboard effectively supports data-driven inventory management decision-making.

REFERENCES

[1] Whittney Gilstrap. (2025, 4 July). Managing Minimum Order Quantity with Inventory Planning Software.
[2] Sasomjit, W. (2016). A study of guidelines for improving raw material inventory management efficiency [Master's thesis, Burapha University].