

**DEVELOPING AN OPTIMAL DECISION MAKING ON CRITICAL
SPARE PART INVENTORY SYSTEM FOR AIR COMPRESSOR UNIT SYSTEM**

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STATEMENT BY THE AUTHOR

I hereby declare that this submission is my own work and to the best of my knowledge, it contains no material previously published or written by another person, nor material which to a substantial extent has been accepted for the award of any other degree or diploma at any educational institution, except where due acknowledgement is made in the thesis.

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ABSTRACT

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The determination of inventory levels for maintenance spare parts is sometimes influenced by the personal comfort requirements of individuals rather than actual risk. Inventory decision can be logical and rational process, a good understanding of reliability principles is required. This research aims to presents a procedure on classifying criticality of spare part developed using Six Sigma, Define - Measure – Analyse – Improve – Control (DMAIC) methodology. The classification will define policy of spare parts inventory level for each criticality. The proposed procedure has been evaluated through brainstorming within company and weighted with Analytical Hierarchy Process (AHP). This research focuses on the *criticality analysis*, *prioritization of stocking spare parts* and its quantity. Several factors that are considered including possible failure mode (FMEA), lead time, consequences of stockout, probability of failure, interchangeability, number of suppliers, time to repair, inventory cost. The effectiveness of the procedure is validated using real maintenance spare parts data. This research concludes with practical recommendations for organizations to adopt the methodology approach in optimizing maintenance spare parts management especially in petrochemical company. The result of the spare parts inventory decision-making using the multi-criteria decision method show a reduction in inventory by 25% compared to the current inventory, specifically for the Air Compressor unit.

Keywords: Failure Mode and Effect Analysis (FMEA), critical spare part management, EOQ, ABC Analysis, VED, FSN, Multi-Criteria Analysis Decision Making

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DEDICATION

I dedicate this work to my parents, my wife, and my children.

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