

Optimizing Excavator Physical Availability Using Lean Six Sigma and Predictive Inventory Management: A Case Study of PC1250 at Samarinda Coal Mine

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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.



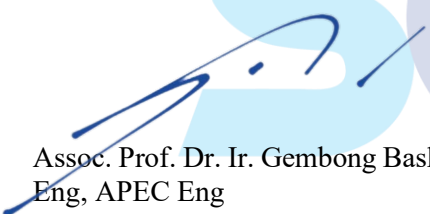
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ABSTRACT

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This study investigates the improvement of Physical Availability (PA) in Komatsu PC1250 hydraulic excavators operating at a coal mining site in Samarinda, where PA was initially recorded at 73%, below the customer target of 85%. The main contributors to low PA were unplanned downtime, delayed troubleshooting, and low On-Time In-Full (OTIF) performance in spare parts delivery. To address these challenges, Failure Mode and Effects Analysis (FMEA) was applied to identify dominant failure modes, while the Lean Six Sigma DMAIC framework was used to design targeted process improvements. Predictive inventory management, supported by Vendor Held Stock (VHS), was also integrated to enhance forecasting accuracy, reduce stock-out risks, and shorten lead times.

The implementation delivered measurable improvements: PA increased from 73% to 83%, MTTR was reduced from 34 hours to 24 hours (-29%), MTBF extended from 92 hours to 117 hours (+27%), and OTIF performance improved from 69% to 95% (+26 pp). These results confirm that a structured, data-driven improvement framework can significantly enhance equipment reliability and operational resilience. The model provides a scalable approach for similar mining operations and supports PT United Tractors' commitment to achieving higher efficiency in product support services.

Keywords: Physical Availability (PA), Predictive Maintenance, Failure Mode and Effects Analysis (FMEA), Lean Six Sigma (DMAIC), Spare Parts Management, OTIF Performance



DEDICATION

I dedicate this work to my beloved family, whose unwavering support and prayers have been the foundation of my journey. I also dedicate it to my lecturers and colleagues, whose guidance and collaboration have shaped the path of this research. May this work contribute, in its own small way, to the advancement of engineering practice and the future of Indonesia.



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To the faculty of Swiss German University—thanks for giving me the tools to think critically and build things that work. To my team at PT United Tractors—thank you for trusting me with real problems worth solving.

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TABLE OF CONTENTS

	Page
STATEMENT BY THE AUTHOR	2
ABSTRACT	3
DEDICATION	5
ACKNOWLEDGEMENTS	6
TABLE OF CONTENTS	7
LIST OF FIGURES	9
LIST OF TABLES	10
LIST OF EQUATIONS	11
CHAPTER 1 - INTRODUCTION	12
1.1 Background	12
1.2 Research Problem.....	17
1.3 Research Objectives	18
1.4 Significance of Study	19
1.5 Research Questions	20
1.6 Hypothesis	20
1.7 Research Scope	21
CHAPTER 2 - LITERATURE REVIEW	23
2.1 Factors Contributing to Low Physical Availability.....	23
2.2 Leveraging Digital Tools & Automation for PA Optimization	25
2.3 Lean Six Sigma for Continuous PA Improvement	26
2.4 Optimizing PA Through Predictive Maintenance & Lean Six Sigma (DMAIC).....	27
2.5 The Impact of Real-Time Inventory Management & Predictive Spare Parts Allocation	28
2.6 Addressing Gaps in Existing Literature	29
2.6.1 Key Differentiators of This Research	30
2.7 Implications for This Study	31
CHAPTER 3 – RESEARCH METHODS	32
3.1 Materials and Equipment	32
3.2 Overall Research Design	33
3.3 Methodological Framework.....	33
3.4 Data Collection Protocol	35

3.5	Analysis Techniques	36
3.6	Pilot-Implementation Procedure.....	36
3.7	Ethical, Safety, and Confidentiality Considerations	38
3.8	Timeline	38
3.9	Chapter Summary	39
	CHAPTER 4 – RESULTS AND DISCUSSIONS	40
4.1	Introduction	40
4.2	Measure — Establishing a Clean, Trustworthy Baseline	41
4.3	Diagnosis with FMEA, Pareto, Fishbone and 5-Why Analysis	43
4.3.1	FMEA Screening	43
4.3.2	Pareto Confirmation	44
4.3.3	Fishbone (Cause-and-Effect) Diagram	45
4.3.4	5-Why Deep-Dive on Top Three Failure Modes.....	46
4.3.5	Diagnostic Summary	47
4.4	Bridging Root-Cause Findings to Improvement Activities	47
4.4.1	How the Levers Were Chosen	47
4.4.2	Mapping Improvement Activities to Levers	48
4.4.3	Mechanism of Impact.....	50
4.5	Improve Phase and Initial Control Plan	50
4.5.1	Workflow Transformation: From Reactive to Predictive System .	51
4.5.2	Improvement Road-map.....	51
4.5.3	Quick-Win Deployment	52
4.5.4	Pilot Implementation on Unit A11	54
4.5.5	Initial Control Measures.....	55
4.6	Performance Verification	56
4.7	Discussion	57
4.8	Limitations	58
4.9	Summary	59
	CHAPTER 5 – RESULTS AND DISCUSSIONS	61
5.1	Conclusions	61
5.2	Recommendations.....	62
	GLOSSARY.....	64
	Appendix 1. Sample Interview/FGD Questions	66
	Appendix 2. FMEA Scoring Criteria	67
	Appendix 3. Rapid-Repair SOP.....	68
	REFERENCES.....	69
	CURRICULUM VITAE.....	72

LIST OF FIGURES

Figure 1 Excavator PC1250 in coal mining industry	12
Figure 2 Challenges of Mining Equipment Maintenance	13
Figure 3 Type of heavy equipment maintenance	14
Figure 4 PT United Tractors Tbk Product line	15
Figure 5 the relationship between labor and their effects on equipment idleness as activities progress.....	23
Figure 6 side-by-side comparison of reactive vs. preventive maintenance workflows	25
Figure 7 flowchart of the DMAIC process applied to maintenance	26
Figure 8 Inventory Management Enhancements. Yan et al. (2023)	28
Figure 9 Pareto Chart (Top-10 Failure Modes)	45
Figure 10 Root Cause Analysis.....	45
Figure 11 Field rollout	53
Figure 12 two-hour micro-training session.....	53
Figure 13 X-bar/R charts for PA.....	56



LIST OF TABLES

Table 1 Research Scope	22
Table 2 Gaps in Existing Literature	29
Table 3 Material and Equipment.....	32
Table 4 Data Collection Protocol.....	35
Table 5 Pilot-Implementation Procedure	37
Table 6 Timeframe of study	38
Table 7 Implementation With DMAIC	40
Table 8 Baseline equipment-reliability KPIs prior to improvement actions	42
Table 9 Diagnosis with FMEA	44
Table 10 5-Why Deep-Dive on Top Three Failure Modes.....	46
Table 11 Mapping Improvement Activities to Levers	49
Table 12 Performance Verification.....	56



LIST OF EQUATIONS

Equation 1 Physical Availability (PA) Calculation Formula.....	24
Equation 2 Time-Based Physical Availability (PA) Formula Using MTBF and MTTR	33
Equation 3 Risk Priority Number (RPN) Calculation Formula	44
Equation 4 Time-Based Physical Availability (PA) Formula Using MTBF and MTTR	47

