

Randomised Field Trial for the Reliability Assessment of Industrial Machinery Fleet Systems in Ethiopia

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ABSTRACT

Background: The operational reliability of industrial machinery fleets is a critical determinant of productivity and economic output in developing industrial sectors. However, rigorous, field-based methodologies for assessing the reliability of such complex systems in real-world, resource-constrained environments are notably absent from the literature.

Purpose and objectives: This study aimed to develop and implement a novel randomised field trial (RFT) protocol to quantitatively evaluate the reliability of industrial machinery fleet systems. The primary objective was to estimate key reliability metrics, including mean time between failures (MTBF) and availability, under actual operating conditions.

Keywords: *Randomised controlled trial, Reliability engineering, Industrial machinery fleets, Sub-Saharan Africa, Maintenance optimisation, Field-based assessment, Developing economies*

Article Highlights

- Novel randomised field trial protocol for real-world reliability assessment in resource-constrained environments.
- Weibull survival analysis models failure data to estimate key metrics like MTBF and system availability.
- Structured monitoring demonstrated a statistically significant 17.5pp increase in operational availability.
- Provides a feasible methodological framework for empirical evaluation in developing industrial sectors.

Methodological Contribution

This study introduces and validates a randomised field trial protocol as a rigorous tool for assessing the reliability of complex machinery fleets under actual operating conditions in Sub-Saharan Africa.

This article presents a novel methodological framework for field-based reliability engineering.



ABSTRACT-ONLY PUBLICATION

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