Analyzing Incoherence and Inconsistencies in Data Utilization within Maintenance Operations for Critical Equipment in the Weaving Section of Textile Manufacturing Processes

Bett Kipchumba[1], Peter Chemweno[1], Eric Nganyi[1], and Jerry Ochola[1]

[1]Moi University

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Abstract

In the context of textile manufacturing's weaving section, efficient maintenance operations play a pivotal role in upholding critical equipment's peak performance and longevity. However, inconsistencies in data utilization during maintenance can lead to equipment failures, downtimes, and decreased efficiency. To address this, this study endeavors to scrutinize these data disparities, focusing on the weaving section's essential machinery. The objective encompasses identifying failure patterns, gauging parameter impacts on system components, and proposing personalized maintenance strategies based on failure characteristics. The study employed the Weibull distribution plot to analyze data from 19 distinctive components, with shape (β) and scale (η) parameters elucidating failure trends, distinguishing early-life and wear-out failures. The Anderson-Darling (AD) statistic validated Weibull fitting. Visual aids and charts presented findings effectively. Analysis showcased distinct failure patterns across system components, where shape parameters exceeding 1 denoted wear-out failures, and scale parameters revealed equipment lifespans. The study emphasized the necessity of bespoke maintenance approaches in response to equipment failure traits. Tailoring strategies for early-life and wear-out failures is essential. The Weibull analysis aids in pinpointing crucial maintenance junctures, optimizing schedules, and enhancing equipment reliability. This study's contribution lies in elevating equipment dependability, curbing downtimes, and augmenting operational efficiency in textile manufacturing processes. Recommendations encompass tailored maintenance strategies, prioritized preventive measures for wear-out-prone components, comprehensive craftsman training, and exploring predictive techniques leveraging sensor data and AI.

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