African Maintenance Engineering

Multilevel Regression Analysis for Yield Improvement in Nigerian Process-Control Systems: An Engineering Perspective

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Abstract

Process-control systems are critical in ensuring consistent product quality across Nigerian manufacturing facilities. A multilevel regression model was employed to analyse data from various Nigerian process-control systems, accounting for both fixed (facility-level) and random (operator-level) effects. The analysis revealed a significant improvement in yield rates by approximately 5% when operators followed standard operating procedures consistently. Multilevel regression models effectively quantify the impact of operator behaviour on process-control system performance, offering actionable insights for Nigerian manufacturers. Manufacturers should implement standardised training programmes to ensure consistent adherence to quality control standards. Process-Control Systems, Yield Improvement, Multilevel Regression Analysis, Nigerian Manufacturing The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Nigerian, multilevel, regression, econometrics, quality-control, analytics, stochastic*

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