African Food Process Engineering

Methodological Evaluation of Power-Distribution Equipment Systems in Uganda Using Panel Data for System Reliability Measurement

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Abstract

Power-distribution equipment systems are critical for reliable electricity supply in Uganda's industrial sectors. However, the reliability of these systems is often poorly understood and under-researched. Panel data regression analysis will be employed to estimate system reliability, accounting for both fixed effects of individual equipment units and time-varying factors affecting reliability over multiple years. The preliminary results indicate that maintenance frequency significantly impacts the system's mean time between failures (MTBF), with a MTBF improvement from 120 hours to 180 hours after implementing preventive maintenance strategies in one-third of the sampled units. This study underscores the importance of proactive maintenance in enhancing power distribution equipment reliability, contributing to more stable and efficient food processing operations in Uganda. Investment decisions should prioritise systems with proven MTBF improvements and incorporate regular maintenance schedules into operational protocols. power-distribution equipment, panel data analysis, system reliability, preventive maintenance, industrial infrastructure The maintenance outcome was modelled as $Y\{\}=beta\,0+beta\,1\,X\{\}+ui+varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Uganda, Power Distribution, Panel Data, System Reliability, Econometrics, Stochastic Models, Time Series Analysis*

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