African Industrial Engineering

Methodological Evaluation of Process-Control Systems for Yield Improvement in Senegal Using Time-Series Forecasting Models

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Abstract

Process-control systems are crucial for improving yield in manufacturing processes, especially in resource-limited settings such as Senegal. Time-series forecasting models, specifically ARIMA (AutoRegressive Integrated Moving Average), were employed to analyse historical data from a Senegalese manufacturing facility. Model selection criteria included Akaike Information Criterion (AIC) for model validation. The ARIMA model accurately predicted yield trends with an R^2 value of 0.85 and confidence intervals indicating the robustness of the forecasting approach. The study demonstrated that process-control systems significantly improve yield, with a notable increase in production efficiency as measured by the time-series models. Implementing the most effective process-control system is recommended to enhance yield stability and reliability in Senegalese manufacturing environments. Process-Control Systems, Time-Series Forecasting, Yield Improvement, ARIMA Model, Manufacturing Efficiency The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, econometrics, autoregression, intervention analysis, stochastic processes, grey systems theory, predictive analytics*