African Wood Science and Technology (Forestry)

Methodological Evaluation of Process-Control Systems in Ghana Using Time-Series Forecasting for Reliability Measurement

Adzitey Asare[1,2], **Sorme Gyamfi**[1,2]

[1] Ashesi University

[2] Council for Scientific and Industrial Research (CSIR-Ghana)

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Correspondence: aasare@hotmail.com

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Author notes

Adzitey Asare is affiliated with Ashesi University and focuses on Engineering research in Africa.

Sorme Gyamfi is affiliated with Council for Scientific and Industrial Research (CSIR-Ghana) and focuses on Engineering research in Africa.

Abstract

Process-control systems are crucial for ensuring reliability in manufacturing processes. In Ghana, these systems play a significant role in optimising wood processing and reducing variability. This research employs ARIMA (AutoRegressive Integrated Moving Average) model for forecasting. Uncertainty is quantified with robust standard errors, providing a comprehensive evaluation of forecast reliability. The ARIMA model showed an average prediction error within ±5% in the tested wood processing systems, indicating high reliability. Time-series forecasting models effectively measure system reliability in Ghana's wood industry processes. The ARIMA method provides robust and precise predictions for future performance. Further research should focus on integrating machine learning techniques to enhance model accuracy and adaptability. Process-control systems, time-series forecasting, reliability measurement, wood processing, ARIMA The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Geographical Information Systems, Geographic Analysis, Time-Series Analysis, Forecasting Models, Reliability Engineering, Quality Control Systems, Spatial Data Interpretation*

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