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Methodological Evaluation of Process-Control Systems in Ghana: A Quasi-Experimental Design for Measuring System Reliability

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Abstract

Process-control systems are critical in ensuring optimal performance and reliability of industrial processes, particularly in resource-rich countries like Ghana where oil and gas operations are prevalent. A mixed-method approach was employed, combining quantitative analysis through statistical models with qualitative insights from interviews with operators and maintenance personnel. Specifically, a logistic regression model will be used to analyse data on process stability and system reliability, with robust standard errors incorporated into the model. The findings indicate that the use of advanced control systems in certain sectors has led to an increase in system reliability by approximately 20%, as measured by the proportion of stable operations over a year. This study highlights the significant role of process-control systems in enhancing industrial performance and underscores the need for continuous improvement in this area. Based on these findings, it is recommended that further investment be made into upgrading existing control systems to maintain high levels of reliability and stability. Process-Control Systems, Reliability Measurement, Quasi-Experimental Design, Ghanaian Oil Industry The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, Ghanaian, robustness, control theory, experimental design, system diagnostics, reliability assessment*

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