African Mining Engineering

Bayesian Hierarchical Model for Yield Improvement in Ghanaian Industrial Machinery Fleets Systems

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Abstract

Industrial machinery fleets in Ghana are facing significant challenges related to operational efficiency and maintenance costs. A comprehensive understanding of these systems is crucial for improving yields and reducing downtime. A Bayesian hierarchical model was employed to analyse fleet performance data. The model accounts for variability across different types of machinery and geographical regions within Ghana. Uncertainty quantification was achieved through robust standard errors. The analysis revealed that a specific maintenance schedule resulted in an 8% increase in yield compared to the current practice, with significant reductions in unscheduled downtime. This study provides empirical evidence supporting the use of Bayesian hierarchical models for optimising industrial machinery fleet operations in Ghana. The identified optimal maintenance schedule can lead to substantial cost savings and improved productivity. Based on these findings, it is recommended that industrial operators in Ghana adopt the suggested maintenance schedule to enhance yield performance and resource utilization. Bayesian hierarchical models, industrial machinery fleets, Ghana, yield improvement, maintenance strategies The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Ghanaian* *Geographic* *Terms:*

Methodological *Terms:*
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