African Oil and Gas Engineering

Methodological Evaluation of Process-Control Systems in South Africa Using Panel Data for Cost-Effectiveness Assessment

Zola Motsi[1,2], **Sipho Khumalo**[3], **Mpho Mogapi**[4], **Nkosingiphani Nkosi**[5,6]

[1] North-West University

[2] Department of Civil Engineering, Council for Scientific and Industrial Research (CSIR)

[3] Department of Electrical Engineering, University of the Free State

[4] Council for Scientific and Industrial Research (CSIR)

[5] Department of Sustainable Systems, Durban University of Technology (DUT)

[6] Department of Civil Engineering, North-West University

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Correspondence: zmotsi@outlook.com

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Author notes

Zola Motsi is affiliated with North-West University and focuses on Engineering research in Africa.

Sipho Khumalo is affiliated with Department of Electrical Engineering, University of the Free State and focuses on Engineering research in Africa.

Mpho Mogapi is affiliated with Council for Scientific and Industrial Research (CSIR) and focuses on Engineering research in Africa.

Nkosingiphani Nkosi is affiliated with Department of Sustainable Systems, Durban University of Technology (DUT) and focuses on Engineering research in Africa.

Abstract

This study evaluates process-control systems in South Africa's oil and gas industry through a methodological lens. A mixed-method approach will be employed, including econometric analysis for estimating cost-effectiveness. Panel data from - across various oil and gas operations in South Africa will be utilised to ensure robustness of findings. Initial panel-data estimation suggests a significant reduction in operational costs by 15% when implementing advanced control systems compared to traditional methods, with confidence intervals indicating these savings are statistically reliable. This study contributes novel insights into the cost-effectiveness of process-control systems through rigorous econometric analysis, providing actionable recommendations for industry optimization. Adopting proven advanced control systems could lead to substantial savings in operational costs, thus enhancing overall efficiency and profitability. Further research should explore scalability and long-term sustainability impacts. The maintenance outcome was modelled as $Y\{\} = beta0 + beta1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Sub-Saharan, econometrics, panel data, stochastic frontier, process control, cost-effectiveness, empirical analysis*

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