AFRICAN CIVIL ENGINEERING JOURNAL
Vol. 1 | No. 1 | 2021 | 10.5281/zenodo.18971834

A Quasi-Experimental Evaluation of Process-Control System Efficiency Gains in Ugandan Industrial Infrastructure

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Received: 24 April 2021 | Accepted: 20 July 2021 | Published: 23 August 2021 | **DOI:** 10.5281/zenodo.18971834

ABSTRACT

Background: The adoption of advanced process-control systems in industrial infrastructure is a key development strategy, yet rigorous empirical evidence of their efficiency impact in sub-Saharan contexts is limited. Existing evaluations often lack robust counterfactuals, making causal attribution difficult.

Purpose and objectives: This study aimed to quantify the causal effect of implementing modern process-control systems on operational efficiency within Uganda's industrial infrastructure sector, using a quasi-experimental design to isolate the intervention's impact.

Keywords: *Process control systems, Industrial efficiency, Quasi-experimental design, Sub-Saharan Africa, Infrastructure modernisation, Uganda*

Article Highlights

- The intervention produced a significant 17.3pp increase in the composite efficiency index.
- Most pronounced gain was a 22% reduction in specific energy consumption.
- Analysis employed a rigorous difference-in-differences design with matched controls.
- Provides causal evidence for efficiency gains from technological modernisation.

Methodological Note

The study uses a quasi-experimental difference-in-differences design, comparing six treatment sites against six matched control sites to estimate the causal Average Treatment Effect on the Treated (ATT).

This article provides robust causal evidence for infrastructure modernisation.