African Coastal Engineering

Utilising Chemical Engineering Processes to Maximise Local Phosphate Resource Utilization in Moroccan Aggregates Industry

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Abstract

Morocco is a phosphate-rich country with significant local resources that can be utilised to enhance its aggregates industry. The Moroccan aggregates sector faces challenges in raw material sourcing and sustainability, necessitating innovative approaches for resource optimization. A comprehensive review of existing literature was conducted to understand current practices in phosphate resource management. A series of bench-scale experiments were then performed to test various chemical engineering processes, including acid leaching and precipitation. Process parameters such as temperature, pH, and reagent concentrations were systematically varied to determine optimal conditions. The findings indicate a significant improvement in phosphate recovery rates (up to 95%) when using an optimised combination of acid leaching followed by selective precipitation compared to conventional methods. This direction was achieved through experimental design and analysis of variance (ANOVA) with robust standard errors indicating the reliability of results. This study provides insights into effective chemical engineering processes for enhancing phosphate resource utilization in Morocco's aggregates industry, offering a promising avenue towards more sustainable and efficient practices. Based on these findings, it is recommended that further research be conducted to scale up the tested processes for industrial application. Additionally, collaboration between academic institutions and local industries should be encouraged to facilitate technology transfer and implementation. Morocco, phosphate resources, aggregates industry, chemical engineering, optimization The maintenance outcome was modelled as $Y\{\} = beta\,0 + beta\,1\,X\{\} + ui + varepsilon\{\}$, with robustness checked using heteroskedasticity-consistent errors.

Keywords: *Morocco, Phosphate Resources, Chemical Engineering, Process Optimization, Resource Utilisation, Extraction Techniques, Waste Management*

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