

Advancing Sustainability in Pumping Systems: A Comprehensive Methodology for Calculating, Monitoring and Minimising Power and Water Consumption

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ABSTRACT

Pumps play a critical role in mining operations, and their energy consumption and environmental impact are significant. This paper addresses the need for a holistic approach to sustainable pump deployment by expanding on previous work presented at IMPC Asia Pacific 2022 and World Mining Congress 2023. The paper delves into the detailed study of sustainability metrics for an operational slurry pump, establishing calculation methodologies to evaluate energy, availability, and water efficiency. These metrics focus on carbon dioxide emissions, yearly power consumption, pump efficiency, uptime, yearly water utilised, parts consumed, and associated total ownership cost. The proposed methodology is then integrated into a real-time monitoring system for pump condition monitoring. Three case studies from iron ore, copper, and nickel operations globally were employed to evaluate the proposed methodology. The findings demonstrate that continuous monitoring enables the implementation of sound prescriptive maintenance strategies, effectively minimising power and water consumption while maximising operational availability. The case studies also highlight significant shortcomings in current operational practices and non-optimal maintenance regimes, emphasising the need for practical recommendations to maximise savings and optimise pump performance. The functional performance of pumps is crucial to each mineral processing plant, and a comprehensive analysis encompassing design, selection, and operation can yield substantial savings and benefits. In the context of increasing climate change awareness and the imperative for global decarbonisation, this research highlights the necessity of critically assessing methods and operations to drive sustainability in the mining industry. By adopting a holistic approach to sustainable pump deployment, mining operations can effectively reduce their environmental impact while enhancing operational efficiency and economic viability. The proposed methodology and case studies provide valuable insights and practical recommendations for mining companies seeking to achieve sustainable practices and contribute to a decarbonised future.