

PMAP: Smart and Sustainable In-Situ Treatment of Mine Wastewater & Critical Metals Recovery Technology

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Abstract:

The mining industry faces significant environmental challenges in managing tailing ponds and wastewater treatment, including the risk of contaminated water, breaches of tailing dams, and energy-intensive treatment processes. Traditional methods involve pumping water to treatment facilities for neutralization, which is costly and poses operational and environmental risks.

In response to these challenges, PMAP leverages magnesium-based slow-release reagents and AI-driven intelligent dispensing systems to optimize treatment processes within the tailing pond.

The Unmanned Smart Dispensing Vessel (USDV) conducts bathymetry to gather data on water quality and quantity, allowing the system to determine the appropriate reagent quantity and injection strategy. This approach transforms the tailing pond into virtual reaction columns, enabling individual and simultaneous water treatment while optimizing efficiency.

PMAP's novel reagent demonstrates exceptional efficacy in removing critical metals like cobalt, nickel, and copper, as well as reducing harmful metals such as mercury and manganese to undetectable concentrations. Unlike traditional lime-based treatments, PMAP's reagent prevents

gypsum formation and reduces waste volume significantly, improving reagent utilization and solid waste handling.

Furthermore, PMAP technology, by reducing water treatment costs and improving resource management, enhances operational efficiency and aligns with broader corporate sustainability goals. Additionally, PMAP expedites permitting processes by eliminating the need for traditional water treatment infrastructure and mitigating risks associated with hazardous reagent transportation.

Additionally, the PMAP could be used as a pre-treatment before the existing lime facility. This integration provides further benefits, including optimization of treatment operations, reduced reagent consumption, and the potential recovery of valuable metals from generated sludges.

Overall, PMAP represents a groundbreaking advancement in mining wastewater management, showcasing the transformative potential of AI and environmentally friendly solutions to foster sustainable and responsible mining practices globally. Its inaugural project in the Yukon Territory aims to demonstrate its capability to pave the way for widespread adoption in the industry.