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BEYOND LIMITS: TITANIUM NITRIDE'S GAME-CHANGING ROLE IN HYDROMETALLURGICAL PRODUCTION

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ABSTRACT

The latest advancements in surface modification technology, tailored specifically for the demanding environments of the High-Pressure Acid Leaching (HPAL) and Pressure Oxidation (POx) industries, along with their trial outcomes, will be presented. The Callidus Group, comprising Callidus Welding Solutions (CWS) and Callidus Process Solutions (CPS), shall introduce innovative, engineering-based approaches that fortify equipment resilience and extend operational lifespans.

Hydrometallurgical processes, such as HPAL and POx, heavily depend on titanium owing to its inherent corrosion resistance and mechanical properties. However, persisting challenges such as erosion, abrasion, and wear call for advanced solutions, as conventional methods such as thermal spray coatings on metal-seated ball valve trim prove inadequate.

Collaborating with Deakin University, Victoria, Australia, CWS embarked upon a comprehensive exploration of the microstructure-property-performance relationship. This collaborative effort culminated in developing an advanced generation of Titanium Nitride, characterized by notable improvements in hardness, toughness, and corrosion resistance. This novel surface modification demonstrates enhanced resistance to sliding abrasive wear and exceptional corrosion resistance, addressing critical shortcomings in existing solutions.

The culmination of this research partnership with CPS resulted in the development of a patented severe service ball valve trim named "FM-1500," highlighting significant advancements in material performance. The presentation will elucidate the scientific journey from conceptualization to realization, spotlighting key findings from initial characterization studies, developmental milestones, and successful field trial outcomes.

Keywords: HPAL, POX, titanium nitride, novel, innovation, hardness, fracture toughness, wear, abrasion, erosion, corrosion resistance, metal-seated ball valve, valve trim.