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Tantalum Corrosion in Steel Pickling

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ABSTRACT

Steel pickling is achieved using 85°C hydrochloric acid (HCL) to remove the iron oxide layer from the steel strip before cold rolling. Temperature is a critical variable in the pickling process. The existing design of the resistance temperature detector (RTD) thermowells used for temperature control are made from thick-walled plastic (HPV-PPS). A 316SS thermowell with a tantalum sheath was trialled as a secondary measurement to provide a more accurate and responsive reading, whilst also allowing for redundancy. This failed after 120 hours due to extensive pitting corrosion of the tantalum sheath. Corrosion of tantalum is very rarely mentioned in literature due to the highly resistant tantalum pentoxide layer.

Several laboratory experiments, extensive metallography analysis, and trials were conducted to investigate different theories for the corroded tantalum. The results showed that the root cause was due to a stray current local to the plant that caused an electrolytic cell with tantalum as the anode. The source of the stray current could not be identified.

A solution was developed to use a galvanically isolated transmitter that prevents stray current from getting through the RTD, whilst still allowing the signal to pass through.

KEY WORDS

Tantalum, corrosion, pickling, stray current

BIOGRAPHY

Ashley King completed a Bachelor's degree in Chemical and Biomolecular Engineering and Commerce at the University of Sydney. She now works as a Graduate Process Engineer for BlueScope Steel and has been working on various projects for the Coupled Pickle Cold Mill (CPCM) at the steelworks in Port Kembla.

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