

A NEW VORTEX EROSION TEST METHODOLOGY FOR EVALUATING EROSION RESISTANCE

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Lachlan Graham, Greg Short, ²Olaf Celliers, ²Gary Brown, ²David Whyte, Dean Harris, Bon Nguyen, Jie Wu

> CSIRO Mineral Resources, Clayton, Australia CSIRO Mineral Resources, Clayton, Australia ²Alcoa of Australia, Kwinana, Australia ²Alcoa of Australia, Kwinana, Australia ²Alcoa of Australia, Kwinana, Australia CSIRO Mineral Resources, Clayton, Australia CSIRO Mineral Resources, Clayton, Australia CSIRO Mineral Resources, Clayton, Australia

Presenter and Corresponding Author

Bon Nguyen

ABSTRACT

Vortices are often generated in industrial slurry flows where flow disturbances exist. These can include bolt heads, weld beads, temperature sensors and other similar flow disturbances. The vortex flow generated typically leads to changed particle impact angles and velocities creating increased localised erosion. Such localised erosion can lead to the premature writing off of slurry handling equipment.

Recent work at CSIRO's Fluids Engineering Laboratory has built on previous fundamental erosion studies to develop a standardised methodology for evaluating the erosion performance of different classes of materials under vortex erosion conditions. The fundamental experiment design is a flat plate sample with a cylindrical obstacle protruding from it to provide the vortex generation at the junction of the sample and the cylinder. The cylinder has a ceramic structure to minimise its erosion thus keeping the geometry of the erosion creating geometry constant. These samples are then mounted in the large scale CSIRO slurry erosion test rig and exposed to a sand-water slurry flowing at 3.6 m/s, typical of industrial slurry applications. The erosion on each sample is measured using a coordinate measurement machine (CMM).

The relative erosion of alloy steels, white iron, ceramic materials and a polymer material under vortex erosion conditions was tested using this methodology. The erosion results were then compared with the ceramics and polymer showing significant resistance to the vortex erosion. These results are discussed in terms of the erosion test methodology and improved slurry flow designs to mitigate erosion such as modified flow geometry to reduce flow separation and vortices.

Keywords: Slurry erosion, vortices, fluid dynamics.