Non-invasive and Real-time Monitoring of Tailings Slurry Density in Transmission Pipeline Using the Electrical Resistance Tomography Method

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# ABSTRACT

Monitoring the density of tailings slurry during pipeline transport is essential for optimising transportation efficiency and preventing blockages. This study proposes using electrical resistance tomography (ERT) to measure the cross-sectional density distribution of slurry tailings in a transmission pipeline as an alternative to the conventionally used nuclear densitometer. A pipeline system was constructed at the Long Pocket Campus, the University of Queensland, featuring a 200 mm-diameter pipeline, the same size as that used in situ. The system can be configured for a dam break test, in which 1 m³ of tailings slurry is discharged through a monitored pipeline at time-varying velocities ranging from 0 to 2 m/s, as well as a pipe loop test, where tailings slurry is circulated inside the loop at a constant velocity of up to 0.7 m/s. Sensitivity analyses were conducted by varying the solids density of the slurry and the electrical conductivity of the process water. In addition to laboratory tests, the ERT system was trialled in situ alongside a gamma-ray-based nuclear densitometer. Comparisons were made between density measurements obtained from ERT and those from the conventional method. This paper presents the results obtained to date.