The evolution of level control and its role in advanced control in the Northparkes flotation circuit

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ABSTRACT

The Northparkes processing plant is comprised of two parallel grinding modules each feeding a primary rougher flotation cell. The primary rougher underflows are then combined and processed through a single flotation bank consisting of 4 x rougher and 2 x scavenger 200 m^3 tank cells. Since the commissioning of this circuit in 2018, achieving circuit stability had been challenging due to issues with the instrumentation and control valves.

The primary areas of concern were the actuators on the rougher cells and the pinch valves controlling the scavenger cells. For the rougher cells, it was found that torsion exerted on the internal darts by the slurry caused the feedback mechanisms to the positioners to loosen or even fail. Hence, the valves actuated at an uncontrolled rate. In late 2021, fit-for-purpose actuators were installed on these cells to improve the level control significantly, though the scavenger cells remained problematic.

A project was then initiated to replace the scavenger pinch valves with external eDart valves. Computational fluid dynamics (CFD) analysis was conducted to determine the optimal piping layout and valve sizing for accurate level control. As a result, the level deviation from set point was reduced from around +/- 50 mm to around +/- 10 mm.

Success here has enabled implementation of the advanced real-time process optimiser ESTIMATA in the flotation circuit. ESTIMATA performs a real-time mass-balance around the circuit and calculates optimised set points based on adaptive fundamental models. These optimised set points are sent directly to the PID control loops. The results of extensive on/off trials have shown a 1.21 % recovery benefit when utilising ESTIMATA. This paper details the outcomes of these projects, including analysis of the process control improvements and plant survey data to quantify the metallurgical benefits achieved.