MODELLING HIGH-PRESSURE DEWATERING ROLLS FOR MINERAL TAILINGS

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ABSTRACT

Mineral tailings are solid-liquid suspensions that contain finely ground waste rock particles and processed water. To ensure safe storage and disposal of tailings and minimise water usage, it is crucial to increase the solid concentration of the suspension and recover water through various dewatering techniques. A novel filtration technology, coined High Pressure Dewatering Rolls (HPDR) designed and developed at the University of Melbourne[1], is currently being investigated through experiments and modelling to utilise as a secondary dewatering stage following the thickening process.

To understand the flow dynamics and cake formation inside the HPDR, a modified two-fluid framework[2] that accounts for multi-particle effects is used in this study. The model includes material-dependent functions describing suspension compressibility, permeability, and a solid volume fraction-dependent viscosity model partitioned between the solid and liquid phases. On application of a vacuum pressure to the permeable rolls, preliminary results show filter cake formation on the rolls and an increase of cake thickness along the roller surface. The cake is forced through the gap between the rollers, exposing it to a high compressional load. Further, simulations show that the part of the formed cake near the top surface of the roll is swept away as the feed suspension falls on top of the cake (see Fig 1). Shifting the feed location to the bottom of the HPDR shows no disturbance to the cake formation, suggesting the possibility of utilising the simulation results in optimising the HPDR design and throughput.

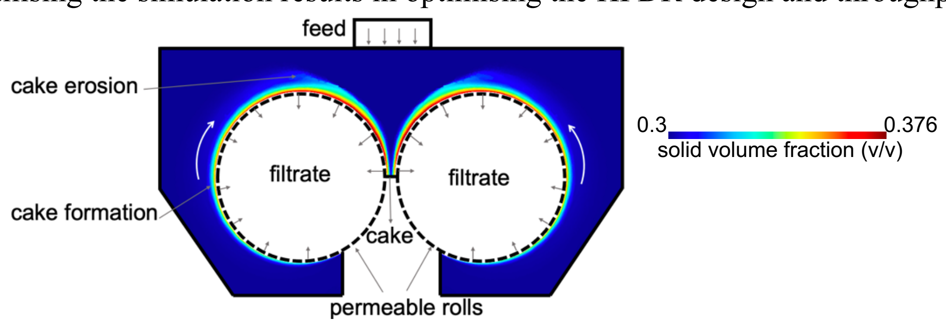

Figure 1: Filter cake formation inside the HPDR in a 2D transient simulation.

REFERENCES

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