Aalto University
School of Chemical Technology

Protocol development for evaluation of water-saving alternatives in minerals processing "Bridging North to South"

CENTRE FOR MINERALS RESEARCH

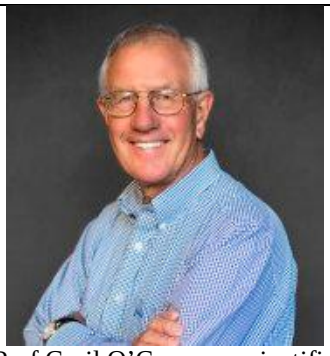
Conservation and management of freshwater resources is one of the major challenges humanity is facing in this century. Due to the limited availability of freshwater resources in many areas, government regulations, civil actions and corporate sustainability policies and goals, there is great pressure put on the mining industry to save freshwater resources. Water usage is in fact one of the most important aspects of the "social license to operate" debate.

Froth flotation is the most widely used mineral beneficiation process carried out in water with the help of air bubbles. The hydrophobic particles attach to the air bubbles and rise to the top of the flotation cell from where they are removed, while the hydrophilic material remains in the cell. The quality of the process water has a greatest impact on the surface properties of minerals and air bubbles and thus the efficiency of the process. Mineral processing plants are being forced to fully recycle their process water. This means that the water recirculation time shortens to a few hours at longest. Such water is in dynamic state with many thermodynamically favored but kinetically varying reactions ongoing. In such a scenario the role of makeup water becomes less- and the unstable properties of recycled water will become more important due to the negative effects on the flotation performance. These effects mainly arise due to the very complex interactions taking place in the liquid phase and at the air-liquid, solid-liquid and air-solid-liquid interfaces.

This research is a collaboration between Aalto University and University of Cape Town. It aims to map the key components and outline the research protocols for assessment of extremely complex recycling water systems that help evaluation and implementation of alternatives for water saving in mineral processing operations with special focus on flotation. The protocol will define how to identify, monitor and evaluate the critical water quality related parameters and specify the 'still acceptable' inorganic water constituent levels that do not inhibit the optimal plant operation. At present such a protocol does not exist.

The research includes comprehensive mapping of the key protocol constituents, experimental work, modelling water systems and the actual outlining of the research protocols. This approach will bring benefits in the design phase of new plants and for evaluating different alternatives of closing water circuits in already existing plants.

Researchers working in the group and their titles/tasks

Aalto University		
 Prof Pekka Taskinen-PI Aalto team	 Dr Nóra Schreithofer - senior researcher	 Ishmael Muzinda - doctoral student
University of Cape Town		
 Prof David Deglon -PI UCT team	 Jeremy Mann - Adjunct Professor	 Dr. Kirsten Corin - senior researcher
 Jenny Wiese - researcher	 Prof Cyril O'Connor - scientific advisor	Doctoral student

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