NRC·CNRC

Process and Separation Technologies

"We use advance characterization methods to find breakthrough separation technologies"

Industry Challenge: Low grade ore and deleterious constituents in ore bodies.

NRC Solution: Improved characterization techniques for early elimination of deleterious materials coupled with targeted separation technologies for process performance.

Clay Materials

In addition to declining ore grades, the presence of deleterious constituents in the ore body can significantly affect process performance. This adverse impact can be observed in both oil sands and mining processes. Elevated content of clay minerals can significantly affect bulk ore handling requirements, increase viscosity of slurries, affect flotation performance, impede leaching kinetics, and significantly worsen settling and filtration characteristics of slurries. The NRC has initiated a research program focusing on better characterization of clay materials and several mitigation strategies beyond current activities practiced in the industry today.

Bitumen Production from Mined Oil Sands

Mined oil sands operation is unique to Canada. This industry has been faced with numerous challenges from depressed oil market pricing to public pressure in addressing environmental concerns. Historically, the froth treatment process has been carried out using naphthenic (highly aromatic) solvent to recover and then upgrade the bitumen into synthetic crude oil. The industry trend is to transition processing to paraffinic solvent to avoid energy intensive upgrading and provide bitumen directly to refinery markets. The challenge therefore is to develop solvent-specific froth treatment to deal with low grade and high clay ores to produce solids and water-free bitumen that will meet changing specifications of refinery markets.

The primary solution to sustainable oil sands production is to reduce costs in the extraction of bitumen via froth treatment processes. With remaining oil sands ore reserves having lower grade (bitumen content) and higher clay content, development of an improved overall extraction process is the priority to reducing plant costs and environmental impacts. The key to unlocking an improved process relies on mineralogy expertise. The NRC is focused on developing detail analytical methods in combination with chemistry, morphology and chemical characteristics of the ore in order to provide defining solutions for process change. This research will concurrently target developing extraction alternatives that avoid or eliminate energy intensive upgrading while producing manageable tailings rejected from extraction processing.

Impact of Water Quality in Flotation Circuits

The NRC has initiated a research program to better understand the impact of water quality on flotation performance. While it seems obvious, water is the least studied aspect of the system yet it is a major component in a water pulp. Water quality and the ions contained in water can alter the surface characteristics of minerals, and in turn the separation of fine and ultra-fine minerals could be influenced by water quality. Our program focuses on optimization strategies for the reduction of water consumption and increased water performance.

In-Situ Leaching (ISL)

In situ mining has been identified as an effective technique for recovery of valuable minerals contained in mineral bearing stratum. However, one of the major perceived problems by the public has been the environmental impact of this technique including ground water contamination and remediation. The NRC's mining program has started exploring the best possible mining methods using environmentally friendly lixiviants to make *in-situ* leaching applicable to gold, copper and nickel extraction.

Cyanide-Free Lixiviants for Leaching Gold Ores

The recovery of gold through cyanidation is a well-established conventional practice in the gold mining industry. However, direct cyanidation may yield poor gold recovery or result in excessive lixiviant consumption in certain cases such as refractory, preg-robbing, or polymetallic ores. The HEM program is currently screening alternative lixiviant systems that are technically and economically competitive to cyanidation in order to find an effective balance that allows for minimal environmental impact.

CONTACT

Thom McCracken
Process and Separation Technologies
Technical Lead - Program
Tel.: 613-993-9569
ThomMcCracken@nrc-cnrc.gc.ca

Ben Yu
Mining and Mineral Processing
Team Lead
Tel.: 613-990-0347
Ben.Yu@nrc-cnrc.gc.ca

www.nrc-cnrc.gc.ca

NR16-239/2018E-PDF
ISBN 978-0-660-27339-6 PDF
ISBN 978-0-660-27340-2 PAPER

August 2018
Également disponible en français