Floating a test bubble:

Investigating new potash flotation reagents

Saskatchewan has nearly 40% of the world's known potash reserve and produces approximately one-third of the world's total potash production. Potash ore is valuable because it is primarily made up of potassium chloride (KCl or sylvite), one of the main components of plant fertilizer. There are several processes required to separate potassium chloride from the raw ores mined from deep underground. After the ore is mined and brought to the surface, it enters the flotation process in the mill. Flotation is a process where most of the potassium chloride is separated from the raw ore. In the flotation process, the ore is mixed with process brine and a chemical called a flotation reagent. Air is injected into the mixture to create bubbles. The flotation reagent causes the potassium chloride (KCl) to stick to the bubbles and the resulting KCl-laden foam can then be skimmed off the top of the mixture. The potassium chloride is then moved to its next step in its evolution to final product.

The potash industry in Saskatchewan has used the same flotation reagent for a very long time, so researchers at the University of Regina, in collaboration with Nutrien, Mosaic and KSPC, proposed a project called **Investigation of Polymeric Reagents for Potassium Chloride Collection during Potash Flotation**. There have been numerous advances in polymer science and polymers have been shown to be highly effective reagents in a wide range of industrial applications including "separating" processes. This project proposed to investigate if polymer-based reagents could improve the efficiency of the potash flotation process, improve potassium chloride concentrate grade and recovery, reduce the amount of reagent required, thereby creating higher product yield and lowering operating costs. A more efficient flotation reagent could have a significant impact on the potash industry.

At the University of Regina, the researchers tested ten different polymeric reagents along with the traditionally used reagent as a baseline. The potash ore solution (potash flotation pulp) was first analyzed to determine the amount and size distribution of the potassium chloride particles prior to bench-scale testing in a Denver flotation cell. Samples of each polymeric reagents were prepared and tested. The concentrate (foam skimmed in the test) and the tailings (material not skimmed) were collected, dried and then tested by the Nutrien labs.

The testing revealed that all of the polymeric reagents were able to capture significant quantities of potassium chloride but were particularly good at capturing small particles. In fact, the majority of the KCl particles captured by the polymeric reagents were less than 1 mm in size. Although it was found that the traditional flotation reagent was more efficient and could capture a wider range of particle sizes than the polymeric reagents, the polymeric reagents could improve the overall efficiency of potash flotation by being used at the end of the process, capturing the smallest potassium chloride particles and improving overall process efficiency.

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Project Duration: **Jan – Dec 2018**

Project Cost:	**$35k**
IMII (cash):	$25k
Industry (in-kind):	$10k

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