IC Potash Corp. (ICP)
Hobbs, New Mexico USA - ICP is focused on becoming a global industry leader in the production and distribution of high-quality, low-cost specialty fertilizers.

Its Ochoa project in Southeastern New Mexico will mine polyhalite and process the ore to produce high-quality sulfate of potash (SOP) using a proprietary process†.

The region has the largest known concentration of potash reserves in the United States and accounts for more than 77% of the product produced in the country.

† U.S. Patents 8,551,429 & 8,802,048; other U.S. and foreign patents pending

The Client’s Needs
ICP’s Ochoa Mine Project is projected to produce approximately 714,000 tons per year of SOP (K₂SO₄) from polyhalite ore for greater than fifty years as concluded in a feasibility study.

Another part of the feasibility study was the demonstration of a unique process, based on research that dated back nearly a century, to produce SOP economically while maintaining a high-quality, specialty fertilizer product.

The crystallization of the brine developed after ore processing is critical to both the cost of production and the desired product quality. A process would need to be developed and validated to confirm the commercial design.

The Solution
ICP selected Veolia Water Technologies to refine the process due to their experience in the industry and overall development capabilities for crystallization process design using HPD® Technology. A series of tests were conducted to simulate various stages of the proposed flowsheet with the goal of validating the overall design.

This testing was performed at Veolia’s HPD® Evaporation and Crystallization Research and Development Center in order to replicate the full process. This facility is fully equipped for full analytical, bench-scale and pilot-scale testing.
Testing Objectives
The objectives of the test program were as follows:

• Verify operating parameters of the calcined polyhalite leach process and confirm the composition of feed to the Veolia process equipment.

• Perform pilot testing on leonite dissolution and pre-concentration to study the precipitation of calcium sulfate (CaSO₄) solids at pilot scale and to prepare SOP crystallizer feed.

• Pilot testing of SOP crystallization to produce samples.

• Optimize leonite crystallization to maximize recovery of leonite and ultimately, the final product.

Testing Description
• Calcined ore is fed to ICP’s countercurrent leaching process. This produces a brine rich in potassium and magnesium sulfates with some impurities that includes sodium chloride and calcium sulfate.

• The leach brine is then fed to a dissolution tank in which leonite solids, produced later in the process, are dissolved. Producing this potassium and magnesium-based mineral and recycling the solids maximizes overall production of SOP. This recovers as much K₂SO₄ as possible from the process purge stream.

• A seeded, mechanical vapor re-compression HPD® (MVR) Crystallizer then provides bulk water removal from the leonite enriched brine. The controlled seeding prevents scaling of heat transfer surfaces while aiding in precipitation of CaSO₄-based solids from solution.

• Following a filtration step to remove precipitated solids, the second crystallizer (SOP crystallizer) produces a slurry of pure SOP. The slurry is sent to a centrifuge from which the solids are fed to a dryer that yields a granular, crystalline product.

• The purge from the SOP crystallizer, containing potassium, is sent to the multiple-effect leonite crystallization system. It is composed of three stages of crystallization to efficiently recover leonite from the purge stream. The leonite slurry is sent to a centrifuge and the solids are then fed back into the production loop to be combined with the leach brine at the beginning of the process.

The Results
The series of testing proved to be a success. The SOP crystals produced in the pilot tests grew to a size and habit of those in the prior bench-scale testing. Inspection of heat transfer surfaces also revealed no fouling in the process equipment.

Samples generated included:
• Dried sulfate of potash
• Leonite

The collaboration between ICP and Veolia allowed refinement and confirmation of the polyhalite processing. Based on the results, the testing provides the confidence that a commercial system would perform as designed meeting product quality and process efficiency standards.