New Technology to Streamline Water Treatment

Commercial tests are underway at Imperial Oil’s Cold Lake operations on a new method of removing impurities from process water that will streamline water treatment.

The tests will determine if Vibratory Shear Enhanced Process (VSEP) membrane technology will be effective in removing macromolecules and dissolved minerals, such as calcium and magnesium, from process water. Dissolved minerals make water hard and form deposits that build up in a steam generator, hampering its ability to produce steam. Improved treatment would lower energy use and provide an efficient technology alternative to clean and soften process water. This water can then be recycled and reused to generate steam at Imperial Oil’s future in situ oil sands operation.

In situ oil sands recovery involves injecting high-pressure steam into a deep bitumen reservoir. The heat reduces the bitumen viscosity, enabling the bitumen to flow back to the wellbore where it is transported to the surface.

Natural gas, water (both in situ and condensed steam), and minerals dissolved from the underground reservoir are produced along with the bitumen. A number of processes are used to separate the natural gas, water and bitumen. The water has to be treated to remove very small particles and dissolved minerals that would cause scaling problems in the steam generators.

VSEP is a water treatment technology that vibrates a polyamide membrane to create shear along the membrane surface, which lifts the mineral solids and remixes them with the process water. This reduces clogging or “fouling” of the membrane, which in turn, increases its ability to remove impurities from the process water.

Tests will determine if VSEP can replace the higher energy, existing hot lime softening process in future applications. The hot lime softening process relies on a chemical reaction at an elevated temperature in a large vessel to turn dissolved minerals into solids that eventually settle out of the process water.

Imperial conducted laboratory tests on the VSEP membrane technology before moving to pilot scale testing at its Cold Lake operation. The significant learnings gained from the pilot tests were used to design and improve the commercial demonstration unit, which has been installed and further testing is underway.