COSIA in the News

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For the greater good

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Think of environmental excellence and oil sands is not the first part of the mining sector that would usually spring to mind. However, this might be about to change, reports Carly Leonida

In northern Canada, a pioneering group of oil-sands producers have decided to take a fresh approach to some longstanding challenges.

Canada’s Oil Sands Innovation Alliance (COSIA) is focused on accelerating and enhancing the environmental performance of its member’s operations through collaborative action and innovation; and the results so far look extremely promising.

The organisation was envisaged as a vehicle through which oil-sands companies could do things differently and move quickly on their environmental performance. On March 1, 2012, representatives from 13 of the industry’s biggest oilsands producers came together in Calgary to sign a charter that would change the way their companies and, ultimately, the sector as a whole conducts itself.

As a group, COSIA’s members have a fair bit of clout; together they represent 90% of oil-sands production in Canada. Shifting from competitors to collaborators, the members, which include BP, Shell, Syncrude, Suncor and Imperial Oil to name a few, now work together on shared environmental challenges.
Their aim is that by leveraging each others’ technology, knowledge and expertise they will find solutions to some of the industry’s biggest environmental challenges, eliminate duplication and lower the cost of technology development and testing – and they’ll do it faster together than going it alone.

To do this, COSIA has created aspirational statements describing the end states that it wants to achieve. These include:

- Produce oil with lower greenhouse-gas (GHG) emissions than other sources of oil;
- Be world leaders in land management, restoring the land and preserving biodiversity of plants and animals;
- Transform tailings from waste into a resource that speeds land and water reclamation; and
- Be world leaders in water management, producing Canadian energy with no adverse impact on water.

To date, COSIA members have shared 814 technologies and innovations that cost almost C$1.3 billion (US$1 billion) to develop. “The level of sharing has increased significantly since 2013 when members began tracking this information – in some cases, the level of sharing has increased by as much as 500%,” explains Dan Wicklum, COSIA’s chief executive.

And COSIA is not only about members collaborating with other members; it’s about members collaborating with the brightest minds around the world and bringing together leading thinkers from industry, government, academia and the wider public.

“Through our associate membership programme, members are working with organisations such as GE and IBM, as well as local, regional and international innovators, to develop solutions,” Wicklum tells MM.

Using challenge statements, COSIA’s oil-sands companies articulate their innovation needs in a way that innovators working anywhere in the world can understand and propose targeted solutions to solve challenges in four environmental priority areas (EPAs) – tailings, water, land and GHG.

As an example of one of COSIA’s biggest open innovation efforts, through COSIA, members have forged a partnership with the XPRIZE Foundation and US power company NRG Energy to launch the NRG COSIA Carbon XPRIZE. The purpose of the Carbon XPRIZE, a US$20 million competition, is to turn CO₂ from a waste product into a valuable product that could create economic benefit.

COSIA’s list of projects both current and past is vast; the group is leaving no stone unturned. So by way of introduction, MM delved further into just two of the group’s priority areas: water and tailings.

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Focus Area: Water

Research into pit lakes is a key part of COSIA’s work

COSIA’s Water EPA is looking for innovative and sustainable solutions to reduce water use and increase water recycling rates at oil-sands mining and in-situ operations, with an end goal of producing energy with no adverse impact on water quality or quantity.

The results so far are extremely impressive. In 2014, COSIA members with mining operations reported a reduction in their net water use intensity from the Athabasca River and its tributaries by 30% compared with 2012 figures, meeting a hefty goal that was originally set for 2022. This means that members used 1.5 barrels of Athabasca River water to produce one barrel of bitumen in 2014 compared with 2.2 barrels of water in 2012.

Members with in-situ operations also reduced their fresh water use intensity by 36% that year compared with a 2012 baseline. These companies used 0.23 barrels of fresh water to produce one barrel of bitumen in 2014 compared with 0.36 barrels of fresh water in 2012, and are now on target to achieve the goal of a 50% intensity reduction by 2022.

“While members expect there may be significant variation in performance from year to year, early results against these two goals are encouraging,” explains John Brogdy, COSIA’s Water EPA director.

“By sharing best practices, making basic changes in the design and deployment of In-situ boilers to produce more steam with less water, and closing knowledge and technology gaps to enable the safe return of mine water to the Athabasca River watershed, COSIA members are achieving impressive results.”

Key to further accelerating this performance is the mining sector’s focus on pit-lakes technologies to ensure that pit lakes evolve into self-supporting natural lakes.

Before an operator is given approval to build a mining operation, it must first have government approval for the site reclamation plan. In the plan, the operator must fully reclaim the land to its equivalent use. All closure landscapes for virtually every mine on earth are designed to include pit lakes and oil sands mines are no exception. Given their importance, the Alberta government requires that the oil sands industry undertake additional research on pit lakes.
A water technology development centre

COSIA has projects under way focused on building a greater body of scientific knowledge on pit lakes as part of oil-sands reclamation.

The first commercial-scale demonstration of the technology is Syncrude’s Base Mine Lake project, which was commissioned at the end of 2012 and is currently being monitored and studied. Findings are being shared with COSIA companies with mining leases and will inform the future work of the Demonstration Pit Lakes project.

The Demonstration Pit Lakes project is a joint industry project within the Water EPA that includes all six of COSIA’s mining operators: Canadian Natural Resources, Imperial Oil, Shell Canada, Suncor, Syncrude and Teck.

It envisions a world-class research facility on a mine site in northern Alberta, studying over a dozen lakes and ponds of various sizes and depths with different contents, vegetation treatments and drainage approaches.

Feasibility studies are currently under way to assess how best to address the diversity of characteristics that require research across the breadth of proposed pit lakes, including various lake/pond configurations, combinations of materials used, and the hydrologic uniqueness of each planned pit lake.

While the Demonstration Pit Lakes project is still early in its inception, the Syncrude Base Mine Lake is currently active. The data gathered from studying the lake will create the basis for future studies undertaken through the Demonstration Pit Lake project.

COSIA intends the projects to be complementary and is confident they will address knowledge gaps in the research currently under way.
Focus Area: Tailings

Tailings centrifugation technology is being introduced by oil-sands producers

Since 2009, the oil-sands industry has invested billions of dollars in the deployment of commercial-scale technology to manage tailings. Through COSIA, the industry continues to develop and evaluate potential new technologies and improvements.

Some of the challenges in moving from technology development to implementation are the large scale of operations, and ensuring that the technologies selected lead to desired closure and reclamation outcomes. Industry collaboration through COSIA has so far facilitated the sharing of 132 technologies specifically for tailings management at a cost of C$665 million.

An impressive achievement of the Tailings EPA was the opening of Syncrude’s commercially ready C$1.9 billion full-scale centrifuge plant aimed at speeding the release of process water from fine fluid tailings, accelerating tailings reclamation and minimising tailings pond size.

A tailings centrifuge unit at Shell’s commercial-scale demonstration plant at Jackpine Mine
By sharing its centrifuge technology through COSIA, Syncrude helped Shell deliver similar technology in a more timely and cost-effective manner. At its Jackpine mine, Shell commissioned a commercial-scale demo plant (with two centrifuges) in 10 months. The project was so successful that Shell was able to rapidly commission two more centrifuges at Jackpine. A total of four centrifuges will be used to assess the technology's applicability for commercial installation at Shell's Muskeg River mine.

The centrifuge technology process consists of three steps. Fine fluid tailings (FFT) are dredged from a tailings pond. A polymer (the same kind that is used at a municipal wastewater treatment plant) is added to the FFT slurry, which is then fed into a centrifuge that spins the water out and produces a clay material that has the consistency of a mud cake.

The process water is returned to the tailings pond while the clay material is pumped or transported via truck and placed in an area that will allow for further consolidation. Once the clay is sufficiently dense, it is capped with sand and reclaimed soil, and then planted with trees, shrubs, and other native vegetation.

Due to the large scale of oil-sands mining projects and the complexity of tailings and fines management, the development and implementation of new technologies is expected to occur at a measured pace over the long term.

Through COSIA, companies have identified a suite of technologies for tailings management that it believes external innovators could help refine and advance. These are aimed at reducing GHG emissions, accelerating water release and minimizing land footprint. Examples of current projects include:

- Tailings centrifugation;
- Laminar flow research;
- Dynamic flocculation; and
- In-place electro-kinetic treatment of tailings.

Accelerated dewatering uses the sun to dry tailings naturally

Accelerated dewatering is another technique that the oil sands industry learned from phosphate mines in Florida and involves using the sun to dry and naturally dewater tailings. This dries the material 10-100 times faster than if it were left to dry on its own. Accelerated dewatering is an option that is more cost-effective than other mechanical dewatering technologies, and allows for low to zero energy use, and therefore negligible GHG emissions.
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Canadian Natural has been adding CO₂ to tailings since 2009, enhancing the solids settling rate, reducing the size of the surface area of its Horizon tailing pond by 50%, and fast-tracking time to reclamation while sequestering CO₂ in the process.

Canadian Natural recently implemented non-segregating tailings production in 2015 using cyclones and thickeners where CO₂ is also added to the process. The thickeners release warm water for recycling in their operations, further improving energy efficiency and resulting in additional environmental benefits of 16% expected savings in GHG emissions and accelerated reclamation.

The continuous improvement of tailings management is an integral component of successful oil-sands mining operations and is just one key area of future research for COSIA members.

The challenges these companies face may be massive, but by standing together and opening their arms and minds to other Industry experts, they might just have found the right formula to overcome them.