

Found barrels

Producers saving capex and building production through major investments in debottlenecking

MRO: inside the oilsands industry's annuity

A significant labour shortfall looms for turnaround trades

Leaders in maintenance and reliability

EDITORIAL

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Editor's Note



Maintenance isn't always about fixing stuff that is broken or even maintaining stuff to run as is. Often it can provide the opportunity to vastly improve operations and, in the oilsands, significantly increase the number of barrels a facility produces. In the near term, project owners are expecting to add hundreds of thousands of barrels per day to their bottom lines through this debottlenecking process, which is viewed by many to be at least as much art as it is science.

Suncor Energy Inc. is one company investing a great deal in near-term debottlenecking at its oilsands projects. The oilsands giant announced this year it expects to find 100,000 barrels per day of new production through facility retooling rather than new capital investment. Don Clague, senior vice-president, in situ, describes the process: "When you get this new plant, everything has its nameplate capacity, and what you find is that certain pieces of equipment can actually run past their nameplate capacity. Not all of them can run at the same level, so what we find is that we've always got a bottleneck in the system."

"We've always got some pieces of equipment that aren't running at full capacity, and we've got other ones that are running at full capacity. We look at debottlenecking as an opportunity to utilize existing underutilized capacity and try and drive more out of the asset."

As the oilsands industry matures, so, too, do its massive maintenance, repair and operations requirements—and the ongoing opportunity to debottleneck.

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Oilsands producers save capex and build production through major investments in debottlenecking

By Gordon Cope

Costs in the oilsands are under constant upward pressure. Operators, in turn, seek out more efficient construction methods and operating processes, continually incorporating new technologies and processes designed to do more with less. But of the myriad of machinations companies can perform, one process continually tops the list: debottlenecking.


Industry participants use various definitions to describe debottlenecking, but all agree that it is a highly valuable

post-commissioning process in which engineers seek out ways to improve performance. “Debottlenecking is not a major overhaul, more of a fine-tuning,” explains Bob Dunbar, president of oilsands consultancy Strategy West Inc.

Debottlenecking is rarely focused on rectifying design errors. “When a new project doesn’t meet its planned capacity, it isn’t usually a case of poor planning,” says Dunbar. “Sometimes mistakes are made—you put in an eight-inch steam pipe when

you should have used a 12-inch pipe—but it is most often a matter of how much upfront capital investment you are willing to make.”

As an example, Dunbar points to one of the most costly facets of steam assisted gravity drainage (SAGD): steam generation. “When designing steam-generating capacity for SAGD, you have to make decisions regarding redundancy,” he says. “Let’s say you expect a boiler to be online 95 per cent of the time and down five per cent of the time for maintenance and repairs. Do you



Suncor Energy Inc. is one of several oilsands producers with significant debottlenecking work underway. The company has said it expects to increase production from its oilsands operations, including the Firebag SAGD project seen here, by 100,000 barrels per day in the coming years through debottlenecking alone.

barrels

put in an extra five per cent, or 10 per cent or 20 per cent redundancy? You can invest conservatively in the front end and reserve capital expenditures for later.”

Debottlenecking projects also often arise when on-site analysis pinpoints choke-points. Alex Campbell, principal at engineering consultancy Vista Projects Limited, explains, “The operator of a facility typically identifies the need for debottlenecking. They usually have a good idea of where problem spots exist or spare capacity is available, based on operational experience.”

DEBOTTLENECKING ON THE GROUND

Most oilsands operators have debottlenecking projects underway or planned. At its ►

DEBOTTLENECKING STAGES

Once a facility is up and running, operational information and measurements are gathered and analyzed to determine what is meeting expectations and what is being strained. Data in hand, the decision is then made to make adjustments. According to Alex Campbell, principal at Vista Projects, the main stages of a debottlenecking project include:

- Setting a new design basis (flows, compositions, pressures, temperatures, product specifications);
- Preparing a new heat and material balance for the facility;
- Reviewing all the equipment against the new heat and material balance and determining shortfalls;
- Reviewing the interconnecting systems such as piping, in-line instrumentation (flow meters, control valves, pressure relief valves, etc.) and electrical systems;
- Determining the equipment and system upgrades that need to be made;
- Completing a cost estimate and schedule for detailed engineering for the facility modifications (process, mechanical, civil/structural, electrical, instrumentation, controls); and
- Executing the construction and commissioning.



Sometimes it is not just equipment that needs to be adjusted for improved operations, but people and processes as well.

HUMAN DEBOTTLENECKING

Since start-up in 2007, Devon Canada Corporation had concerns with fluctuating daily production rates at its Jackfish steam assisted gravity drainage (SAGD) project.

“As we went through our first ramping up at Jackfish, we noticed a steady improvement in stabilization, but it still went up and down,” says operations manager Kelly Hansen. “We had to address the issue; a one per cent improvement in stability at a 35,000-barrel-per-day SAGD project adds \$4 million [in net revenue] per year.”

Devon brought in Evolve Partners LLC, a Houston-based oil and gas consultancy, to help. “Operators are discovering that substantial improvements in safety, production and costs can be achieved by maximizing the performance of the people who operate and maintain the plant—something we refer to as ‘human debottlenecking,’” explains Rupert Hucker, Evolve’s chief executive officer. “The great advantage of this approach is that it requires no [capital expenditure] and often achieves benefits much more quickly than engineering projects.”

In 2011, Devon and Evolve formed a team to examine Jackfish operations from top to bottom, and quickly found some low-hanging fruit: “A SAGD plant is a 24-hour operation with two 12-hour shifts, seven days on, seven days off, so you have a total of four full shifts,” says Hansen. “There are a lot of handovers, so we focused on establishing log books and other tools so that each shift was aware of what the previous shift did and could hand-off as seamlessly as possible.”

The team worked with staff to standardize procedures and increase core competencies so that they better understood what was expected, and how to deliver. “It’s like flying on a commercial airline,” says Hansen. “The pilot doesn’t just hop in the cockpit and take off. There is a checklist prior to take off, and there is a set of procedures to handle mid-flight events and landing. The pilot knows what to do from beginning to end.”

Within a few months, Devon started to see substantial improvements. “There was a different cadence to data flow and reporting,” says Hansen. “There was more attention to detail. Now, we are at 96.6 per cent plant reliability; that’s in the top quartile performance among our SAGD peer group.”

Kearl mine, Imperial Oil Limited anticipates that debottlenecking of both the initial development and the expansion phase now under construction will increase daily output from about 300,000 barrels per day to the licensed capacity of 345,000 barrels per day. At Aspen, Imperial’s new proposed in situ project, the company plans to build three initial phases of 45,000 barrels per day, for a total of 135,000 barrels per day, but anticipates that debottlenecking will increase final production by 20 per cent, to 162,000 barrels per day. Although Imperial does not have specific details regarding procedures, the company notes that previous debottlenecking at its Cold Lake project primarily involved the optimization of water use and interconnectivity.

In 2011, Royal Dutch Shell plc and its partners in the integrated Athabasca Oil Sands Project, which consists of the Muskeg River and Jackpine mines and the Scotford Upgrader near Edmonton, launched a 10-year, multi-billion dollar debottlenecking project that will focus on improving operating efficiencies and reliability, with the aim of eventually increasing production by as much as 85,000 barrels of oil equivalent per day. Current nameplate capacity is 255,000 barrels per day. The company calculates the net present value break-even of around \$45 for each additional barrel of output, compared to approximately US\$75 for a greenfield barrel.

Earlier this year, Suncor Energy Inc. announced that it plans to invest heavily in debottlenecking at its oilsands projects in the next three to four years. In 2012, Suncor produced an average of approximately 324,000 barrels per day from its Millennium, North Steepbank and Voyageur South mines, and MacKay River and Firebag SAGD projects. Recently, it cancelled plans for the \$11.6-billion Voyageur upgrader after it failed to meet the company’s internal standards for return on investment, but it has no hesitation in investing several billion dollars in debottlenecking current production in order to add an extra 100,000 barrels per day. “These [debottlenecking] projects are extremely attractive because they come at a fraction of the cost of greenfield development,” Suncor president and chief executive officer Steve Williams told shareholders at Suncor’s annual meeting in Calgary.

Syncrude Canada Ltd. also recently announced its plans to retool for improved output, lifting production from its current nameplate capacity of 350,000 barrels per day to 425,000 barrels through a new

debottlenecking program in addition to adding new capacity of 115,000 barrels per day to achieve total production of 540,000 barrels per day by 2020.

ConocoPhillips Canada is currently building the largest single-phase SAGD project ever built at Surmont 2 and, like its peers, is already planning for multi-million dollar debottlenecking projects at the 110,000-barrel-per-day installation.

At Cenovus Energy Inc.'s Foster Creek SAGD project, five operating phases currently have a nameplate capacity of 120,000 barrels per day, but recently the company has been concerned that it wasn't experiencing optimum production on its latest 30,000-barrel-per-day phase, which started up in 2009.

After extensive analysis, Cenovus determined that the water treatment function of its SAGD facility was a major limiting factor. After making adjustments, primarily to its operations, Cenovus was able to deliver clean, recycled boiler water far more reliably. Over the course of three months, the company added 11,000 barrels per day to production, and generated additional net annual revenue of \$139 million.

LIMITS TO WHAT DEBOTTLENECKING CAN ACHIEVE

Unfortunately, to some extent, there are limits to what debottlenecking can do. "SAGD is based on module engineering, so there is great opportunity for debottlenecking during the first phase as you gain knowledge," says Dunbar. "That knowledge

estimating the cost accurately is difficult since unexpected delays or discoveries during the execution of the debottleneck engineering or construction can add unanticipated cost."

But industry participants agree that it will always remain an important part of the oilsands. "Debottlenecking is part of the

"You cannot build a perfect plant out of the box. You are better off getting it online and then identifying potential opportunities and then implement the changes."

— Randy Pasay, instrumentation, controls and electrical manager, Christina Lake SAGD project, Cenovus Energy Inc.

is then built into following phases, so the opportunity gradually diminishes."

"Scheduling debottlenecking construction is always challenging, since any downtime on an operating facility imposes a cost to the oil and gas company in terms of lost production," says Campbell. "Also,

design process," says Randy Pasay, instrumentation, controls and electrical manager at Cenovus's Christina Lake SAGD project. "You cannot build a perfect plant out of the box. You are better off getting it online and then identifying potential opportunities and then implement the changes." ■

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