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Enter the Data-Driven Oil Field

The University of Alberta is partnering with some of the top oil sands companies to figure out what to do with all that data

BY ALBERTA OIL STAFF

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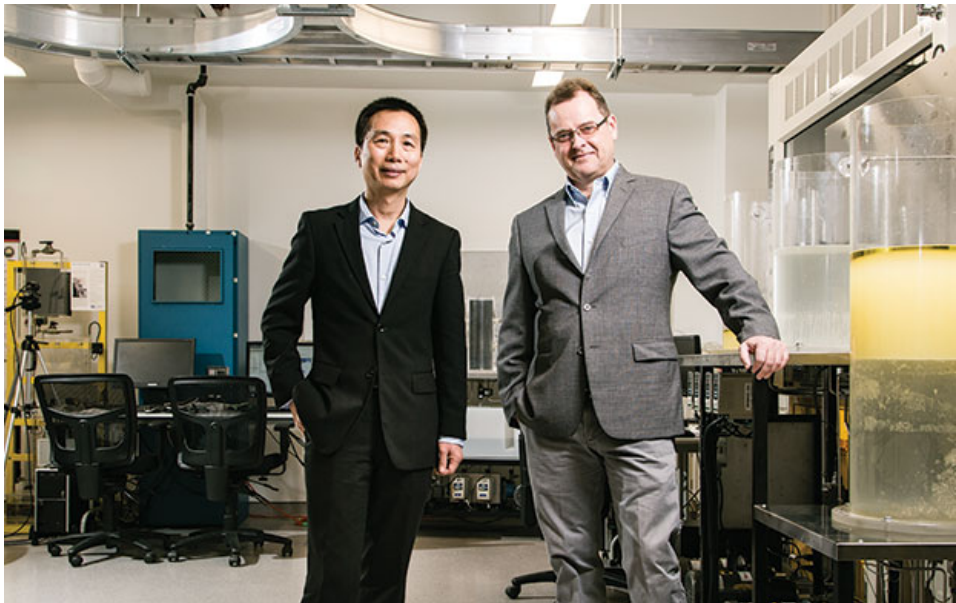
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Biao Huang, left, and Warren Mitchell of Spartan Controls at the University of Alberta
Photograph Ryan Girard

Data has long been a buzzword in the oil field, and for good reason. Oil and gas producers have found that they can collect data on just about anything, from monitoring wellhead pressure and flow rates to modeling future production zones. But with the drive to collect and store data on almost every nuance of the upstream business, confusion still abounds about what exactly to do with it all. Just as the person who doesn't read has no advantage over the one who can't read, to paraphrase Mark Twain, the energy producer who collects data but doesn't put it to use is no better off than the one who doesn't collect it in the first place.

Whether in the upstream, midstream or downstream sectors, the best use of data is drive efficiency and remove costly human errors from processes. To do that, you need more than just data-collecting sensors. You also need the analytical software—or so-called “soft sensors”—to discover trends and anomalies,

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– Biao Huang

and then visualize the data before any improvements can be made.

It's in that software space that Biao Huang, a University of Alberta professor and senior oil sands process control chair at the Natural Sciences and Engineering Research Council of Canada, is working. The goal is a more efficient oil sands operation from topsoil removal to tailings. "You need to have soft sensors and algorithms to optimize the operation of the process through control systems," Huang says. "Then the controller can make the whole operation more efficient. To have such a large-scale application of these sensors in something like the oil sands is not very common yet."

Because of the harsh environment of the oil sands—the intense heat, the cold and, of course, the oily sand—physical sensors tend to break down easily. "For things like temperature, pressure and water levels, those are easier to develop in the oil sands," Huang says. "But other things are much more difficult like a sensor to determine how much bitumen is in the froth—that's not easy to measure with any hardware." The answer to that problem, according to Huang and his project partners at Spartan Controls, Emerson, Syncrude and Cenovus, can be found in the soft sensor and the power of mathematical inference. "You infer something that is difficult to measure with a hardware sensor using math and physics and chemistry, and then you use that data to build your computer models."

Like Syncrude and Cenovus, Spartan and Emerson both earn revenue through the oil sands. They supply many of the process control products and services such as valves and engineering expertise to the mining and upgrader facilities. And with the lasting downturn in oil prices, process efficiency has become crucial to ensure oil sands production stays competitive with cheaper light oil plays. "In refineries they've been using the soft sensors for a long time because the refining process is easier to make inferences on," Huang says. "Refining has better hardware sensors too because the environment is much better than in the oil sands."

One of the biggest hurdles to deploying data analytics in the oil field has less to do with the analytics and more to do with data visualization. Once visualized properly and melded with other visualized data sources, the right course of action can become very clear. But that can often require significant manual intervention with the data and that's something that many oilfield operators haven't budgeted for. Monitoring data from thousands of pieces of equipment and formatting the results onto a single readable computer single screen can be a full-time job. That's one major issue that Huang and his associates are now trying to tackle through the development of simple user interfaces. When they do, advances in cloud-based connectivity will lower the cost barriers for the industry overall and should lessen the burden on oilfield operators enough to use these data services without having to hire a team of computer scientists.

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