

MEASURE

for measure

VOLUME MANAGEMENT TOOL TAILORED TO INTENSIVE NEEDS OF SAGD, ALSO WORKS WITH CONVENTIONAL PRODUCTION BY PAT ROCHE

AN ENGINEER BELIEVES A WELL IS PRODUCING 500 BARRELS OF CRUDE oil a day, but a production accountant says it's extracting 10% less than that. And a manager thinks it's actually 20% higher. Who's right? There's no telling because each figure came from a different source and each system handles the data in slightly different ways.

"And that's an everlasting problem in this industry," says Riku Vilkki, senior manager at Quorum Business Solutions, Inc., a privately-held Houston-based oilpatch software firm with offices in Calgary and Dallas. Working with onshore and offshore producers in several countries, Vilkki and some colleagues studied how various companies did their volumetrics, or measurement and analysis of crude oil production.

Quorum wanted to come up with a volume management system that could gather and manage data from disparate sources in a central repository, and that would validate the data — without the need to replace customers' existing systems. The result is Quorum Volume Management, or QVM, which manages and validates all production-related data — including oil, gas, water and other petroleum products.

OILSANDS APPLICATION. In March, a new Calgary-based company with ambitious plans — Deer Creek Energy Limited — agreed to license QVM. Deer Creek is a pure oilsands producer, meaning its entire output will come from bitumen leases in northeastern Alberta. In the short and medium term, production will come from steam-assisted gravity drainage (SAGD), which uses horizontal well pairs to inject steam and produce bitumen. Deer Creek's SAGD project will grow in stages to 40,000 bbls a day by 2010. In the longer term, the company plans to produce 200,000 bbls a day of bitumen from its leases, including an initial mining project to begin production of 50,000 bbls a day in 2010.

Exiting the first quarter Deer Creek was producing about 250 bbls

a day of bitumen from one well in the SAGD project's first, or "pre-commercial," phase, which is expected to reach 600 bbls a day this year. Construction of the \$97.5-million next phase (10,000 bbls a day) is in full swing and on schedule for year-end completion. The company is already seeking regulatory approval for another 15,000 bbls a day to be onstream in 2007.

Deer Creek is a strong supporter of new technology. In addition to QVM, the company is currently field-testing technology to burn bitumen instead of pricey natural gas as fuel for SAGD projects. Deer Creek is looking at innovative ways to cut its water use, it's testing new water treatment technology, and it's among the companies investigating the use of solvents to reduce or eliminate the need for steam. To cut drilling costs, Deer Creek had a contractor design and build a rig for slant-hole and pad drilling on SAGD projects. Construction of a special completion rig is also planned.

For Deer Creek, volumetric measurement and analysis is critical. Over the life of a thermal oil recovery project, a producer can spend several times as much money on operating costs as on capital costs. By far, the biggest single cost is steam generation. In a SAGD operation, steam is injected into a horizontal well to melt viscous bitumen, which then flows via gravity down to a producer well.

Even if a cheaper fuel replaces natural gas to heat boilers, the efficient use of steam will likely remain the single most important factor in SAGD economics. While a conventional oil producer is concerned mainly with oil, gas and water production, a thermal oil project also has to closely monitor steam generation and its effect on bitumen production. And it has to keep track of diluent — light hydrocarbons mixed with bitumen so it can be pumped through pipelines.

So selecting the right volume management software is crucial. The SAGD producer evaluated existing volume management pack-



Photo courtesy of Deer Creek Energy Limited

VALIDATING VOLUMETRICS

Deer Creek's SAGD project, now under construction, will eventually expand to include surface mining. Among the new technologies built in to the project will be Quorum's new volume management system.

ages, but found they were designed for conventional oil and gas batteries, says David Sealock, information technology consultant at Deer Creek. These systems weren't designed to deal with processes such as steam generation, which is at the heart of a SAGD operation.

"All of the other solutions we considered were either too expensive or too limited in their functionality to really benefit our business," says Sealock. The Quorum solution initially sounded "too good to be true," he recalls, but the technology turned out to be "everything we planned it would be and more" as a flexible, secure, cost effective and easily implemented solution for thermal operations.

Rather than trying to bend a conventional volume management package to fit SAGD, Deer Creek worked with Quorum to configure QVM for thermal oil recovery projects. By monitoring steam and water volumes, the oil company can tell if steam is being lost.

The problem with conventional volume management systems is they're designed mainly for reporting production and don't cover plant operations such as steam generation and water treatment, says Paul Krawchuk, Deer Creek's senior production engineer for thermal operations. "I see QVM as more of a tool — it will fulfil all of our volume reporting requirements and at the same time allows us to navigate and view data that will help us to troubleshoot and optimize our plant."

Compared to a conventional oil battery, a SAGD project is more like a refinery in its complexity. Hence SAGD requires far more monitoring. In a conventional field, one person might manage hundreds of wells. But in a SAGD operation there's so much data that there are very

few wells per person. Operators are keenly interested in the day-to-day, or even hour-to-hour, performance of their \$2-million well pairs.

If expensively-generated steam is leaking off into the formation without contacting bitumen, money is being wasted. On the other hand, too much steam can cause fissures through the pay zone through which steam escapes. Steam will follow the path of least resistance, which in a SAGD operation should be the producer wells. If induced fractures provide an easy escape route for the steam then bitumen from the damaged zone can never be recovered.

SOFTWARE FUNCTION. Krawchuk says a major strength of QVM is its ease of use. While people can be trained to use any software, he says, if it's clumsy and non-intuitive, operators just won't use it to its full potential. He says past attempts were made to adapt programs created for conventional oil and gas batteries to SAGD facilities, but the software was awkward to use and the end result was very few users actually looked at the data.

For ease of use, QVM uses a third-party graphing tool so the user can immediately spot trends without having to eyeball months of data row by row. On every screen there's an information button to provide master-file data for each well. "Whatever master-file data you have defined in the system, it's always one click away," says Quorum's Vilki. If you're interested in steam generation, just click a button labelled "steam generation."

QVM also allows the user to easily export data, with the click of a

button, from anywhere in the application to an Excel spreadsheet. No matter what analytical features are built into a program such as QVM, engineers will typically still want to do some additional calculations of their own, says Vilkki.

So QVM can pull data in from disparate sources — such as SCADA and lab analysis — and provide engineers with tools to manage that data. But how do you know the numbers are correct? Validation is QVM's other major function — ensuring the reliability of data flowing from the field to head office.

“The field guys deal with sub-daily or daily data. They close today, they go home and then come the next day — they don't think about [yesterday's] numbers any more,” says Vilkki. Weeks later, head-office accountants notice a particular number doesn't look right. “They call out to the field and say, ‘Two and a half weeks ago, you had this strange number here, what does it mean?’” Vilkki continues. “And [the fieldworker says], ‘I can't remember. I wasn't working. You need to call Joe because Joe was working that night.’”

To avoid such situations, part of Quorum's implementation process is to define the validations required to trigger an alarm in the system. And, if a customer wants, Quorum can also automate the process. So if the operator on a particular day is too busy to approve the numbers, the system can fill in the missing data and correct any incorrect values. But this means setting rules for how often the operators allow the system to do their work.

“You don't want to get in a situation where the guys sit there and the system does what it does and you lose control,” says Vilkki. “So basically, they have a functionality where if the guy by the end of his shift doesn't go and approve the numbers, the system will approve the numbers automatically, but it will [indicate] this shift didn't approve the numbers. And then the management can go back and say, ‘Hey guys, this is the third time this week you didn't approve your numbers. We can't go on with that.’”

Deer Creek's Krawchuk says the alarms also indicate when meters are producing bad data. “Otherwise you have to depend on someone just catching it,” he says, which may be long after a malfunction occurs. “We don't want to be going to the board and telling them that six months worth of data is wrong.”

In June, after two months of using QVM to analyse post-production data, Deer Creek started using the software to aggregate and analyse live data. For the next few months QVM will run in parallel with Deer Creek's existing systems, giving the company time to catch any bugs before steam injection begins on the first commercial phase of its SAGD project. “And I think that by Nov. 1 we'll have a fully functional application that's going to meet our needs,” says Sealock. “I have no doubt of that.”

Longer term, he believes QVM can be adapted to Deer Creek's planned oilsands mining operation. Meanwhile, SAGD — which is only a few years old as a commercial technology — will undoubtedly evolve over time and Deer Creek officials say QVM is flexible enough to adapt as the industry changes.

FLEXIBILITY. Indeed, QVM is currently used by some conventional oil and gas producers — though their screens look very different from the version for thermal operations, says Roland Labuhn, Quorum vice-president and head of Canadian operations.

For example, the software's network editor visually displays production networks so an operator can instantly see which wells flow into a facility, or which lines flow to a tank or sales meter. This isn't a big deal for SAGD operations with their relatively small numbers

of wells, but is a handy tool for conventional producers who may have thousands of wells. Labuhn stresses that Quorum will work with whatever systems companies have in place, but can also replace all or any of a customer's existing systems if necessary.

Quorum officials say QVM's flexibility is due to what they describe as the open architecture of Microsoft Corporation's .NET platform. Microsoft's .NET is one of two competing platforms for so-called Web services — highly automated computer-to-computer transactions conducted over the Internet. Competing with Microsoft are a handful of alternatives (such as IBM's WebSphere) based on the Java programming language.

Both .NET and its Java-based competitors are software development platforms for applications that perform tasks such as fetching and translating data from disparate databases. Proponents of each technology claim that it enables them to quickly develop applications without having to start from scratch. Although .NET is based on an open standard called XML, it is tied to computers using Microsoft's Windows operating system.

Quorum's Vilkki, who describes himself as a former “Java freak,” says the bottom line is .NET has much more productive tools. He cites an experiment by a firm in his native Finland where two groups of software developers were given a task. One group used Java, the other .NET. Both groups completed the job, he says, but the .NET group took half the time and produced half as much code as the Java group. Lean software is important, he says, because every line of code increases maintenance costs.

A key reason .NET is more productive, Vilkki says, is it offers a wealth of building blocks that software developers can use to quickly create applications. “For us the power of .NET is [it has] a whole bunch of existing software components there that you can go and purchase.... You can plunk them into your system and it just all works.”

For a client like Deer Creek, Vilkki says this means if employees think of new features, or discover components they'd like to add to QVM, “they can come in with the component and say, ‘Hey, guys, could you plug this into your software?’ ... and it will not be a huge task for us to do it.”

Another reason for building QVM on .NET is Quorum was already essentially “a Microsoft shop,” says Labuhn. “For us as a company, developing in the same platform has given us huge economy of scale,” he says. “We see lots of software companies that struggle because they end up with spaghetti code. They have this written in Fortran and this written in something else and some emulation on top. The more consistent you can have your code ... the more efficient we're going to be.”

Although personally a Java fan, Deer Creek's Sealock says he's comfortable going with .NET, pointing out it is one of the two industry standards. All the oil company wants is the ability to integrate data and applications and to ensure data accuracy, and Sealock is confident QVM can do this.

Adds Krawchuk: “We're developing a product that's going to be easy to use for all levels of our company — from the field side ... right up through management. Everyone's going to be able to see the data that they need to see and get at it easily. At the end of the day that's the goal of this sort of software.” ■■■■

CONTACTS FOR MORE INFORMATION

David Sealock, Deer Creek, Tel: (403) 538-4592,
E-mail: david.sealock@deercreekenergy.com

Roland Labuhn, Quorum, Tel: (403) 205-5008, E-mail: roland_labuhn@qbsol.com