

Technology Strategies for Progressive Manufacturers

Tapping Knowledge RESERVES

Oil and gas companies turn to knowledge management tools to capture intellectual assets as workers close in on retirement.

BY STEVEN TITCH

In oil and gas production, capability is defined by the “envelope” — the physical, technical, environmental, and safety constraints within which every refinery must operate.

And considering the average refinery is processing and storing thousands of gallons of flammable petroleum or thousands of cubic feet of natural gas, this is one envelope that runs counter to the cliché; it can't be pushed.

Knowing the limits is critical. To date, the process at most refineries has been handled successfully by the plant manager — likely a grizzled, unflappable industry veteran who, after 30 years on the job, “just knows.”

The problem is that these individuals, who have served as the primary repositories of information regarding the production envelope, are retiring, and their knowledge is going with them. “Shell is facing an age bubble,” says George Pohle, a consultant with Shell Global Solutions Inc. (Houston, TX), an operating company within the Shell Group (Amsterdam, The Netherlands). “We will have a whole bunch of experienced operators walking out the door in the next five to 10 years.”

The expected mass exodus comes at a complicated time. Worldwide demand for petroleum and natural gas is soaring. As a result, oil and gas companies have to increase output while being careful not to exceed plants' limits, which could damage equipment, stall production, or, in the worst case, result in a fatal accident.

“The idea is to know your limits and run within them,” Pohle says.

To ensure that they know those limits, companies like Shell need to capture and transfer intellectual assets be-

fore the experienced operators retire and new technicians come on board. Unsure of whether the exchange will happen naturally, they are turning to their process control partners for help.

Honeywell Process Solutions (Phoenix, AZ), Invensys (Foxboro, MA), and Emerson Process Management (Austin, TX) are offering knowledge management capabilities through comprehensive distributed process control systems that can collect operational data and make it widely accessible to plant floor operators. Taking it one step further, some of these solutions can monitor operations not only at refineries and terminals, but at remote locations such as offshore oil rigs or land-based pipelines that increasingly need to operate without permanent on-site staff (see sidebar).

To ensure that they know the limits of their operations, oil and gas companies need to capture and transfer intellectual assets before the experienced operators retire.

Pohle, for example, works with Shell's worldwide refinery operations deploying large-scale knowledge management systems — an effort internally dubbed the “Ensure Safe Production” policy. The system is based on Honeywell's Operations Management Pro, a suite of work-process tools that collect and assemble data from various plant operations and convert it into accessible information, providing an immediate picture of refinery operations at any time. Managers typically view the information through a Web-based dashboard on a PC. If required, they can also use wireless handheld devices.

“We’re taking our best operations knowledge and making that information ubiquitous,” Pohle says. Shell has completed its first phase of deployment at seven refineries in North America. For competitive reasons, he won’t disclose actual measures in baseline improvement. But, he says, “We’ve seen enough improvement to begin deployment of the operations management system to some 30 manufacturing sites worldwide.”

POCKETS OF INFORMATION

Much of the information about general plant operations is spread among different staffers and managers. The amount of information involved is voluminous. There are physical constraints — parameters such as operating temperatures, pipeline pressure, and general lifecycles of plant machinery; and process constraints — such as how much fuel can be produced safely and efficiently. But that isn’t all; there are also safety constraints such as avoiding the risk of creating a hazardous condition, and environmental constraints; e.g., government regulations concerning the emissions and waste a plant can release in a specific period.

“Intersection points” for this information, as Bart Winters, senior product manager at Honeywell Process Solutions, calls them, were few, and usually known only to high-level plant managers who over the years had gained an intimate familiarity with various stages of production and a clear understanding of the edges of the so-called “envelope.”

“Our tools institutionalize the work process,” Winters says of Honeywell’s products, codifying operating parameters and creating automatic intersection points accessible to employees at all levels.

“These systems,” explains Tim Olsen, process consultant at Emerson Process Management, “unite the physical asset with the people who are operating it.”

For example, distillation of different types of fuel requires crude oil to be heated at different temperatures. A refinery unit may be specified to operate at certain temperatures for a certain amount of time. In the past, a shift manager approving a plan to produce 100,000 gallons of unleaded premium may not have known how close to their operating limits the units he was counting on were. Without the information available through knowledge management systems, use of the overtaxed units would have led to an alarm and perhaps temporary downtime.

AVOIDING DOWNTIME

Companies want to create realistic and achievable production plans, says Peter Zornio, director of product marketing at Honeywell Process Solutions. Operating knowledgeably, within limits and constraints, can pay off in terms of productivity in the long run. Staying within the limits means avoiding a failure and the consequent downtime. “The biggest profit thief is downtime,” he says.

With better knowledge management, information on the status of specific units can be integrated efficiently and far more quickly. Production plans can be set up so they do not risk exceeding constraints. Further, alarms are predictive, not reactive. Should there be a problem, the system alerts operators in advance, and

in most cases, automatically takes corrective action. “We see issues with devices before we see issues with processes,” Zornio says.

Emerson terms the process “Model Predictive Control.” “If a disturbance occurs it can adjust multiple variables at the same time,” Olsen says. In addition, he notes that the corrective control actions are the same across each shift, providing a consistency in operating philosophy.

Even with automated corrective control and process optimization, though, operators still often must take action. That’s why education and training are important components. The same way airlines use flight simulators, Emerson trains plant engineers and operators by running them through work station-based simulations of various refinery operations scenarios.

Shell agrees that knowledge management goes hand in hand with automation. Just as the IT systems go from reactive to preventative, so do the operators and engineers.

“We want the system to be more than a dashboard light in your car that detects a problem but offers little more than ‘service engine,’” Pohle says. “Our systems give you the page in the owner’s manual that tells you how to fix the problem.”

At Shell and other oil and gas companies, knowledge management systems may have had their biggest test yet when Hurricane Katrina struck the Gulf Coast in August, knocking some 25 percent of the U.S. refinery capacity off-line for more than a week. Once the refineries were operational again, there was a heightened imperative to get gasoline and diesel fuel back into production. To facilitate this, some government-mandated production and environmental constraints were suspended. At the refinery level, the faster those limits could be processed, the faster and more productive operations could be.

Shell’s Pohle says all the data on refinery performance in the wake of the storm isn’t in yet, but he says he has been told that the Honeywell operations management system was valuable in terms of dealing with rapid start and stop as well as the adjustments in output levels and constraints.

And how do all those grizzled industry veterans view the introduction of knowledge management technology? Pohle says most are excited to find that there’s a committed effort to document what they know and turn it into information that can be processed and cross-referenced to manage — not push — the envelope. The more intersection points for plant information, they might say, the better.

“Besides, they like to share information,” Pohle says. “They love to show off what they know.” ■

Steven Titch is a freelance writer living in Houston.

workflow

The knowledge management process offers capabilities that keep operations running smoothly:

- Collects operational data and makes it widely accessible to plant floor operators
- Monitors operations at remote locations that need to operate without on-site staff
- Codifies safety, environmental, and regulatory constraints
- Enables knowledge capture from retiring workers