Microsoft Customer Solution
Manufacturing Industry Case Study

Chevron Drives Process Standardization and Efficiency with Mobile Decision Support

Overview

Country or Region: United States
Industry: Manufacturing—Oil and gas

Customer Profile

Chevron is one of the world's largest energy companies, with 59,000 employees and a global refining capacity of more than 2 million barrels of oil per day. Chevron is based in San Ramon, California.

Business Situation

Chevron wanted to improve refinery performance and reliability, reduce maintenance costs, and simplify regulatory compliance. It was also eager to document the knowledge of workers approaching retirement.

Solution

Chevron is using Windows Mobile® devices running Microsoft® software and the Wonderware IntelaTrac field automation software to standardize refinery process steps and deliver decision support to field workers.

Benefits

- Improved refinery reliability
- Reduced costs
- Better knowledge retention
- Improved regulatory compliance

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Mike Brooks, Global Refining IT Adviser, Chevron

The refining industry is driven by tight margins, and oil companies are constantly looking for ways to boost efficiency and reduce costs. Chevron has found significant savings in standardizing refinery process steps using mobile workflow software and rugged PDAs to deliver decision support to field workers. Chevron implemented the solution using Wonderware's Mobile Workforce Management and Decision Support System, IntelaTrac, powered by Windows Mobile® software. With IntelaTrac, Chevron has increased refinery operating reliability, reduced maintenance costs, and improved safety and environmental compliance. Chevron estimates that these process improvements will save the company U.S.$3 million to $5 million annually. Chevron has also found that IntelaTrac helps capture process knowledge before workers retire and speed new-worker assimilation through mobile learning.

Software Solutions for Real-Time Success℠

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Situation

Chevron is one of the world's largest integrated energy companies. Headquartered in San Ramon, California, Chevron conducts business in more than 100 countries and is engaged in every aspect of the oil and natural gas business, including exploration and production, refining, marketing and transportation, chemicals manufacturing and sales, geothermal, and power generation. Chevron has more than 59,000 employees, 8 refineries (plus joint ventures in 13 others), 26,500 service stations on six continents, and, at the end of 2007, it had a global refining capacity of more than 2 million barrels of oil per day.

Although the oil business appears lucrative from the perspective of the gas pump, it was in the doldrums not that long ago. The price of crude oil is outside the industry's control; there's a finite amount of crude in the ground; and there's rising competition for crude, especially from developing nations. As premium-grade oil is disappearing, the industry is moving into lower-grade crude oils, which are more difficult to recover and more expensive to refine. "All of these market dynamics impact us," says Mike Brooks, Global Refining IT Adviser for Chevron. "Over the last 15 years, the industry has done a lot of belt-tightening and work force reduction, which has required that we bring in new technologies to help us increase productivity."

Because oil refineries need to operate with extremely high equipment availability to remain profitable, Chevron began to look for still more efficiency improvements. Although Chevron has invested millions of dollars in sophisticated supervisory and process historian systems for monitoring thousands of data points across its refineries, over half of the assets in a typical refinery are not electronically monitored and need to have field operators performing both visual and auditory checks of pumps, valves, pipes, casings, and other mechanical equipment. Field operators have traditionally used pencils and clipboards to record the needed information, and then later entered the data into a spreadsheet or database for trending and analysis. But these after-the-fact entries were sometimes too late to effect changes that could reduce equipment failures or mitigate negative environmental and safety incidents.

Further, if a field worker noticed a problem with a piece of equipment, it was not easy to resolve it in a standardized way. Although Chevron had created prescribed actions for operators to follow, there was still a great deal of variability in how operators responded. "Depending on their experience, operators could make a range of decisions in the same situation," Brooks says. "They were also sometimes cut off from other personnel in the refinery who might be able to help them make time-critical decisions. We wanted to electronically link our field workers with the rest of the organization so we could make their decisions and actions more consistent and efficient."

For example, an operator might hear an abnormal sound coming from a compressor, while an instrument reading might indicate that something was wrong. Should the operator shut off the compressor and interrupt production, costing the refinery thousands of dollars? Or should the operator let the compressor continue to run and risk equipment failure, incurring a different cost? "Even when we have the time to discuss the situation with the experts, one particular solution could be at odds with other goals," Brooks says. "The right answer is best determined by providing all the facts to the right decision makers so that we can develop a best practice for a given business situation."

In addition to wanting to deliver expert advice to field workers to improve equipment reliability, Chevron wanted to preserve its

workers' years of experience. The company is facing the disappearance of up to 50 percent of its work force in the next 10 years as the "baby boomer" generation retires. "To run our refineries better, we need to capture and institutionalize the experiential or tacit process knowledge that is rarely written down and often not even done consistently," Brooks says.

Solution

Chevron decided that it needed to automate "the last mile" of its operations, giving field operators a way to enter data digitally so that the data could join the rest of the company's data stores. However, it quickly became apparent that there was a huge opportunity to do more than just collect data. Chevron could use PDAs to deliver information to field workers and provide new ways to standardize and manage refinery work. The company could capture decisions and data in a methodical way, make changes rapidly and efficiently, and improve its work processes continuously.

Process Standardization

First, Chevron needed to create standard work processes based on known best practices. Next, it needed to identify the technology needed to support those processes. The third step was to evolve and fine-tune best practices on an ongoing basis as knowledge was added to the database over time. By decoupling the work processes from the underlying technology, Chevron hoped to facilitate agility as both work processes and technology changed.

"There's no way that standard work processes and procedural best practices would be followed, let alone optimized, if they were sitting on a shelf somewhere; we had to make them electronic and put them in front of people," Brooks says. "Our aim is to give more recognition to field workers by ensuring that supervisors and management were aware of their impact on the business in terms of improvements of key performance indicators."

Integrated Mobile Solution

Chevron was ready to bring in technology to support improved field operations. The company surveyed the field of mobile solutions geared to the process industry and settled on IntelaTrac from Wonderware. IntelaTrac is an enterprise software solution that brings intelligent workflow, automated asset tracking, and data collection to field operators and integrates factory floor data with corporate business systems. The solution consists of a Windows Mobile® device (ruggedized, hazardous-certified Motorola/Symbol PDAs) built on the Microsoft® .NET Compact Framework version 2.0 and Microsoft SQL Server® 2005 Mobile Edition. In the data center is a collection of application, wireless security, and Web servers running the Windows Server® 2003 operating system and the IntelaTrac software.

"IntelaTrac was the most mature solution we reviewed," says Eric Rearwin, Program Manager for IntelaTrac and Mobile Computing Systems, Chevron Global Manufacturing. "It had very sophisticated functionality and integrated easily with our business systems. Chevron is a Microsoft shop, so the Microsoft foundation helped, too." Chevron tested IntelaTrac at one refinery and then deployed the solution to its eight wholly owned refineries over an 18-month period. Chevron has also used the solution at several other facilities and business units.

Approximately 225 operator positions use IntelaTrac, but because each position is filled round-the-clock in two shifts, more than 550 people use the mobile solution every day. Many more people view and use IntelaTrac

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reports, bringing total usage of the application to several thousand employees.

Improved Decisions and Predictive Maintenance

When workers start their daily rounds, they grab the IntelaTrac unit instead of a clipboard. As they check equipment, they enter data, which is transmitted into process historian systems when the PDA is docked in a cradle, allowing IntelaTrac data to be combined with real-time process data from the control systems and viewed by operators and engineers. If a piece of equipment is operating out of bounds, workers can collaborate with operations people to take the optimal corrective action then and there. For example, control-room operators can prompt field workers for on-the-spot diagnostics, and field workers can speak with the maintenance staff or others to get focused direction.

"Previously, there was no rules-based engine, and operators were on their own making decisions based on their best judgment," Brooks says. "Now we have several knowledgeable people working the problem and contributing to the decision. The IntelaTrac system also provides exception reporting, automatic report generation, and scheduled e-mailing of reports to the appropriate stakeholders."

The equipment and manual process data collected at a refinery joins similar data from other Chevron refineries and is analyzed by operational experts to improve the company's best-practice responses in the future. Because Chevron now has the power to monitor massive amounts of data, it can do predictive analytics. "With every decision we make, the organization is getting smarter because we're able to analyze which decisions had a positive, profitable result and which didn't," Brooks says. "We now have a mechanism for continuously improving our decisions and our work processes."

One Workflow

Although some IntelaTrac calculations occur on servers and some on the PDAs, the IntelaTrac architecture allows Chevron to use one workflow across all devices. "The key competitive advantages that Microsoft has in the process industry are its robust workflow engine, its mobile operating system, and the investment it's made in integrating Windows Mobile with Windows Server 2003," says Don Frieden, Vice President of Mobile Solutions at Wonderware. "Workers have a great experience, and the business gets immediate benefit from field data." Chevron runs Windows Mobile 5.0 in its European and Australian facilities and will upgrade its North American refineries from Windows Mobile 2003 to Windows Mobile 5.0 next year.

Benefits

Chevron's use of the IntelaTrac mobile field tool has yielded significant payback from improved refinery reliability, reduced maintenance costs, better knowledge retention, and improved environmental compliance. The company estimates cost reductions of U.S.$3 million to $5 million annually across eight refineries.

Improved Refinery Reliability

Using IntelaTrac, Chevron has begun a journey to institutionalize procedural best practices and work processes across all of its refineries, which enables field workers and operators to boost refinery reliability and regulatory compliance. This in turn has a huge impact on the company's bottom line. "With IntelaTrac, we've been able to deliver best practice–focused advice to field operators at every process step," Rearwin says.

Because Chevron has integrated real-time field data with core business data, workers can draw on expert advice when resolving problems in the field. Similarly, the addition of real-time field data to real-time data

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Eric Rearwin, Program Manager for IntelaTrac and Mobile Computing Systems, Chevron Global Manufacturing

historian systems gives the company a more complete picture of refinery operations. "Our ability to capture data and also work processes has been invaluable," Brooks says. "We now have refinery work processes in digital form, so we can continue to analyze and improve them on an ongoing basis."

Reduced Costs

Chevron estimates that the use of the IntelaTrac solution will save $3 million to $5 million annually. "Using IntelaTrac to accelerate and sustain process improvements, Chevron has reduced maintenance costs, improved availability, and achieved cost-effective regulatory compliance," says Brooks. Because field operators have the information they need to make smart, timely decisions, Chevron experiences fewer equipment failures. And a lower failure rate translates into higher equipment availability and refinery throughput. Chevron has also reduced field worker training time by funneling on-demand knowledge and direction through IntelaTrac.

Better Knowledge Retention

Chevron has found that IntelaTrac has proven to be a great help in documenting and retaining institutional knowledge built up over decades. This reduces Chevron's dependence on experienced individuals who are approaching retirement and increasingly in short supply. IntelaTrac also empowers employees to take on new skills and new challenges.

"When we replace our retiring workers, new-worker training costs will be far less," Brooks says. "Workers can achieve a level of competence much faster than they used to. You can't apprentice a new employee to someone for 10 years anymore. We have to meet our staffing demands by complementing recruiting and retention efforts with new learning approaches such as mobile learning."

Improved Regulatory Compliance

An increasingly important benefit of IntelaTrac has been an improved ability to meet stringent governmental safety and environmental regulations. "You can have programs in place to measure when incidents happen, but many companies have difficulty demonstrating that those incidents will not happen again," Brooks says. "We are looking for more leading indicators of incidents, and we find those by measuring things. With IntelaTrac, we can better measure and track equipment status so we have great records and early warning systems. We got auditable regulatory compliance as a bonus, as we can validate that field worker observations, readings, and actions are time-stamped and verifiable."

For More Information

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For more information about Wonderware Mobile Solutions products and services, call (713) 344-2600 or visit the Web site at: mobilesolutions.wonderware.com

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Microsoft Solutions for the Manufacturing Industry

Manufacturing enterprises must compete in an increasingly global environment. Success depends on finding ever-greater efficiencies throughout the enterprise, while developing a greater agility to react to local and global market opportunities. These challenges are best answered with technology from Microsoft and its partners. Microsoft-based solutions offer much-needed value to manufacturers who are under increasing pressure to generate greater returns on the assets that they have employed. This focus on efficiency scales across all the critical functional areas—from getting products to market faster, to streamlining the supply chain, optimizing the manufacturing operations, and generating new revenue streams.

For more information about Microsoft solutions for the manufacturing industry, go to: www.microsoft.com/resources/manufacturing

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  - Microsoft .NET Compact Framework 2.0

Hardware

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