BP: Validating the safety benefits of real-time personnel location monitoring

Overview

- ***Business Challenge***
  Instead of simply complying with more stringent regulations on emergency, BP sought a quantum improvement in the way it accounted for and protected its employees.
- ***Solution***
  BP engaged IBM to develop a first-of-a-kind emergency mustering solution that translates real-time RFID data into actionable, visual information that serves as the cornerstone of new safety procedures. Flexible design enables BP to extend the solution to other key parts of its operations.
- ***Key Benefits***
  - *Major improvement in emergency evacuation preparedness and employee safety*
  - *Improved ability to support compliance with future Homeland Security directives*
  - *Expected reduction in lost or stolen assets*
  - *Reduction in production downtime caused by the delivery of the wrong spare parts*
  - *Increased accuracy in spare parts inventory reporting*

BP is the second-largest petroleum refiner in North America.

Refineries, whose job is to transform crude oil into such final products as gasoline, lubricants and jet fuel, are the last, and arguably most important, stage in the production of petroleum related products. A dense network of pipelines, valves, gauges, storage tanks and production equipment, petroleum refineries can process as much as a quarter million barrels of oil a day over a single square mile of production facilities. This complexity – combined with the inherent volatility of petroleum products at all stages of the refining process – makes refineries one of the riskiest occupational sites.

> *"Our goal was to use technology to raise the bar on how we protected our employees and the public. With IBM's help, we've developed a solution that is true to our commitment to safety."*
>
> – Curt Smith, applications director for the Chief Technology Office, Information Technology & Services, BP

Business Benefits

- Major improvement in emergency evacuation preparedness and employee safety
- Compliance with state occupational safety guidelines
- Ability to support compliance with future Homeland Security directives
- Expected reduction in lost or stolen assets
- Reduction in production downtime caused by the delivery of the wrong spare parts
- Increased accuracy in spare parts inventory reporting

As such, safety is always a critical issue for petroleum refinery operators, and no one is more concerned about safety than BP (www.bp.com). There is ample evidence of how deeply ingrained safety is within BP's culture. It's seen in the small things, like the way BP company meetings always start with a "safety moment," and in the ubiquitous signage promoting safe practices down to the most routine actions. More importantly, though, it's seen in the lengths to which BP routinely goes to protect its employees and the public.

Accounting for all

One of the most important safety issues for petroleum refineries is the safe evacuation of employees in the event of a disaster, such as a fire or explosion. A key element of disaster planning is the process by which employees are located and accounted for. The accuracy of the emergency mustering process, as it is known, has a direct bearing on the actions of emergency personnel, who may put themselves at great risk in their efforts to rescue missing employees. One of the initial proposals called for the use of kiosks placed around a refinery, which would enable employees to account for themselves electronically by swiping a magnetic card. The glaring problem of this approach, however, was that it provided no certainty as to the whereabouts of a missing person, leaving open the possibility of emergency personnel launching a hazardous search operation for an employee who may have left the facility hours before.

"When it comes to employee and public safety, we're not trying to simply meet minimum requirements. BP is going to do whatever is necessary to make people safe."

– Curt Smith

As part of the search for a provider to develop a solution, IBM staff met with BP to propose a design that would bridge what had been technical obstacles to building a positive accounting system. The gist of the plan involved employees wearing RFID tags that would send location information at frequent intervals, with the data uploaded to a control center. Where IBM's plan – and capabilities – stood out, however, was in the all-important handling of the vast quantities of data generated by the RFID system. In essence, BP's system needed to not only track employee locations, but also use that data to trigger events within specific business processes. Business rules would provide this linkage. To achieve this, the solution required an advanced middleware layer with a highly flexible means of changing the underlying business rules to suit different situations and requirements. Equally important to BP's safety managers was an advanced visualization capability to display this data. IBM integrated all these capabilities into a solution known as the Location Awareness and Safety Solution.

Passing muster in a challenging environment

For IBM, the breadth of the Location Awareness and Safety Solution ensured that its development would be a team effort. The core of the solution is IBM WebSphere® RFID Premises Server, a middleware product that provides a platform to integrate data from sensory devices (i.e., RFID tags) into business applications. For the RFID devices themselves, IBM employed the Sapphire DART Precision Asset Location System from RFID leader and IBM Business Partner Multispectral Solutions, Inc. (MSSI). One key factor in MSSI's selection was its strength in ultra-wideband RFID solutions, which provided a high degree of accuracy in highly metallic, interference-prone environments such as refineries. Another was the quality of its active ID tags, which are unique in their ability to support the high "blink rate" necessary to have a real-time view of employee location, without the rapid loss of battery power. The final major component, custom developed by IBM Research, is a real-time visualization engine that provides a rich graphical view of employee locations and associated metrics. IBM Software Group was responsible for assembling these components into a discrete solution, while IBM Global Business Services provided guidance on how the solution should integrate with BP's business processes. The system runs on a pair of IBM System x™ servers.

In the event of an emergency or disaster, the Location Awareness and Safety Solution presents a real-time, three-dimensional view of the location of employees in and around the refinery. Having this view drastically reduces the need for rescuers to conduct sweeps of a particular area in search of unaccounted for employees. The Location Awareness and Safety Solution platform itself is poised to address a far wider range of safety and security issues – due in large measure to the flexibility of the software framework. For instance, through the solution's easy-to-use interface, staff can configure the solution any number of ways to create new or temporary security zones along with conditional business rules that apply to the zones. By integrating the solution with security clearance data within its HR systems, the system can identify unauthorized personnel within a zone and automatically notify safety personnel, who can take fast corrective action to ensure the safety of the employees. BP is testing a variation of this approach to reduce accidents associated with the movement of overhead cranes, which represent one of the biggest causes of injury in the oil business. By integrating RFID position information, the crane safety initiative is designed to provide a collision avoidance warning to alert crane operators.

Key Components

Software

- IBM WebSphere RFID Premises Server
- IBM WebSphere Application Server
- IBM mySpace visualization software

Servers

- IBM System x

Services

- IBM Software Group
- IBM Global Business Services
- IBM Research

IBM Business Partner

- Multispectral Solutions, Inc.

Timeframe

- Development of Location Awareness and Safety Solution prototype: 1 month
- General rollout: 6 months

Why it matters

By integrating active RFID technology with its business processes, a refinery gains a graphical, real-time view of all employees – wherever they are. Flexible business rules enable a refinery to extend the benefits of real-time RFID into such key operational areas as asset management and workplace safety.

Extending a real-time view

The other major use envisioned for the Location Awareness and Safety Solution is real-time asset tracking and management. The two biggest factors driving this are the high degree of wear and tear that oil production equipment experiences – which necessitates the extensive stockpiling of spare parts such as wellheads – and the high cost of these parts, routinely exceeding $100,000 per item. By applying the solution to a spare parts management operation, BP would be able to track the location of each part in real time, saving potentially millions by drastically reducing the incidence of lost or stolen parts. RFID-based inventory tracking also has the potential to reduce the cost and time required to manually check inventory within BP's parts storage facilities, saving hundreds of thousands of dollars annually and ensuring that parts-in-stock records are continually up-to-date and accurate.

Curt Smith, applications director for the Chief Technology Office, Information Technology & Services, and a key driver of the project, sees the largest potential benefit of real-time parts tracking as improved accuracy and efficiency in the way BP supports its oil production operations in the Gulf of Mexico. The return on investment is driven by the cost in lost production of sending out the wrong parts to fix a problem. With high production costs and volumes, the solution's benefits build up fast. "We view the solution's real-time tracking potential as an important tool to improve our performance and substantially reduce the down-time associated with parts delivery errors," he explains.

While Smith expects the solution's benefits to extend deeply into BP's operations, he points to improved safety as the ultimate benchmark of success. "Our goal was to use technology to raise the bar on how we protected our employees and the public," says Smith. "With IBM's help, we've developed a solution that is true to our commitment to safety."

For more information

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