Repsol Unearths Operations Benefits in SIS Migration

Challenge

- Replace existing safety instrumented systems (SIS) at two production facilities to comply with new, internal safety standard
- Reduce risk of downtime associated with aging equipment and improve visibility into system performance

Solutions

- SIS provides easy integration with existing installed base in SIL 2 application
- System alarm and event capabilities provide better visibility into the systems' performance and downtime issues

Results

- SIS complies with Repsol's new, corporate safety standard
- Migration to new technologies reduces risk of downtime
- Reduced spare-parts inventory by standardizing on one platform
- Improved system visibility helps operators more quickly troubleshoot and predict failures
- Ability to meet higher SIL requirements provides greater system flexibility

Drill-to-Pump Operations

Repsol is a global, oil and gas company with operations spanning the entire supply chain.

On the upstream side, the company produces more than 650,000 barrels of oil equivalent per day and has a reserve volume of more than 2 billion barrels.

Downstream, its businesses include oil-refining operations, crude oil and products trading, and more than 4,700 service stations throughout Europe and South America.

Headquartered in Spain, Repsol has activities in more than 40 countries and more than 27,000 global employees.

In Ecuador, Repsol has exploration and production (E&P) operations covering 199square kilometers in the eastern part of the country.

The operations are established through service contracts with the Ecuadorian government and include two main production facilities known as NPF and SPF.

Operations began at the NPF and SPF plants in 1994 and 1997 respectively.

While still highly productive, the company needed to update its decades-old safety instrumented systems (SIS) in these facilities to bring the facilities into compliance with the company's newly implemented, internal safety standards.

The aging equipment also presented obsolescence risks and lacked information visibility required to help plant workers effectively maintain them.

New, Internal Safety Standard

Repsol in recent years created and implemented a new, internal safety standard for its E&P sites around the world.

Based on the global IEC 61508 and IEC 61511 safety standards, the company's standard was designed to help the company work toward its goal of zero accidents in all areas of its operations.

In 2013, Repsol conducted several types of risk analysis of its global, industrial assets to identify their compliance levels with the new corporate standard.

This included conducting safety integrity level (SIL), and hazard and operability (HAZOP) analyses at the NPF and SPF facilities in Ecuador.

The studies helped Repsol identify the SIS upgrades that would be needed to bring the facilities into compliance with the new standard.

More than that, however, they also brought attention to the obsolescence risks faced by some of the equipment used in the two facilities.

Hardware, such as the PLC-5 systems that were in place in the two facilities, was still operational and in good working condition.

However, Repsol had limited spare parts available to support the systems, which could have resulted in a prolonged downtime event should a failure occur.

Additionally, the aging systems lacked diagnostic information, which made troubleshooting and downtime resolutions more difficult for operations and technicians when issues did arise.

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As a result, Repsol sought to migrate to an SIS system that could bring its Ecuadorian facilities into compliance while also reducing downtime risks associated with aging equipment.

The company also wanted the nearly month-long migration to be carried out without interrupting production, which runs continuously at both sites.

SIS and Network Upgrades

Repsol worked with Rockwell Automation and Exida, an Encompass™ Product Partner within the Rockwell Automation PartnerNetwork™ program, to define and select the best solution for the new SIS at its NFP and SPF facilities.

The team selected an Allen-Bradley® ControlLogix®-based SIS from Rockwell Automation.

From an implementation standpoint, the system provided easy integration not only with the PLC-5 that it would be replacing but also with the rest of Repsol's existing installed base of Rockwell Automation equipment and other vendors' equipment.

This ease of integration reduced risk of downtime during the migrations.

"Sharing information across different vendors' systems is possible but not always easy, and sometimes it requires that you bring in outside technical experts," said Marcelo Villegas, project engineer, Repsol Ecuador.

"That wasn't the case with the Rockwell Automation system. It gave us a clean interaction between the different systems that we had in place."

As part of the migration, Repsol also implemented a new fiber-optic network for the communications between controllers and I/O racks, and used alarming and events capabilities within the new system to gain better visibility into performance and downtime issues.

Benefits Beyond Compliance

Because the NPF facility is smaller and has only about one-quarter the capacity of the SPF facility, Repsol used it as a proving ground for the first of two SIS migrations.

The NPF migration was successfully completed in 21 days, and the team carried over key learnings from that project to the SPF migration.

Despite the SPF facility being much larger, the team completed the migration in the same amount of time.

Migrations at both facilities also were completed without interrupting production.

The new SIS systems now meet Repsol's new, internal safety standard at both facilities.

Furthermore, the systems are creating new opportunities for Repsol to improve reliability and productivity at both sites.

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Replacing the decades-old SIS technology with modern systems reduced the risk of downtime that plagued both facilities due to a lack of spare-parts availability with the previous system.

Additionally, the new systems are standardized on the same technology, allowing Repsol to minimize its parts inventory.

Repsol workers also can now use alarms and events to access information about system performance to improve troubleshooting should a failure occur.

Workers can even use real-time performance data to predict where failures are likely to occur to help avoid downtime events in the first place.

"We didn't have any insights into failures in the previous systems," Villegas said.

"The new system allows us to monitor every part of the architecture, whether it's the controller, the different I/O racks, or a specific output signal. This can help us more quickly identify the root cause of a failure and in some cases anticipate where a failure is likely to happen."

Looking to the future, the systems will offer Repsol greater flexibility for meeting safety requirements.

Both facilities currently only have SIL 1 safety requirements, but the new SIS provides SIL 2 performance should it someday be necessary.

"By staying ahead of our current safety requirements, the Rockwell Automation solution prepares us for future expansion," Villegas said. "These systems will help us get ahead of potential SIL requirement increases without another SIS upgrade in the future."

The results mentioned above are specific to Repsol's use of Rockwell Automation products and services in conjunction with other products. Specific results may vary for other customers.