FMC Minera del Altiplano Improves Its Lithium Production Operation With Experion PKS

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FMC Corporation is a diversified global chemical company, and ranks as a world leader in the production of lithium-based products used in pharmaceuticals, polymers, batteries and lubricants. High-grade lithium ores and brines are the present sources for all commercial lithium operations.

FMC Minera del Altiplano is a subsidiary of the FMC Lithium Division involved in lithium mining and processing in Argentina. The company previously utilized Honeywell’s TDC 3000 Distributed Control System (DCS) to automate its production processes, but the older DCS lacked sufficient capacity to keep pace with continuous operational improvements. Plant management was also concerned about obsolescence and a lack of commercial support for its existing control platform.

In 2007, FMC Minera del Altiplano decided to migrate its DCS to the Experion Process Knowledge System (PKS). This next-generation control solution delivers robust operational capabilities and an open communications architecture. Thanks to new Experion C300 controllers, FMC Minera del Altiplano has a significantly expanded processing capacity, and control application execution is deterministic, consistent and reliable. Expanded data collection and storage capabilities ensure uninterrupted data archives and minimize risks to critical plant information.

Background

FMC Corporation is a major worldwide producer of chemicals and machinery for industry, government and agriculture. It employs 21,000 people at 97 manufacturing facilities and mines in 21 countries. The company’s business is divided into five major segments: Performance Chemicals, Industrial Chemical, Machinery and Equipment, and Defense Systems & Precious Metals.

FMC Corporation ranks as an industry leader in the production of lithium-based products. The FMC Lithium Division is committed to providing complete solutions to major identifiable markets, including air treatment, construction, energy, fine chemicals, glass and ceramics, greases and lubricants, polymers and others.

Lithium is a silvery-white metal that is harder than sodium, but softer than lead. It is extremely light, and has a density that is approximately 50% of water. Lithium never occurs as a pure element; rather, it is always bound in stable minerals or salts (See Fig. 1).
Lithium derives its excellence from the following characteristics:

- Low density
- Low melting point
- Soft and easy to form
- Low dynamic viscosity
- Very high ionization energy
- Very high electrode potential

Argentina contains one of the largest and best quality reserves of lithium-brine in the world. The Andes Mountains hold a large saline body with brine deposits generated by water filtered through the sub-soil. Brine of the Salar del Hombre Muerton region possesses high concentrations of potassium, lithium and boron. High-grade lithium ores and brines are the source for commercial lithium production.

**Production Process**

Minera del Altiplano is a subsidiary of the FMC Lithium Division involved in lithium mining and processing in Argentina. Its production facilities include Selective Absorption and Lithium Carbonate plants at Salar del Hombre Muerton in the Argentine Andes, and a Lithium Chloride plant in Guemes City, Salta Province.

At Minera del Altiplano’s production operations, processing of Lithium Carbonate is based on Lithium Chloride solutions obtained as a by-product of Potassium Chloride. Lithium Chloride solutions are processed to produce Lithium Carbonate. Brines that are not used are re-injected into the salt flats.
Minera del Altiplano’s Selective Absorption Plant employs a patented absorption process based on columns. Lithium Carbonate is obtained by means of a chemical reaction between Salmuera de Litio and Sodium Carbonate, and is packaged in 1 tn supercoats. Lithium Chloride is crystallized, centrifuged and dried, and then packaged in different drum sizes according to customer orders (See Fig. 2).

Figure 2. Minera del Altiplano is a subsidiary of the FMC Lithium Division involved in lithium mining and processing in Argentina.

Operational Challenges

Today’s competitive marketplace demands automation solutions that increase production efficiency and profitability. Control system performance can significantly impact a manufacturer’s bottom line. Outdated legacy control systems may not meet corporate objective for enterprise-wide sharing of critical data. As such, industrial operations must find ways to optimize large-scale, multivariable process applications.

Minera del Altiplano previously utilized Honeywell’s TDC 3000 Distributed Control System (DCS) to automate its production processes. This older DCS lacked sufficient capacity to keep pace with continuous operational improvements and the increased number of tags. Plant management was also concerned about security, obsolescence and lack of commercial support for its legacy controls.

In 2007, Minera del Altiplano decided to migrate its aging DCS platform to the next-generation Experion Process Knowledge System (PKS). Experion PKS R310 delivers robust operational capabilities and an open, yet secure communications architecture. It is built upon a standard, distributed control architecture utilizing technology from the Abnormal Situation Management (ASM)
Consortium and integrates enterprise-wide physical plant and computer systems security features (See Fig. 3).

Figure 3. Experion PKS R310 delivers robust operational capabilities and an open, yet secure communications architecture.

Automation Solution

Experion PKS embeds solutions designed for asset management and abnormal situation management to reduce unplanned outages and increase process uptime. HMIWeb technology provides an HMI offering the benefit of fully integrated data delivery using standard Internet technologies such as HTML and XML. The user interface includes a comprehensive set of standard displays, supporting navigation and operation of the entire system.

The Experion PKS architecture employs Fault Tolerant Ethernet (FTE), which provides not only fault tolerance, but also fast response and security required for critical process control applications. FTE increases system availability and reduces cost of commissioning and maintenance. It also leverages commercial Ethernet technology found in IT networks to lower costs of the FTE network infrastructure, connections to IT networks, and connections to third-party Ethernet devices.

With a 1000 Mbps capability, FTE provides performance well beyond Minera del Altiplano’s current control system requirements with ample capacity for future needs. FTE maximizes the availability of communications within the Experion system by providing four communication paths between nodes, versus two with dual network approaches. The Ethernet network improves UCN security by supporting two simultaneous faults.
At the Minera del Altiplano facility, new Experion C300 controllers provide 1,100 PU of processing capacity and handle up to 64 cards of IOP. Experion servers allow for expanded historization, with a storage capacity limited only by hard drive space. Historical archives are physically separated and superfluous—minimizing the risk of loss of critical plant information.

The Experion PKS solution also improves connectivity and expands visualization of plant performance and maintenance. Historical data can be integrated to Uniformance PHD and visualized across the enterprise without jeopardizing process operations. The plant business office can even access production data for better economic decisions.

The Experion system utilizes Configuration Studio, making it easier for plant personnel to create, modify and execute control strategies. Application packages employ the familiar Windows™ operating environment, which saves time for configuration compared to the older TDC system. HTML technology provides robust HMI capabilities, such as instructions for abnormal situations, notes regarding plant operation, etc.

**Project Results**

Minera del Altiplano commissioned its new Experion PKS-based control system in early 2008. Thanks to new Experion C300 controllers, plant operators have an expanded application processing capacity; application execution is now deterministic, consistent and reliable. In addition, the burden on the control system database has been lessened. Expanded data collection and storage capabilities ensure uninterrupted historical archives and minimize risks to critical plant information.

The migration of points, screen and programs to the Experion system has been a seamless process. The Experion solution also reduced set-up times for new control configurations. Plant operators are better able to handle alarms and abnormal situations, and cost savings have been realized through faster startup times and improved alarm handling. Additional saving were achieved through the use of standard, commercially available system hardware.

**Conclusion**

Minera del Altiplano has begun migration of the DCS at its Fénix plant to the Experion PKS platform, and in the future, will integrate the system across all of its facilities by means of a connection LAN. System integration will have a significant impact on business performance by allowing common monitoring of process variables and process data, as well as implementation of company-wide production strategies.