Invensys helps Astrakhan Gas Processing Plant achieve Operational Excellence

Goals
- Improve safety and minimize environmental impact through modernization of control system.
- Increase productivity.

Challenges
- The environment is hostile with the hydrogen sulfide content of the formation fluid up to 25%.
- The manufacturing process is complex with pressures of more than 600 atmospheres and temperatures of up to 110 degrees Celsius.

Solutions and Products
- Foxboro Distributed Control System - I/A Series®
- Triconex Critical and Safety Systems

Results
- Overall all improvement in the safety and control system of the plant.
- In 2010 increase in separated gas and condensate production.

“In addition to improving the control and safety system, the solution achieved outstanding performance results in separated gas and condensate production.”
Gazprom dobycha Astrakhan, LLC, Russia is a subsidiary of Gazprom, one of the largest energy companies in the world.

The Astrakhan gas and condensate field was launched on December 31, 1986 with the commissioning of the Astrakhan gas complex, a major sulfur producer in the former USSR. The main activities of the company involve the following:

- The exploration of hydrocarbon deposits
- Production of sour hydrocarbons, gas and condensate processing resulting in production of dry and liquefied gases, gasoline, diesel fuel, fuel oil as well as liquid, solid and prilled sulfur
- R&D, exploration and design work.

Currently, Gazprom dobycha Astrakhan is the world leader in the production of sulfur, with an 81% share of all the sulfur produced in Russia and about 10% of the world’s total production. The entire plant is a complex that embraces 19 subdivisions within a unified process chain involving the Astrakhan gas processing plant. This involves oil, gas and gas condensate processing.

Improved environmental safety and production efficiency

Astrakhan gas condensate field is unique in Russia. It has an extremely high content of hydrogen sulfide in the formation fluid (25%), it is very deep (4000 - 4100 m), it has high reservoir temperature (110 degrees Celsius) and pressure (more than 600 atmospheres). Due to the high complexity of technological processes during gas processing, the primary goal of the company is to improve environmental safety.

The project required a phased reconstruction, modernization and expansion of the gas processing plant so that it meets the current and future European requirements. Because of these goals, the executive management decided to modernize the control system by replacing the legacy system into a modern, high-speed, microprocessor-based system.

Choosing the right solution and partner

The automation and process control system modernization was entrusted to the Russia office of Invensys Operations Management because of its experience in completing similar projects.

The Foxboro I/A Series DCS and Triconex Tricon Safety System use of the state-of-art technologies and architectural solutions that meet the operational requirements of Gazprom dobycha Astrakhan.

The goals of the automation and control system include:

1. Improve safety and meet its environmental goals by upgrading the control system and try to avoid erroneous operator actions during unit start-ups and shut downs.
2. Improve the working conditions of plant operations personnel by creating a central control room with easy display of plant information.
3. Have the ability to edit the supervisory and control functions and improve display screens.
4. Increase in company’s profit by increasing technical capability and making efficient use of use of raw materials, auxiliary facilities and energy.
5. Increase productivity by increasing the production of separated gas, condensate and sulfur.
6. Enabling remote monitoring while being able to control and manage the entire plant from a central control room.
7. Be able to solve production problems by analyzing historical information.

The Characteristics of the process

The control of the Astrakhan GPP plant is characterized by a variety of a complex and continuous batching process that involves control of gas, condensate and mined products. It also involves the storage, preparation, processing, shipping and transportation of critical products that are highly explosive and are potential fire and gas hazards. A number of processes take place at high pressures (over 600 atmospheres) and at high temperatures.
(110 degrees Celsius). All processes of gas processing, storage, shipment, transportation are closely interrelated and require clear central control. The environment inside the plant is also hazardous because the hydrogen sulfide concentration in the formation fluid is 25%. This results in a lot of corrosion and if unchecked, also makes the raw materials toxic. Furthermore, the possible mixture of hydrogen sulfide with hydrocarbons is a real danger to the equipment. This required Gazprom dobycha Astrakhan to specifically ask for a control solution that will be able to meet the following requirements:

• The Control System should be able to operate in the limits of the hazardous environment prescribed above, without component failure
• The Control System should be spread out and distributed so that the operations personnel is not present in the dangerous product areas.
• The Control System should be redundant and provide a high operational tolerance (that is, the faults and failures of individual components will not lead to the failure of the whole system).
• The Control System should be built as an integrated, multi-level hierarchical solution that is easy to maintain and upgrade.

Invensys installed a control system that includes a Foxboro I/A Distributed Control Systems (DCS) and a Triconex Tricon Safety for seven processing units. Invensys, Russia plant modernization at the Astrakhan gas processing plant that included the following:

1. Detailed engineering of the process control system including, documentation and development
2. Supply of all equipment
3. Installation at end user site
4. Installation, testing and commissioning according to a clear project schedule that took into consideration, planned maintenance shutdowns
5. Integration of new subsystems (nodes 6, 7) with the existing process control system without shutdown
6. Training of engineering and operations personnel. The works was carried out within schedule, despite the complexity of the processes. There was effective communication and full cooperation with the entire team and this contributed to the project’s success.

Achieved results and Business Metrics

In addition to improving the control and safety system, the solution achieved outstanding performance results in separated gas and condensate production.

Invensys is proud to have been part of this endeavor and is prouder to be part of the team that helped its customer record operating results that are above expectations.