SUCCESS STORY

Introduction of CENTUM CS 3000 Maximizes Productivity and Improves Product Quality at Special Polymer Plant

Location:	**Duque de Caxias/Rio de Janeiro, Brazil**
Order Date:	**December 2006**
Completion:	**April 2009**
Industry:	**Chemical**

NITRIFLEX

Executive Summary

Nitriflex, a Brampac Group company, was founded in 1971 and has its headquarters in Rio de Janeiro. A major supplier of special polymers and nitrile rubber with a wide range of products, the company has made a name for itself on the international market.

Nitriflex's plant was controlled by board instrumentation and legacy PLC/SCADA systems. To improve automation of its production processes, Nitriflex decided to upgrade to the CENTUM CS 3000 distributed control system (DCS). The reasons for this were as follows.

- Upcoming projects required the handling of more complex data, improved quality assurance, and reduced costs and risks, with minimal human intervention.
- Various technologies ranging from pneumatic instrumentation to PLC and SCADA systems were in use throughout the plant. In addition to having different control philosophies, these systems could not communicate with each other.
- The registration and control of data was essentially a manual process, compromising traceability, process monitoring, and management.
- Cycle times were long due to the high reliance on manual operations.
- Competitiveness was negatively impacted by quality issues resulting from high variability in critical process variables.

Nitriflex established clear targets before starting this modernization project.

- Improve product quality and process variability by reducing the inherent process oscilation due to the utilization of conventional instrumentation.
- Reduce operating cycles by using automatic sequencing between steps, eliminating dead time.
- Optimize development, operation, maintenance, and engineering activities and make more effective use of resources by ensuring real-time access to precise data.
- Integrate production and business management by delivering information on production, inventories, raw materials, cycles, etc. to executives and providing relevant corporate data on production planning, logistics, and other items to the people on the factory floor.

Project Overview

- A multidisciplinary project team with personnel from production, engineering, maintenance, and technology R&D was established to define project targets and objectives.
- A preliminary automation master plan for the technical backbone was drawn up that specified the technology, architecture, number of I/O points, I/O interfaces, communication protocols, legacy system interfaces, and so on.
- The project phases and the goals for each phase were defined.
- A techno-economic feasibility study analyzing the return on investment was carried out by Yokogawa Brazil, with the support of Nitriflex.
- Yokogawa Brazil was selected to provide a turnkey CENTUM CS 3000 DCS solution based on Nitriflex's specifications.
- A PIMS tool was introduced to support 6-Sigma methodologies.

Feasibility Study

After extensive information gathering on site, Yokogawa Brazil recommended an approach that focused on using automation to improve the company's competitiveness by reducing process variability (improving product quality) and making better utilization of critical raw materials (increasing yield).

Phased Implementation Strategy

Based on a prioritization of strategic issues that included the need to reduce process variability, achieve greater competitiveness, and lower costs by increasing production efficiency, the decision was made to conduct the project in the following phases.

1st phase - Monomer recovery: Optimizing process conditions to more efficiently recover all residual monomers from polymerization reactions and class A raw materials for this process.

2nd phase - Polymerization: Includes the full automation of solution preparation and reactor loading (automatic recipes) and optimization of the polymerization conditions (cynetic control) to improve quality and reduce cycles. This phase is scheduled to be completed in March 2011.

3rd phase - Advanced process control implementation: Inference and control of polymer quality variables such as conversion, composition, and molar mass. The main objective is to reduce the variation in the value of highly-aggregated-value polymers. Other objectives include improving productivity and reducing residual emissions to the environment.

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Results

A major improvement as a result of this project is that butadiene monomer recovery efficiency jumped from 76% to 98%. The estimated benefit to Nitriflex is US$2 million per year.
In addition, there were the following benefits for Nitriflex.

1. Environment: A remarkable reduction (near complete elimination) in residual monomer emissions into the atmosphere and a reduction in liquid effluents through the installation of a collection system.
2. Safety: Improved monitoring and control systems ensure a safe and timely response to changes in process conditions and reduce the likelihood of human error by eliminating the need for direct operator intervention.
3. Agility:Shorter production cycles allow a more agile response to shifts in demand and greater stability in product quality ensures increased flexibility in production scheduling.
4. Intermediate stocks: The increased production capacity makes it possible to keep less intermediate stocks, improving the balance among all production areas.
5. Process variability: The reduced need for direct operator intervention reduces process variability.
6. Speed: The use of PIMS and other special tools to distribute real-time production information to sales, planning, engineering, and other functions throughout the company speeds up its operating and commercial activities.

The central control room before

The central control room today

Customer Satisfaction

Speaking about this project, Luis Carlos, senior process engineer for Nitriflex, says, “We are very happy to be using Yokogawa’s CENTUM CS 3000 to improve production. To meet the requirements of end users and compete in the global market, we will increase the agility of our production activities and improve product quality.” He went on to say, “We are always thinking about sustainable manufacturing, and for this we need a strong partner like Yokogawa.”

Luis Carlos, senior process engineer

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