

Aracruz Celulose Pulp Mill

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"We chose to implement Foxboro intelligent remote I/O because of the increased architectural flexibility and lower cost it provides."

*Luiz Renato Chagas Figueiredo
Automation Manager*

Aracruz Celulose Modernizes, Upgrades Production at World's Largest Pulp Producer using multi Invensys Solution

Goals

- Allow each Fiberline to operate independently and provide a unified view into all operations for better management of overall plant productivity

Challenges

- Plant has multiple systems from different vendors, most of which are outdated
- Current plant capacity is limited and needs to be expanded to meet demand

Solutions and Products

- Foxboro® Distributed Control System - I/A Series®
- Foxboro Measurements and Instruments
- Triconex® Critical and Safety Systems
- SimSci-Esscor® Dynamic Simulation
- Wonderware® InTouch® HMI Software

Results

- Plant was expanded to become the largest single pulp production facility in the world, capable of producing more than two million tons of market pulp per year
- Boiler using Fisher Provox DCS with 1000 I/O was migrated to Foxboro I/A in 3 hours and 7 minutes
- Provides a strong avenue for future growth in production capacity
- Expanded overall production capacity and eliminated production bottlenecks

Espírito Santo, Brazil – Lush green forests sweep grandly from the mountains to the ocean in the coastal states of Espírito Santo and Bahia, Brazil, about 450 kilometers north of Rio de Janeiro. What is unusual about these forests, however, is that they are part of nearly 420,000 acres of eucalyptus plantations owned and managed by Aracruz Celulose, one of the world's leading producers of market pulp.

Project Scope

Aracruz Celulose is unusual in that the mill here uses eucalyptus trees for making pulp, which is shipped around the world to paper producers who make tissue, fine printing, writing and specialty paper products. The advantage of eucalyptus trees is that they grow so quickly, reaching mature heights of about 35 meters within just seven years of growth. This means that they can be harvested much more frequently than the slow growing pine forests of North America. In addition, while their fiber was originally considered to be secondary quality, because of their shorter length, it now is sought after because of its characteristics that provide high opacity, softness and good absorption of inks.

For all of these reasons, the Aracruz pulp mill has now grown to be the largest single pulp production facility in the world, capable of producing more than two million tons of market pulp per year. Operations just east of the city of Aracruz began in 1976 with the building of Fiberline A, which was capable of producing 400,000 tons a year of bleached pulp. This first line was controlled by Foxboro PCI-100 pneumatic instrumentation. The plant's production capacity was expanded in 1986 when Fiberline B was brought online to produce an additional 600,000 tons of pulp a year.

In 1995, Aracruz management overhauled both lines to modernize and eliminate production bottlenecks – while expanding their overall production capacity to 1.2 million tons per year. At this time, they replaced the original pneumatic control systems with Foxboro I/A Series Distributed Control System. These were configured in a five-node local area network, combining multiple application processors, user workstations interfaced

to programmable logic controllers (PLCs). As many as 125 field enclosures provided the I/O interfacing to more than 1,500 field instruments, using FoxCom communications. In addition, InTouch Human Machine Interface software from Wonderware was installed to create new process visualization screens for operator control of wood yard operations.

This approach to production control worked so well that in the year 2000 Aracruz management undertook their largest project of all – the construction of Fiberline C and the upgrading of Line A and B controls. The goal was to allow each line to operate independently but to provide a unified view into all operations for better management of overall plant productivity.

Following a year of planning, consultation and project definition, Aracruz management decided to continue their strong relationship with Invensys Operations Management and use the Foxboro I/A Series DCS to operate Fiberline C and upgrade the majority of lines A and B – including interfacing to all the production equipment for major process steps.

Fiberline A was upgraded from its original pneumatic control systems to the I/A Series system. The Fiberline A controls architecture was so effective that it was used as the basis for the Fiberline C plant expansion. Significant savings in reusable engineering were realized.

Fiberline B's boiler and evaporation units were controlled by a Provox system. Retrofitting controls on Fiberline B was simplified using Foxboro's plug-in migration strategy. I/A Series I/O modules, manufactured to be one-for-one, form fit replacements for the original Provox I/O modules, plug-in to the legacy I/O racks. The physical switchover was accomplished without moving any field wiring. Total process downtime to migrate this 1,000 point system was 3 hours and 7 minutes.

Production on a Massive Scale

Despite its enormous size, the Aracruz plant is a typical modern pulp mill. Logs arrive daily by truck from the plantations. Much of the wood is stored in the wood yard, for use as a buffer supply, while

the remainder is unloaded directly into debarkers and chippers that feed each line. The chips are conveyed into the pulp digesters, where they are cooked with caustic liquors to form the pulp. The modern stainless steel digesters, rising high above the plant floor, look more like rocket ships than production equipment.

The brown pulp stock is washed and screened before being bleached white and fed into drying machines. These dryers look much like standard papermaking machines, but instead they simply dry the pulp to form continuous blankets. At the end of each drying machine, the pulp blankets are cut into rectangular sheets and baled for shipping. The wrapped bales are transported by truck to the nearby port at Aracruz where they are shipped to customers around the world.

In addition to the production equipment deployed to make the pulp itself, Aracruz operations include several production support systems. These include the chemical plants that produce the caustic liquors used in the digesters; the recovery boiler that reclaims used liquors for recycling in the production process; the evaporative systems used to reclaim water from the washing and screening process; a chemical plant for producing bleaching agents; and a power plant for supplying electricity for the entire facility. All are managed using the Foxboro I/A control system.

Sophisticated Remote I/O

The complete Foxboro I/A Series DCS on Fiberline C consist of five network nodes with Windows NT workstation processors. A Trident triple modular redundant safety shutdown system from Triconex is used for protection of the oxygen reactor. All Foxboro field instruments – ranging from pressure and temperature devices to magnetic, mass, pH and conductivity devices – are all interfaced with the system by means of the FoxCom protocol, using remote I/O racks that are physically close to the process. Motor controls are connected via intelligent MCCs to as many as 25 Micro I/A nodes via Profibus networks, without having to use PLCs.

Foxboro I/A Advanced Controls packages were also installed in each production area to gather baseline measurements for evaluating performance improvements obtained from the advanced process controls.

All engineering work for regulatory control is being managed by Invensys as well, through subcontracts with the nine primary equipment suppliers. Simulation packages for this effort, to emulate actual use of all control processors and Micro I/A units, were supplied by SimSci-Esscor.

Foxboro Command Centers with thin profile LCD displays have now been installed in all three control rooms. The processors and I/O cards from the competitive system have been swapped out for Foxboro I/A replacements that have the same form factor, but which incorporate today's latest electronics circuitry technology. This helped bring the new line on-stream faster – and under budget – and it provides a strong avenue for future growth in production capacity. In fact, with this facility upgrade Aracruz was the first pulp mill in the world to start up with all advanced controls in place and running.

That is a good situation to be in because the so-called “paper-less revolution” that people have talked about for years has never really occurred – and that means the world will always need fine papers for use in computer printout, copiers and old-fashioned hand-written letters.

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