Aracruz Celulose Pulp Mill

Industry: Pulp & Paper

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Aracruz Celulose modernizes, upgrades production at world’s largest pulp producer using multiple Schneider Electric solutions

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.

The Aracruz mill constructed a new fiberline, overhauls and modernized existing lines, and eliminated production bottlenecks while it expanded its overall production capacity.

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Goal

• 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• Plant has multiple systems from different vendors, most of which are outdated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

• Foxboro™ Distributed Control System (DCS)
• Foxboro Measurements and Instruments
• Triconex™ Safety Systems
• SimSci Dynamic Simulation
• Wonderware™ InTouch™ Human-machine Interface (HMI) Software

Results

• Plant was expanded to become the largest single pulp production facility in the world, capable of producing more than 2 million tons of market pulp per year
• Boiler using Fisher Provox DCS with 1000 I/O was migrated to Foxboro DCS in 3 hours and 7 minutes
• Provides a strong avenue for future growth in production capacity
• Expanded overall production capacity and eliminated production bottlenecks

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Project scope

The Aracruz mill is unusual in that it 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 quickly, reaching mature heights of about 35 meters within just seven years. 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 2 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 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 tons of pulp a year.

In 1995, Aracruz management overhauled both lines to modernize and eliminate production bottlenecks while expanding overall production capacity to 1.2 million tons per year. At this time, they replaced the original pneumatic control systems with the Foxboro DCS. These were configured in a five-node local area network combining multiple application processors and 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 HMI 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 yet: the construction of Fiberline C and the upgrading of Line A and B controls. The goal was to allow each line to operate independently while providing 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 Schneider Electric and use the Foxboro 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 Foxboro DCS 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. Foxboro DCS 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 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 DCS.

Sophisticated remote I/O

The complete Foxboro DCS on Fiberline C consists 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 DCS nodes via Profibus® networks, without having to use PLCs.

Foxboro 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 Schneider Electric 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 DCS units, were supplied by SimSci.

Renato Gueron, project manager says, “The final step in upgrading the plant was the complete change of the three control room layouts. We changed the control rooms for the fiber lines, recovery line, and drying machines to consolidate Lines A, B, and C. This was necessary because Line A had Foxboro CRT consoles and monitors, while Line B had competitive CRT consoles and monitors — which meant there would be no space to add Line C operating stations. They now all operate under one master control system.”

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 DCS replacements that have the same form factor, but which incorporate today’s latest electronic circuitry technology. This helped bring the new line on-stream faster — and under budget — and it provided 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.

Walter Lidio Nunes, plant manager says, “When we launched Fiberline C we had the advantage of installing advanced controls at the start, before production even began. We had the benefit of having tested our methodology on Fiberlines A and B so we could make the best use of our experience. Once the plant processes are fully stabilized, we will have established a baseline so that we can compare improvements in plant operation over time. If everything works as we anticipated, we should be able to improve our bottom-line performance and enhance our competitiveness and profitability to succeed better in a very difficult global pulp market.”

That is a good situation to be in because the so-called “paperless 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 printouts, copiers, and old-fashioned hand-written letters.