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ENERGY EFFICIENCY AND RENEWABLE ENERGY, U.S. DEPARTMENT OF ENERGY

Advanced Quality Control System for the Thermomechanical Pulping Process Improves Quality and Reduces Energy Costs for Augusta Newsprint

Summary

In July 2001, the Augusta Newsprint Company partnered with Invensys' Pacific Simulation group to implement an advanced quality control (AQC) solution for the thermomechanical pulping (TMP) process at Augusta Newsprint's Augusta, Georgia, site. The goal of the project is to decrease energy and raw material costs while maintaining final pulp quality. The project involves coordinating AQC in 3 areas of the paper mill to reduce the amount of energy required for manufacturing. In addition, a time-of-day production (TODP) feature will use current power market pricing data to adjust production rates in the pulping operation to minimize the average cost of purchased energy. The AQC implementation is currently in progress.

Benefits

- Annual energy savings of more than 800 kilowatts (kW)
- Annual savings of $1.12 million
- Improved energy efficiency
- Reduced manufacturing costs
- Improved product quality

Applications

To combat rising energy and manufacturing costs, competition from alternate media, and reduced demand, paper production costs must decrease while quality must increase. The advanced quality control (AQC) technology links final product quality with the thermomechanical pulping (TMP) process. Integrating the pulping process with the paper machine optimizes production, quality, and cost.

Plant Overview

The Augusta Newsprint mill is part of a joint partnership between Abitibi Consolidated and the Woodbridge Company, Ltd. The mill produces up to 440,000 metric tons of of standard newsprint each year from southern pine and recycled newspaper and magazines. The mill has 2 paper machines and employs 380 workers.

Abitibi-Consolidated is a global leader in newsprint and uncoated groundwood papers with ownership interests in 27 paper mills in Canada, the United States, the United Kingdom, and Asia (including its 50 percent interest in Pan Asia Paper Company). The company also has ownership interest in 22 sawmills, 2 remanufacturing facilities, and a market pulp mill. Abitibi-Consolidated employs approximately 18,000 people and supplies products in nearly 100 countries.

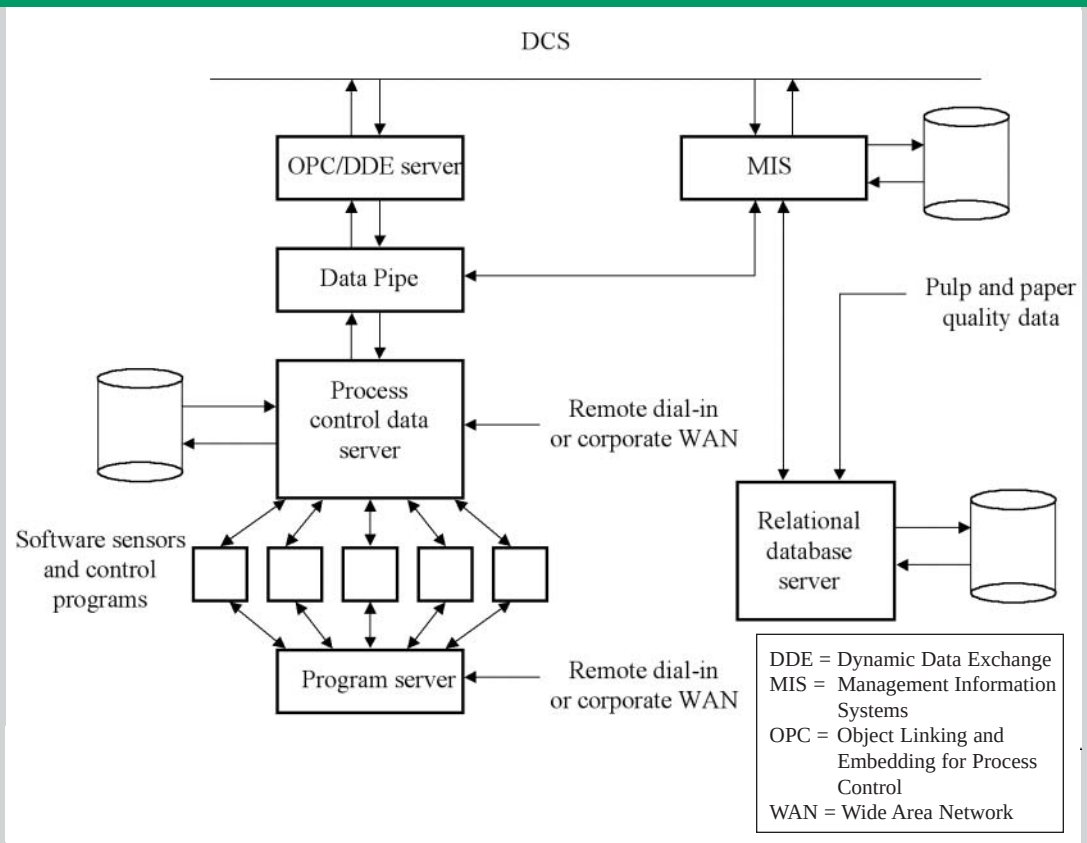
Project Overview

When Augusta Newsprint and the U. S. Department of Energy (DOE) performed a plant-wide energy efficiency assessment at the mill, it became evident that improving the efficiency of the TMP process could result in substantial energy and cost savings. The TMP process involves 4 main lines, each with 2 Sprout twin 50 refiners, a screen room, and 3 reject refiners. The TMP process separates wood chips into individual fibers using refiners driven by 12,000-horsepower motors. The processing of wood chips into pulp requires large amounts of energy and constant quality control. Electrical energy accounts for 23 percent of the production costs; the TMP process accounts for 71 percent of the mill's total electrical energy use.

Augusta Newsprint looked for opportunities to improve the energy efficiency of the TMP process and decided that the most promising alternative was an AQC system. Augusta Newsprint teamed with Invensys' Pacific Simulation group to implement the AQC system.

The project involves installing control systems in the mainline refiner, reject refiner, and screen room. These systems will help to control specific energy and blowline consistency to achieve and maintain desired freeness and fiber length. Software sensors are used in these areas to predict production rate, throughput, blowline consistency, and pulp quality. Pulp mill quality optimization is also being implemented to allow the mill to use real-time information from distributed control systems to modify quality targets relative to dynamic process and equipment conditions. Figure 1 depicts the information infrastructure installed to implement the control system.

FIGURE 1. INFORMATION INFRASTRUCTURE INSTALLED TO IMPLEMENT THE CONTROL SYSTEM



The AQC solution also includes using TODP control to allow the mill to modify its production schedule to match real-time pricing from the electrical power market. TODP adjusts pulp production rates to minimize purchased energy costs based on power pricing predictions using current market data.

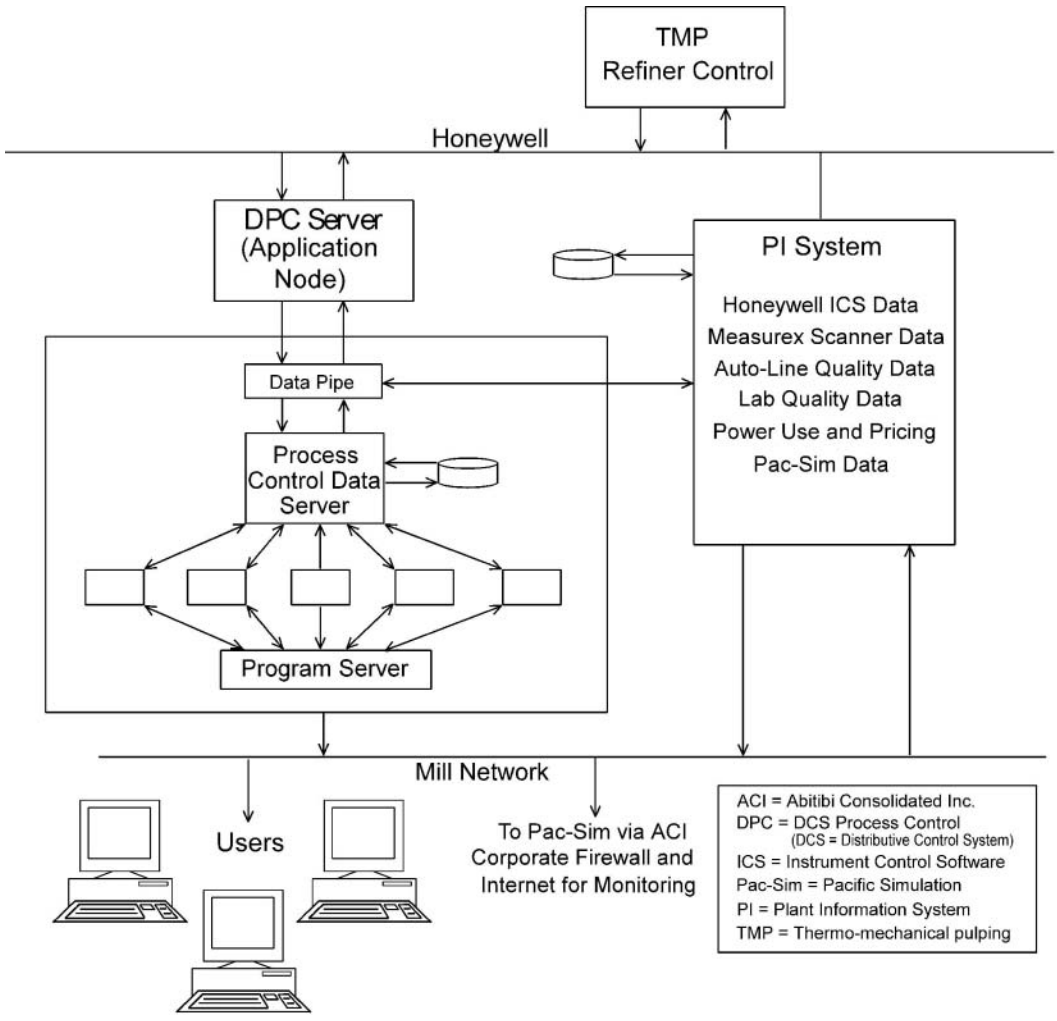
Project Implementation

Improving the fiber length helps enhance ultimate paper quality. A primary goal for Augusta Newsprint is to increase the quality of the paper during the production process. The AQC solution at Augusta will make the final paper quality better by increasing control of the TMP process, which improves the pulp quality at the front end before it enters the paper machine.

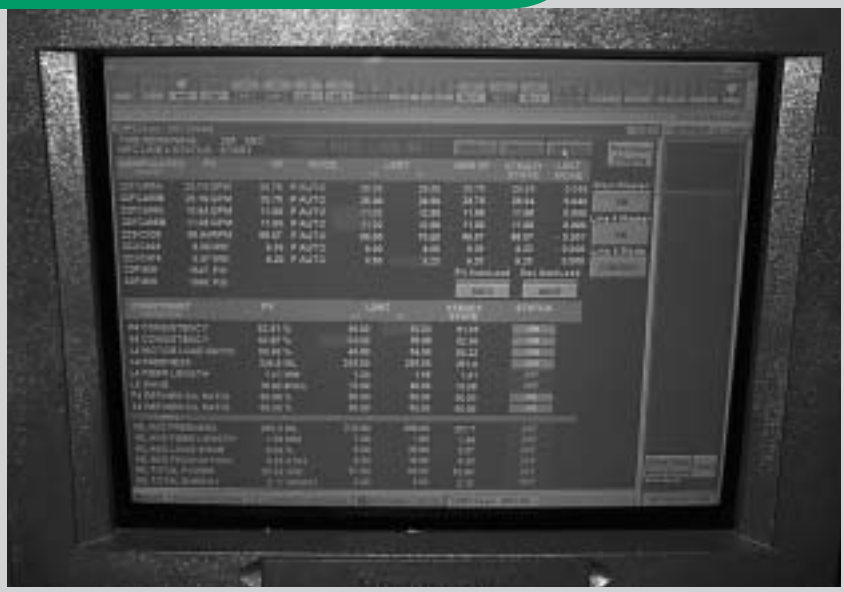
An advanced, model-predictive, multivariable controller will interface with the mill's existing distributed control system. This method provides real-time and on-line predictive models and modifies control actions to maximize quality and minimize costs. Using software sensors, the system can predict difficult-to-measure quality and process variables. The model predictive control algorithms associated with AQC suggest process changes to control quality.

Additionally, the AQC solution allows the mill to modify its production schedule to match real-time pricing from the electrical utility. As TODP control forecasts the upcoming power market price using available data, the control system adjusts production rates in the pulping operation to minimize average cost of purchased energy. With this feature, Augusta Newsprint can better manage energy use while maintaining quality and paper machine production rates. Figure 2 shows a schematic of the installed AQC system.

FIGURE 2. INSTALLED ADVANCED QUALITY CONTROL SYSTEM



Operator Interface for AQC System



Results

The Augusta Newsprint AQC implementation is currently in progress. The AQC system is not a substitute for skilled and trained operators; it provides an integrated tool that will enhance the workers' ability to respond to changing market and process conditions. The system will also allow operators to control product quality while reducing operating costs. Augusta Newsprint expects improved energy efficiency, reduced manufacturing costs, and improved quality from project implementation. Augusta Newsprint has invested $1.4 million to install the system and estimates annual savings of $1.12 million. Energy savings are predicted to contribute about $239,000 per year to the total expected savings; the remainder of the savings is related to raw material (kraft) reduction and TODP power cost savings.

Industry of the Future—Forest Products and Agenda 2020

*In November 1994, DOE's Secretary of Energy and the Chairman of the American Forest and Paper Association signed a compact, establishing a research partnership involving the forest products industry and DOE. A key feature of this partnership was a strategic technology plan-**Agenda 2020: A Technology Vision and Research Agenda for America's Forest, Wood, and Paper Industry**. Agenda 2020 includes goals for the research partnership and a plan to address the industry's needs in six critical areas:*

- *Energy performance*
- *Environmental performance*
- *Capital effectiveness*
- *Recycling*
- *Sensors and controls*
- *Sustainable forestry*

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Project Partners

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