By **MONICA SHAW,** Editor

Command over consumption

Rising energy costs are a battle for North American mills, but advanced process control has helped Augusta Newsprint fight back with lower consumption at the 100% purchased electricity mill

Cost control is an overriding concern these days as mill margins are pinched by rising energy and raw material prices, but competitive pressures dictate that gaining command over consumption cannot impact end product quality. Precise control of processes, however, offers some hope of curtailing expenses.

At Augusta Newsprint in Augusta, Ga., advanced quality control for the mill's thermomechanical (TMP) process has helped the mill reduce energy costs, as well as the use of costly kraft pulp, while still improving the quality of its sheet. The reduction in energy use was especially critical for the mill, which runs off of 100% purchased electricity from Georgia Power and is the utility's largest single customer.

The necessity for installing advanced TMP control became apparent in July 2001, when Augusta Newsprint Co., in conjunction with the U.S. Department of Energy (DOE), performed a mill-wide energy efficiency assessment that showed improved TMP efficiency could cut costs significantly. According to TMP plant supervisor Michael Alford, the mill could see the handwriting on the wall.

"At 100% purchased energy, we knew we were vulnerable since electricity mirrors the cost of fuel oil, and the TMP plant accounts for 71% of total mill energy use," Alford describes. "We were also using 5% purchased kraft in our sheet that was impacting the bottom line, and we wanted to wean off that."

In December 2001, Augusta began installing Metso Automation's PacSim Advanced Quality Control (AQC) system, which was partially funded by the DOE's Office of Industrial Technology. The system, helped along by other process adjustments, is accomplishing its goals while providing a platform for further fine-tuning of the TMP process and cost reductions.

TMP plant idiosyncrasies

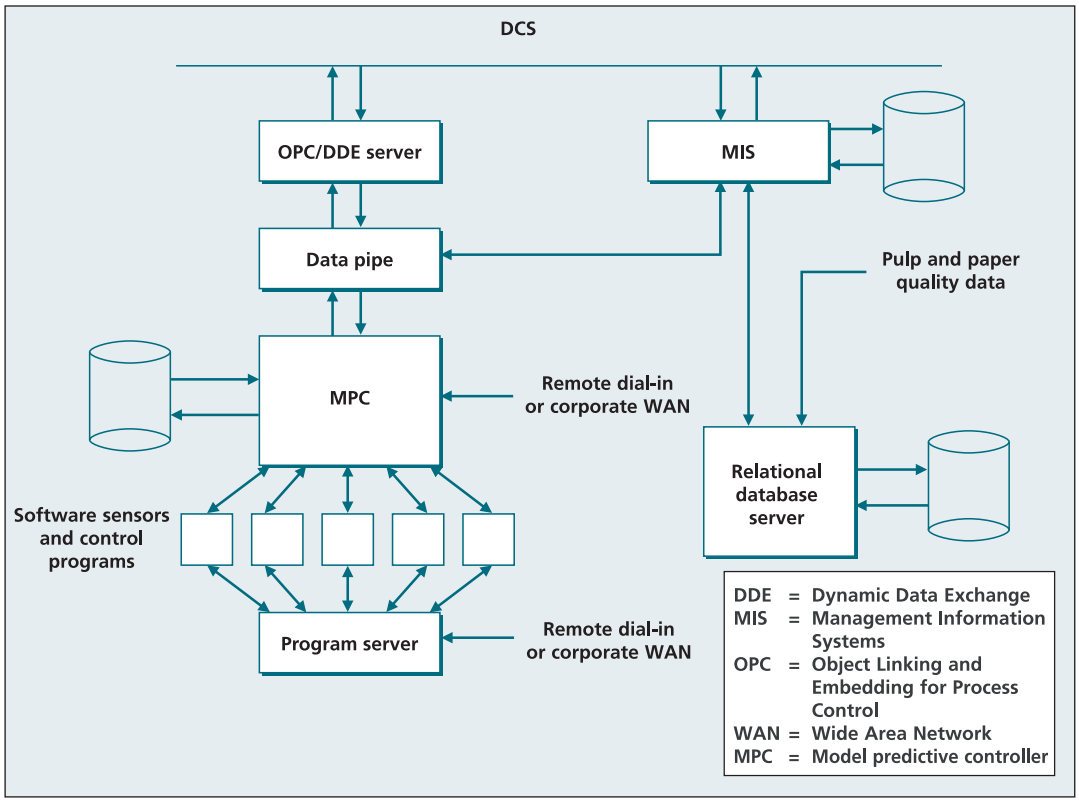
Augusta Newsprint, a joint venture between Abitibi-Consolidated and Woodbridge Co. Ltd., produces 440,000 mtpy of newsprint on two paper machines. The TMP plant produces around 1,000 mtpd, and there is a 450-mtpd recycled plant to support sheet requirements of up to 45% old newspapers and magazines (see sidebar, p. 36).

Augusta's TMP plant is comprised of four main lines, each with a primary and secondary 50-in. Andritz (Sprout Waldron) Twin 50-CP refiner driven by a 12,000-hp motor. There is also a screen room that features two stages of 0.006-in. slotted screens and three 12,000-hp, Twin-50 reject refiners. The screen room is also equipped with five Bird screens with 0.070-in. hole baskets.

Some of the idiosyncrasies of the TMP plant factor into recent process improvements at the mill. For one, the refiners predate gap control. Also, the Metso (formerly Sunds Defibrator) slotted screens are variable speed, allowing the mill to adjust the rotors.

In addition, due to cost considerations when the TMP plant was constructed in 1983, the four main TMP lines feed into only one 214,000-gal latency

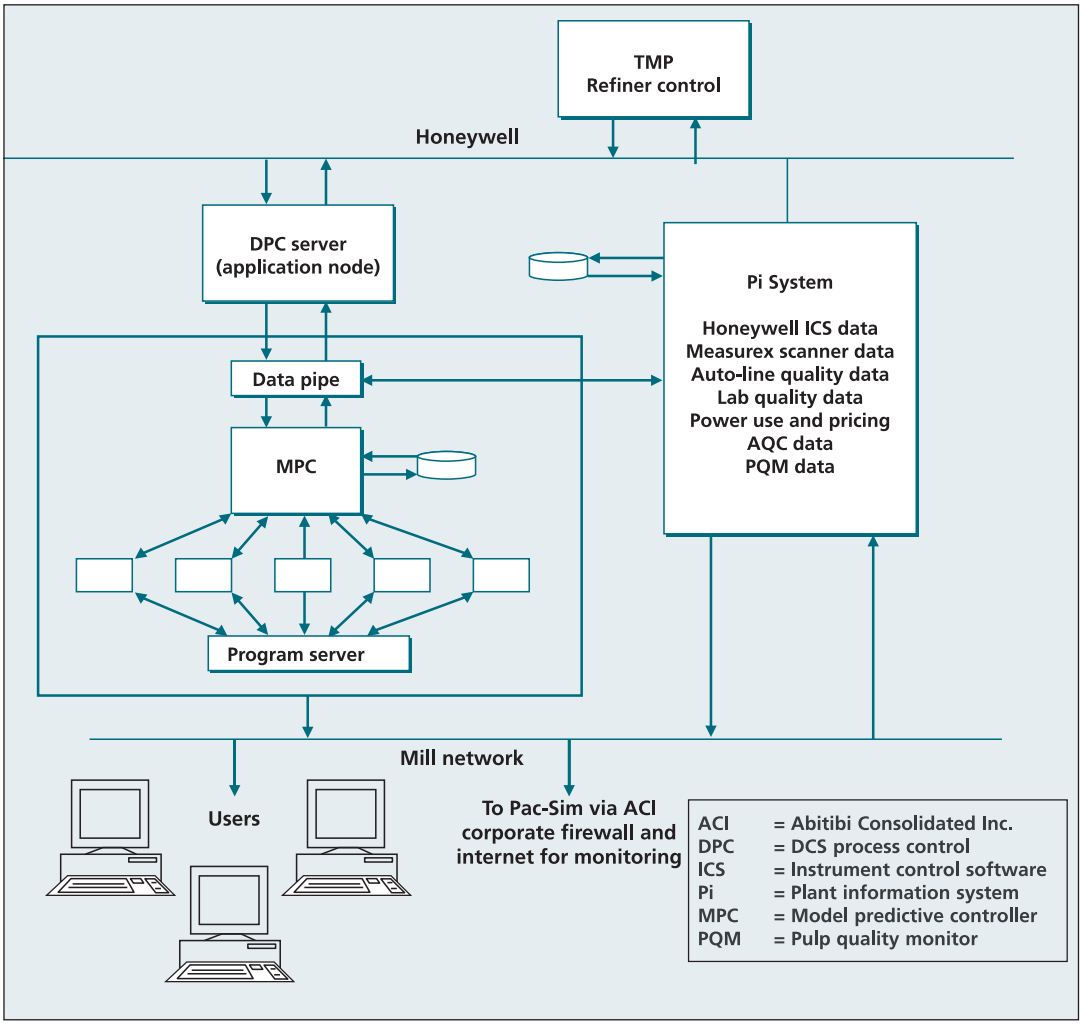
FIGURE 1.
Information infrastructure installed to implement the control system



chest, meaning the mill loses some of the individual knowledge associated with each line.

"One thing we needed to do was control specific energy on each line, but having one latency chest prevents you from knowing exactly how much mass is going through each refiner line," says Alford. "You can't just divide what comes out of the chest by four, because each line is different."

FIGURE 2.
Installed advanced quality control system



Installations and innovations

To correct the efficiency issues in the TMP plant and support the use of less kraft pulp, Augusta Newsprint purchased a PacSim Advanced Quality Control (AQC) system from Metso Automation for its refiner lines after research led by RNP superintendent Chris West and paper mill manager Jim Herrmann. The system incorporates a model predictive, multivariable controller (MPC) that interfaces with the mill's existing Honeywell distributed control system (DCS) and provides algorithms that suggest process changes to control quality based on software sensors. The DOE absorbed about 50% of the AQC's $600,000 purchase price, while the mill spent another $100,000 upgrading instrumentation so the MPC would have reliable information.

In December 2001, installation began for the AQC, which includes control systems for the mainline refiners, reject refiners, and screen room. These systems help control specific energy and blowline consistency to maintain freeness targets. Sensors are used to predict freeness, consistency, and reject rate, and historical data was used to create the predictive models. Figure 1 shows the information infrastructure for the AQC.

Sensors for freeness were installed on all refiners, as well as those for blowline consistency. Internal calculations are used to predict refiner freeness, and the mill controls to a freeness target as opposed to a specific energy target since there is only one latency chest.

Figure 2 provides a schematic of the installed AQC. The system gathers data such as motor load and dilution flow from the DCS and predicts freeness. Then, it sends adjusted settings for motor load back through the DCS.

Before installing the MPC for the AQC and its supporting architecture, the mill had to address issues associated with the lack of

"By minimizing variability, we minimize it for our customers," says TMP plant supervisor Michael Alford of the pulp improvements since installation of advanced quality control.

refiner gap control. The issue was pressing because the mill felt it might be over-refining and wasting energy.

Since a retrofit for gap control was cost prohibitive, E&I technician Steve Rooks, with input from the automation supplier, designed what the mill calls a "dither" for incorporation into the AQC. In this workaround, the AQC signals the DCS to pulse the plates together hydraulically, decreasing the gap, while it monitors whether motor load stays the same or decreases during this activity. If the load decreases, signaling the refiner is overcutting, the AQC signals the DCS to back out the refiner slightly and start over.

Making transitions and more

Prior to AQC installment, the refiners in Augusta's TMP plant used 145 horsepower days (HPD)/tonne of TMP pulp. With the new controls in place, the mill has been able to bring that number down to 125 HPD/tonne.

One way that the AQC has helped reduce energy consumption is by allowing the mill to question and assess various targets, says Alford. For example, the system provides a window into the impacts of reduced motor loadings on pulp quality (Figure 3). Alford estimates that about 90% of the benefits from the system have stemmed from reduced TMP plant energy consumption.

"We were running to freeness targets of 240-260 before the new system, and now we are at 330-340 because we saw no there were no quality variations, which translates to significantly less energy use through reduced motor loads," Alford explains.

Every hour, Augusta receives predictions for power rate changes from Georgia Power. This allows operators to drop or add TMP lines through the DCS based on the hourly estimate. The AQC is critical in this process because it helps meet the freeness and consistency targets much more quickly.

newsprint quality

Cultivating customer satisfaction

Augusta Newsprint has two wide, fast paper machines on which it produces sheets made of TMP and recycled ONP and OMP. At a 324-in.-trim width, the larger No. 2 paper machine typically produces a higher-strength sheet with anywhere between 35-45% recycled pulp, depending on the customer, while the 302-in.-trim No. 1 paper machine uses between 60-65% TMP. Customers include well-known dailies such as the *Atlanta Journal Constitution*, *Orlando Sentinel*, and *Tampa Tribune*.

Augusta runs anywhere from 27- to 32-lb newsprint. The prevailing trend is to try 27.5 lb, and many of the above customers are following this tendency, according to TMP supervisor Michael Alford. Changes such as the TMP plant's advance quality control (AQC) system described in this article are "setting us up to make the transition to efficiently making lighter weights," Alford says.

"The 27.5-lb sheet is not as strong as a 30-lb, but customers are demanding the lighter weight, meaning target changes in the TMP plant for us, and possibly the recycled pulp plant, to achieve customer satisfaction," Alford comments. "The market is very competitive, but products like the AQC definitely give an edge to deal with those types of challenges."

With the AQC, says Alford, the TMP plant can better control freeness to provide the necessary drainage characteristics and fines distribution required on the wire for a lighter sheet. Among other changes, adjustments in the paper machine's dryer section have also been made for better steam condensing and sheet drying. The bottom line, according to Alford, is to make a sheet that runs well in the customers' pressrooms.

"Typically, a large daily newspaper has four to five different paper suppliers, so we are compelled by competitive reasons to benchmark how well our paper runs in the pressroom," Alford describes. "We monitor parameters such as breaks per day and breaks per hundred rolls that are consumed. We watch our ranking, which normally runs around Number 1 or 2 in the varied pressrooms where we run."

Augusta Newsprint also has a "Drive-to" Team comprised of mill employees and sales staff members that visits customers to monitor the progress of the mill's products and provide feedback to a Customer Service Satisfaction Team. In addition, quarterly meetings between the sales team, mill management, and all "drive-to" participants are held to discuss runnability at customer sites and create a battle plan if issues arise.

"The model-based controller is able to predict the values needed to meet these targets before we can actually test for them," describes Alford. "So for that half hour as a line transitions back to production, we know that we only need to load up to 6 or 6.5 megawatts rather than 8 or 9, which saves money."

The advantages the AQC brings to transitioning lines up and down extend past energy cost. The mill now sees a transition time of 15 min. before pulp is of good quality — a reduction of 30 min., meaning that the paper machine will be less inclined to make off spec product for customers.

During these transitions, the variable speed screens offer an advantage in screening rejects that is controlled through the AQC. Operators speed the rotor or slow it with the system to control consistency and freeness to maintain a specific reject rate.

"We probably could have designed a way to do this through the DCS, but within the AQC, you can see so much more of the process," says Alford. "Rather than just adjusting one individual screen, the AQC can also see if there's something on the mainline or reject refiner that needs tweaking."

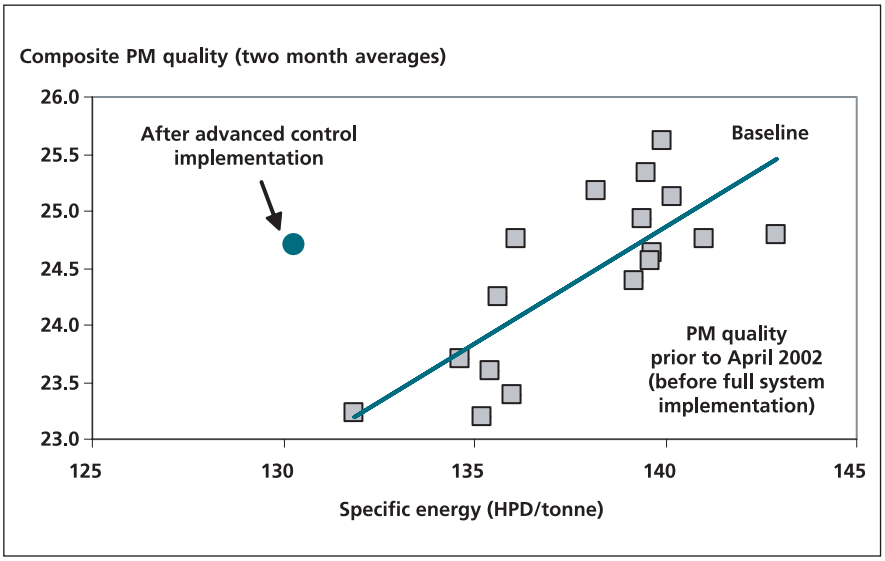
Through Augusta's Pi system, the AQC has access to both offline lab data on pulp quality and online data from a Metso Automation Pulp Quality Monitor (PQM) that monitors freeness and consistency. This lets the mill see impacts on the chest when a line comes back up.

The mill also has a sample point for the PQM on the accepts of the primary screens and the reject screen feed chest. When the mill began using PQM with the AQC, it was able to improve freeness variability out of the reject side, Alford says.

"If the AQC detects that freeness is up going into the reject screen feed chest, or that it's coming out higher from the reject refiners, it will adjust that refiner's target lower for you," Alford describes. "This happens almost immediately, rather than having to wait four hours for a lab test, so you have more control over that particular line."

FIGURE 3.

Performance of Augusta Newsprint's AQC system in the TMP plant is measured in terms of the quality and specific energy relationship. The goal is lower energy for a given quality than baseline. As seen here, specific energy is now significantly lower at a high quality level.



Better control of the TMP process, along with other adjustments, also allowed the mill to reach its goal of weaning from kraft consumption. Prior to AQC, the newsprint sheet was around 5% kraft, which reduced to 2-2.5% with the new advanced controls. With the introduction of enzymes in the pulping process, that percentage of kraft pulp is now zero.

Alford says the AQC saves the mill around $1.12 million/year, which is on track with DOE estimates.

An edge for the future

The AQC has positioned Augusta Newsprint to achieve further energy savings, along with quality improvements for customers (see sidebar, p. 36). Alford reports that the mill is working to reduce the transition time of 15 min. for TMP line startups and on-spec pulp production to 5 min. Also, the mill is working on an "Energy Blitz" project that will provide technology flow and consistency meters for controlling to specific energy - the "next step," according to Alford. However, challenges remain.

"When we installed the motor load controls through the AQC and dithering, the paper machine folks were astounded by the strength shift and we also got rid of the swings in quality," Alford describes. "But we still have to work on the freeness variability, which is our biggest nemesis right now. If we do, we can possibly make a target shift to use lower energy from 340 freeness to 350. We can also tell whether we should make this change on the primary, secondary, or the reject refiners. By minimizing that variability, we minimize it for our customers and at the same time put money back in Augusta Newsprint itself.

" We are going to push the envelope and remove as much energy from the TMP process as possible." P&P