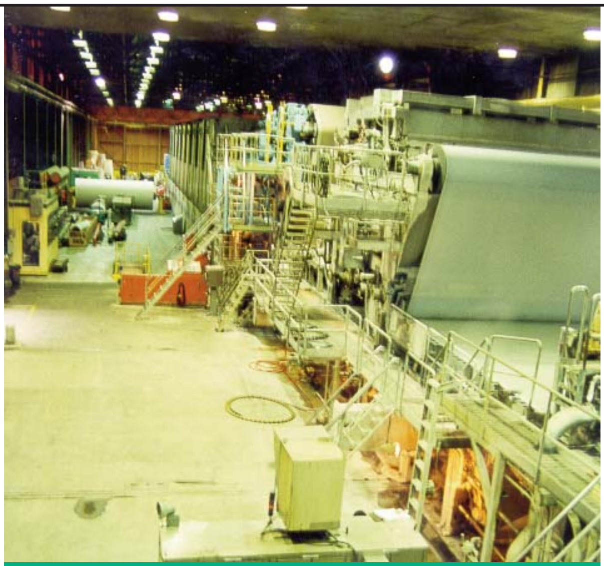
Abitibi Boosts Newsprint Output and Quality, Reduces Production Cost with DeltaV™ System, Fieldbus Technology

RESULTS

- Reduced installation cost
- Reduced training cost
- Reduced downtime
- Reduced maintenance cost
- Reduced operating costs
- Improved process control
- Improved product quality
- Reduced process cycle variability
- Estimated 1.8 year investment payback



APPLICATION

Pulping mill, newsprint production

CUSTOMER

Abitibi Consolidated mill at Steilacoom—near Seattle, Washington—with around 210 employees, produces up to 127,000 tons of newsprint per year. Major customers are large West Coast metropolitan daily newspapers, including The Seattle Times, The Orange County Register, The Sacramento Bee, The Everett Herald, and the Tacoma News Tribune.

CHALLENGE

The facility, which dates back to the turn of the century, began producing newsprint in the '40s. The plant's currently operating machine dates back to the mid-'60s. Maintenance, repair and upgrading equipment are a continual process, and a key part of electrical and instrumentation superintendent Richard Hatten's job. Hatten oversaw a three-area change-out of the plant's automated control system, to a PC-based digital system, including field-based architecture and FOUNDATION fieldbus technology. In the following paragraphs, Hatten recounts the system's reduced installation and maintenance costs, and the resultant increased control, performance, and product quality at the mill.

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For more information:
www.EmersonProcess.com/DeltaV

The control challenge

The Abitibi Steilacoom mill had issues with reliability and trouble-shooting of control hardware. The distributed control system we'd been using in most of the mill dated back to the late eighties and was the industry standard. The racks of stand-alone, digital analog controllers on our paper machine were micro-processor-based, but difficult to configure and maintain, and the controls were poorly documented. It was very difficult for us to manage, and we were largely dependent on contractor help for that management.

Intermittent hardware failures in the wet end of the paper machine had caused 10 to12 hours of shut down time in one month alone. The other major issue was correcting improperly implemented control strategies. When a controller was programmed, it did not generate a configuration document, so there was no accurate record of how it was last configured. The only way to tell was to manually scroll through all of the setup menus.

Our first challenge was in the reliability of several stand-alone controllers. The wet end cabinet is installed ten feet from the headbox—obviously a warm and humid environment. The system that pressurized the cabinet had failed and the air conditioning had failed, so the controllers were subject to this adverse operating environment, which contributed to failures.

A second challenge was some improperly set up control strategies and processes—specifically on our dry end pulper. These caused weight swings on the wet end of the machine, and often low-consistency stock back through the broke system. If we added water to correct consistency, somewhere down the line, we would have to take that water back out again. This manual correction invariably threw off the white water balances in the mill. This introduced variability on all the consistency loops that were dependent on a common white water source, compromising quality coming out of the pulper.

A third challenge was with the five sets of low volume condensate receivers, which reside in a very high vibration environment. These receivers drain the condensate out of the dryer section of the paper machine. The old pneumatic controls in this area were very susceptible to failure from vibration. As a consequence, we seemed to have a technician in every other day to repair those controllers. Adjustment was difficult and imprecise, and often the job was improperly done. The receiver levels would go unstable, and condensate would either back up into the dryer cans—which reduces drying capacity and slows the machine down—or they would run the receivers dry and we would cavitate and damage the pumps that remove the condensate.

SOLUTION

When we began looking at alternative systems, we had been paying a six-digit annual service contract to maintain the existing system, and I did not feel we were getting a good return for that fee. I had bad experiences with incompatibilities in gateways between control systems and PLCs, so I wanted one clean, integrated system.

Representatives from control engineering company PCE Pacific asked me to review Emerson's DeltaV™ system, and its field instrument integration path. We had a considerable investment in intelligent field instruments and an asset management system. I reasoned that if any system was capable of integrating these components, I wanted it. I'd first heard about the DeltaV system among the emerging PC-based control systems a couple of years earlier. But at the time I did not believe it offered all the features I wanted in a control system. Now, a few years after its inception, I saw a system designed to work in conjunction with the instrumentation that I was putting on the machine today.

Implementation

We began by installing the new system to control the 55 I/O in the machine's wet end. We had several days of outage to pull out the old controllers, modify the cabinet to accept the new hardware, and reterminate the existing wiring. We contracted our local representative to implement the existing control strategy in the new platform. To minimize impact on the operators, we emulated the existing faceplates in the new graphics. Everyone was nervous about the new system's startup, but it went very smoothly. When we did have a process problem that took the machine off line, we were able to use the new historian to systematically eliminate potential causes for the problem. Since it presents time-stamped events in the same view as the graphical history, determining cause and effect was easy.

Subsequently, we implemented the first phase of the dry end. This was a perfect opportunity to get our feet wet with fieldbus, because it was a stand-alone application with pneumatic controllers and some Fisher® valves. We purchased a cabinet and the configuration service. We developed all the graphics and did all the loop drawings and the training documentation for our operations staff. To resolve the ongoing control headache in the area with its high vibration level, we put new fieldbus differential pressure transmitters and valve positioners on the existing valves, all connected via one fieldbus segment going out to all five receivers. In each receiver, the PID control runs between the transmitter and the valve, so we now have five loops running on this one fieldbus segment. They all execute at about 400 milliseconds, for extremely fast control. The whole system for five level control loops and a serial interface to the PLC for motor control was installed in an eight-hour shift. By then our people had some training on the new system and we took over the project's configuration.

The next area was the steam and condensate system. Here, we put in the cabinet we had purchased for the condensate receiver. We did all the fieldbus and hardware engineering internally. We did all the graphics, and after some initial fieldbus configuration help, we did most of the control configuration internally as well. The commissioning was that easy.

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Reduced installation cost
On the dry end, there are 23 FOUNDATION fieldbus transmitters, and five fieldbus positioners, five that are analog, and five motors hardwired to the PLC. We cut the number of twisted pairs required from thirty-three to eight and, because of the serial interface to the PLC, we did not have to re-wire any of the motors. In addition, we were able to eliminate our traditional hard-piped conduit to each transmitter by using pre-fabricated fieldbus quick-connect cables with stainless steel connectors. These cables have excellent temperature and environmental ratings, and are standing up well to the dryer section's hot, humid environment. The serial interface was written in the native communication language of our PLC, so it was very easy to implement.

Reduced training time
Due to an oversight on my part, the operations staff was out of the mill on a two-week curtailment when they installed this phase of the system. I had written up some narratives and made some graphics, but had not scheduled any formal training. So when these operators returned to the plant, they found a totally new system to operate, with absolutely no training. To their credit, everyone on the staff picked up on the system right away. In fact by the next day, they were offering suggestions for improvements. The system is so simple and intuitive that operators, based on a little understanding of the process, were able to navigate their way around the whole system, and get the information they needed to control the process, with just a few simple key strokes.

Similarly in the wet end, when we implemented the system changeover, we programmed the new system's faceplates to look similar to the old single-loop controllers. So when we made the transition, the operators came in and, with only a couple of hours training, were able to navigate and control the machinery.

Reduced downtime
We immediately eliminated down time losses. And we calculate payback on the system, based on previous downtime, at 1.8 years—a rather quick return on our capital expenditure.

Reduced maintenance
Perhaps the best maintenance result of the changeout is in the steam and condensate area. Here, I can now watch the positioners hold their condensate levels within a fraction of an inch. Since the changeover, this area has gone from being the number one maintenance problem on the entire machine, to being a non-issue. It is just basic control, but the control is being executed right there on the valve positioner in that high vibration environment, and they stay dead on.

Reduced operating costs
I have also been working on a program to eliminate all of the old control system hardware over a period of time equal to the amount we would pay on an annual basis for the system's support.

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The second thing we have seen—though not a high cost impact for us—is big savings in steam consumption, which we have documented at 200,000 pounds per month. The original control strategies were improperly implemented on the thermo-compressors. One of the first things the dry end operators pointed out to me was that we were no longer using any make-up steam. And the reason is simply that the old single loop controllers could not maintain levels and differential pressures adequately by flashing condensate from high-pressure receivers into the next, lower pressure, receivers, thus saving energy. So the mill had been using makeup steam at every set of dryers. It was very simple in the new control system to get the thermo-compressors working properly to provide the flash steam.

Improved product quality

The side benefit from increased level and pressure control, which will ultimately be far more important than the steam savings, is the quality of the paper itself. Though difficult to quantify, the quality was evident right away in the form of more uniform paper. With better level and differential pressure control comes better temperature control. During the first month's operation, this has resulted in dramatic moisture variability reduction, which in turn greatly impacted the quality of sheet caliber, basis weight and moisture content, and bottom-line profitability of the machine.

Improved control

With the installation of the new system, I got a huge surprise when I saw the tuning numbers in the dryer section. In the past, we had to rely on experience and gut feeling to tune the loops in the dryer section. With the tuning information provided by the new system, we can now see the hard data and make truly informed decisions. This aspect of the system has empowered our operators. We have given them information that they had always lacked before. They are able to use that information to make good decisions. And the reliability of making grade changes is an immediate win.

Improved production

Possibly the most important benefit we can attribute to the new system is an output improvement. A sheet break on the machine puts it into an unstable situation. When you thread back up you've got to cycle out the variabilities before regaining normal inspector grade. With the new system, we've been able to reduce the number of sheet breaks. And when we do get a break, we are now able to thread up and get back on grade faster.

In conclusion, I'm convinced that we've met every criterion we started out to meet in terms of reduced down time, and improved quality and reliability. None of the controllers on the fieldbus side has given us the slightest problem, and we feel that the maintenance cost of the system will be greatly reduced as a result of all the off-the-shelf equipment that

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Electrical and Instrumentation Superintendent, Abitibi Consolidated, Steilacoom Mill comprises the new system. And we fully expect to see a big payback in reduced long-term maintenance of this system. Combine that with the supportability from a local sales force from the vendor, and I think we've got a perfect solution.

In summation, the new system enabled our maintenance and operations staff with some tools that allow them to take our paper machine to the next level of performance and quality. With the improvements we've implemented in this old plant, the quality of our product is on a par with any of our competitors. We now have a direction in which to continue cost-effectively increasing our quality and output. Our future steps include continuing to phase out the older generation system, opening further opportunities for variability reduction and production increases we can capitalize on.

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