In a league of its own

One of the world's most modern pulp mills uses ABB's 800xA Extended Automation System

Lena Sjödin

With an annual production of 500,000 tons of pulp – including 420,000 tons of kraft pulp and 80,000 tons of CTMP pulp – SCA's plant in Östrand, Sweden, is high on the list of Europe's largest pulp mills. Operating 24 hours a day all year round, wood from the forests in Northern Sweden is processed into chlorine-free bleached kraft pulp and semi-chemical pulp that is eventually used in everyday products such as magazine paper, tissue paper, hygiene products and packaging. Ensuring production stability and efficiency to the highest standards requires a flexible and reliable control system. These values are fundamental to ABB's Industrial^{IT} System 800xA mode of operation and that is why it was selected to help turn one of Europe's biggest pulp mills into one of the world's most modern.

Following two years of construction work and expenditures totaling US $1.6 billion, another of SCA's[1] large-scale industrial investments in Sweden is complete. To be more precise, the Östrand mill (see photo below) is now perhaps one of the most modern in the world. Both the recovery boiler, which started operation in October 2006, and the water treatment system are controlled using ABB's Industrial^{IT} Extended Automation System 800xA[2] – an investment that has made an integrated system with graphical function design features and an advanced simulation interface possible.

A requirement of the new integrated control system was that it should unite electrical generation and instrument operations in the most advantageous way possible.

In search of integration

The decision to purchase an integrated control system was reached at the same time the company decided to buy a new recovery boiler. However, the search for possible control system suppliers had in fact started more than a year earlier. One of the most important criteria the new system had to meet was that it should unite electrical generation and instrument operations – which previously had separate control systems – in the most advantageous way possible. This was desirable partly to overcome the drawbacks in terms of production quality that come with having distinct departmental divisions, and partly because it takes both time and resources to maintain functioning communications between two separate systems.

The procurement process for the new control system started in 2003. An engineering group within the automation department undertook a four-month research period that included a number of research trips before a specification was established. According to Alf Eriksson, Östrand's head of automation systems, "We had a great deal of input and secured support from the organization throughout the procurement process. In order to really be able to compare what the different potential suppliers had to offer, we provided them with hypothetical flow charts to see what kind of technical solutions they could come up with. We then tested all of the proposals during a two-week testing phase." When the need to make a decision regarding investment in a new recovery boiler came up in August 2004, the organization was already prepared to choose ABB's Industrial^{IT} System 800xA. "Perfect timing," says Alf Eriksson. 1 shows a typical integrated solution based on System 800xA.

"Having everything governed by the same system definitely provides us with superior control," adds Alf Eriksson, who now oversees a comprehensively integrated department. "The advantages of the new arrangement will manifest themselves over time. But we are already seeing advantages in terms of simplified work routines for switching between maintenance and production modes, and the dialogue between the electrical-generation and instrument disciplines has become more natural."

"Green" power

The new soda recovery boiler is a combined recycling facility and steam boiler. Its raw materials are the used chemicals and wood waste from the kraft mill. The chemicals are recycled and reused while the wood scrap is burned to fuel the boiler. Steam is produced at a pressure of 105 bar and a temperature of 515 °C, higher than in any other comparable facility in the world. The new recovery boiler and the new turbine enable a doubling of present biomass-based electricity-production to 500 gigawatt hours per year. As a result external electricity requirements will be drastically reduced thus putting the Östrand pulp mill complex at the cutting edge of what is currently possible. Even at today's production level of 420,000 tons of pulp per year, the kraft mill will actually make a net contribution of "green" power to the electricity grid.

The system comprises nine operator stations and seven AC 800 M processing stations for control of the recovery boiler and the water treatment plant, as well as a control system simulator.

SCA's Östrand pulp mill, Sweden (Photo: Michael Berggren)

Footnotes

[1] http://www.scatissue.com/about/corphistory, (March 2007)

[2] More information can be found at www.abb.com/controlsystems, (March 2007)

This can be increased when, at some time in the future, the new boiler is expanded to its full capacity of about 800,000 tons.

Simulation is key to better understanding

A congenial work atmosphere reigns in the joint control room in Östrand 2 with a modern systems platform that can be modified to meet future functional requirements. System 800xA is open-ended and versatile with excellent modalities for aspect coupling, and involves clear advances from the standpoint of safety.

The system delivered by ABB comprises nine operator stations and seven AC 800 M processing stations for control of the recovery boiler and the water treatment plant 3. It also includes a control system simulator for the boiler with two operator stations and a smaller training system. The simulator is based on a mathematical model of the recovery boiler, which is a complex process involving both combustion and chemical reactions. There are pre-programmed scenarios such as basin leaks, electrical failure, dry-content problems and furnace leaks. These scenarios can be combined with a number of so-called "snapshots", each of which represents a different operational state of the recovery boiler.

The goal throughout has been to provide information in a way that is immediately accessible and easily comprehended even by occasional operators.

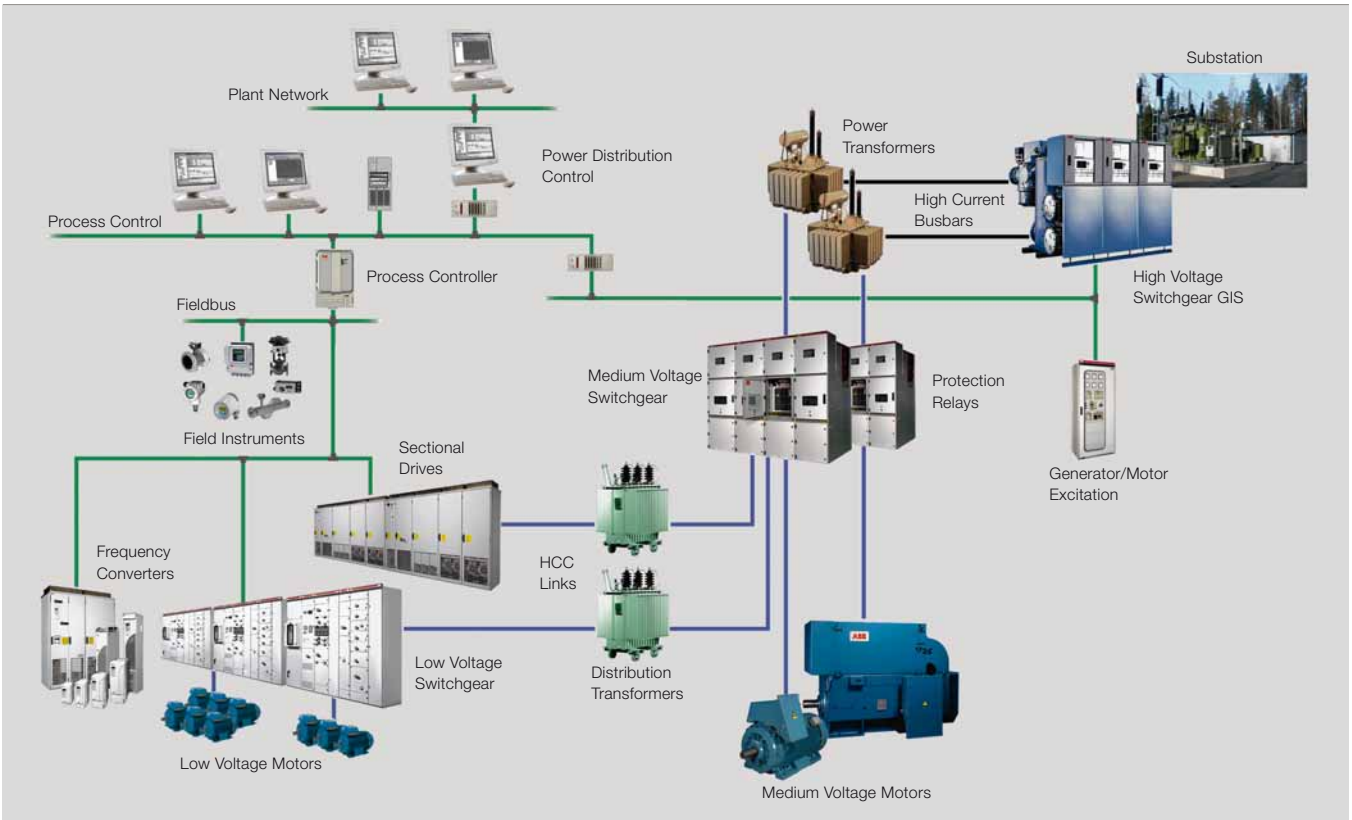
"ABB had the best simulator solution," says Alf Eriksson. "It enabled us to do a dry run with the recovery boiler before it was operational. Now we can conduct training using an exact mock-up of the control system. If we make adjustments to the programming of the operational system, it is easy to transfer them to the simulator, which means that it will remain useful over a longer term. "

Old way of working translates into new way of thinking

The Östrand mill has a long tradition of proprietary programming, and this has also been extended to the new system. Östrand's standard protocols have been applied to the operation of ABB's System 800xA. The basic ideas and the thematic approach to the old way of working have been translated into a new way of thinking and related to a different process. The goal throughout has been to provide information in a way that is immediately accessible and easily comprehended even by occasional operators. To achieve this result the 800xA's graphical function design has been a useful tool and the Östrand mill is the first in Sweden to use it. Presenting information related to each function as a diagram rather than in text form facilitates a deeper understanding of the underlying process. The graphical function serves as an interpreter that translates the program language into something familiar.

"With graphical function design, you can easily access your application

1 A typical configuration of electrical integration



2 Control room at the Östrand pulp mill complex in Sweden (Photo: Michael Berggren)

3 Controllers at the Östrand mill (Photo: Michael Berggren)

translated to a universal language," explains Alf Eriksson. "This gives you a useful overview and facilitates troubleshooting, for example."

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Fieldbus capability a must

Another important criterion for SCA was that the system should interface advantageously with data-bus technology and be able to handle an increased volume of information related to preventive maintenance.

The mill has a long practice of using Advanced Switching Interconnect (ASI) Profibuses, and great weight was attached to finding a new control system for water treatment that was compatible with existing field buses. With the new recovery boiler, all frequency converters and approximately 90 percent of switchboxes are controlled via Profibuses. Digital signals for everything from shut-off valves to alert systems are controlled by ASI. The analog signals are distributed to fieldboxes.

"We make extensive use of HART-I/O and have now begun to work towards managing the increased data provided by ABB's 800xA in developing routines that will make it possible for us to predict the need for maintenance more accurately than we can today," says Alf Eriksson.

Customer needs linked with system potential

A close relationship with ABB's service organization and a favorable service agreement were decisive factors behind the decision to invest in the 800xA. A resource person from ABB was present at the mill throughout the programming and installation period to assist in optimizing utilization by helping to unite the system's potential with Östrand's needs.

"The resource person has meant a lot to us and to the project," says Alf Eriksson. "We have learned a great deal in the process and I believe ABB has also gained some knowledge because of the critical scrutiny we bring to bear on functions and solutions."

Considering that the old solution with two different control systems had been in place for twenty years, the changeover was smooth, partly because the technical transition was carried out without a hitch and partly because operations and maintenance personnel took to the new control system in exemplary fashion.

"With graphical function design, you can easily access your application translated to a universal language" – Alf Eriksson.

"It goes without saying that the challenge was initially daunting but the longer we work with the new system, the more we see its advantages. We're not rushing around but are rather following a methodical course of improvement. All of our employees have worked impressively on this project. Many deserve praise for the support they have given to others. The result is that we have been able to meet our quality and productivity goals despite the enormity of the undertaking."

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