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Skoghall press trip

Stora Enso

Helping Stora Enso achieve big energy savings

Stora Enso, the world's biggest papermaker, has slashed carbon dioxide emissions at one of its largest mills with the help of a range of technologies from ABB.

The Skoghall paper mill in central Sweden cut carbon dioxide emissions by about 170,000 tons a year following a two-year revamp costing 211 million euros (\$290 million).

“This was a very large project which was implemented without stopping production,” said Peter Olsson, engineering manager at Skoghall mill. “The demands placed on project planning were extremely high, as were the demands on equipment with regards to availability, security, user friendliness and energy efficiency, to ensure that the mill will be competitive for years to come.”

The Skoghall mill is gigantic: every day, 100 truck-loads and two train-loads of logs arrive at the mill to be chopped, processed to a pulp and turned into paper. Workers use bicycles to circulate in the cavernous hangars that house the two 300-meter long paper-making machines. In less than an hour, one of them can produce enough paper to make 2 million milk cartons.

The big energy consumers are the boilers that produce steam to power turbines that generate electricity for the mill and it is these that Stora Enso rebuilt. ABB's contribution to the project included:

- High-efficiency motors
- Variable-speed drives to help adjust the speed of the motors to the processes they are running. Many motors in industry waste energy by operating at full speed even when not required.
- A motor management system that optimizes the coordinated operation of a whole set of motors running at constant speeds.

- ABB's System800xA to control the recovery boiler, where waste from the pulping process is burned to produce steam and chemicals are recovered. The system collects and analyzes data in real time from thousands of instruments fitted to equipment throughout the plant, helping operators adjust the settings to run operations at their optimal level to get the most out of the energy consumed.
- Instruments to measure flows, temperatures and pressures on equipment around the plant and feed the data to the control system.
- A MicroSCADA installation helps to prevent blackouts and disturbance, plan power consumption, and provide total control over the power supply with real-time data from the substations.

The revamp of the recovery boiler and the conversion of the oil boiler into one that burns organic waste – mainly bark, sawdust and other waste wood – helped reduce oil consumption by the equivalent used in 30,000 Swedish homes with oil-based central heating.

Discharges of oxygen-consuming substances from plant processes into the nearby lake were cut by 10 percent. And since boilers now produce up to 40 percent of the electricity Skoghall consumes, the mill's equipment must be as energy efficient as possible.

The savings achieved at Skoghall make the mill more competitive, securing production and therefore jobs at the Swedish location, which is the world's biggest plant for liquid packaging board, used to make drink cartons.

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Motors and drives

Picking the low-hanging fruit

Motors offer the biggest potential for energy savings in industry. They run everything from machines and fans to conveyors and pumps and account for about two-thirds of the electrical energy used in industry.

There are about 7,500 motors in operation at Skoghall alone, and millions in use around the world in industries as varied as agriculture and cement, transport and mining.

Motors come in different efficiency categories, like light bulbs or fridges, although ABB's long-standing policy has been to offer high-efficiency motors only. When the European Union introduced its three-tier classification of motor efficiency in 1999, all ABB motors fell in the top two classes.

It makes financial sense to spend more on a motor that consumes less, because the purchase price is only about 1 percent of the total cost of ownership of a motor over its lifetime, the rest being energy. As an example of the savings that can be achieved, a new ABB motor in the highest efficiency class reduces emissions of greenhouse gases by eight tons a year compared with a 75-kilowatt, four-pole motor in the second-highest class.

Most of all though, it makes sense to combine electric motors with variable-speed drives. These are devices that regulate the speed of a motor to the needs of the process it is running. This can reduce consumption by 50 percent for motors running pumps or fans, because the alternative is often to let the motor run at full speed and simply "throttle" the output, like controlling a car's speed by stepping on the brake while the other foot remains on the accelerator.

Despite the scale of the potential savings, less than 10 percent of motors worldwide are equipped with a variable speed drive.

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MicroSCADA

Managing the power supply for better results

Controlling the power supply in an industrial plant is a job performed by MicroSCADA. As its name suggests, it is a smaller version of SCADA, or Supervisory Control and Data Acquisition, which is used to manage power supplies on the high-voltage networks of utilities.

The two perform much the same function on a different scale, which is to collect, store and analyze data from points all around the network, perform network modeling, simulate power operation, pinpoint faults, preempt outages and trade energy.

Power supplies are prone to dip and surge depending on weather conditions or demand, and a sudden change can affect the quality of a product such as paper where the machines are expected to produce rolls of uniform thickness and purity in a continuous process. Poor quality results in a waste of raw materials.

The main benefits of MicroSCADA in an industrial plant such as the Skoghall pulp and paper mill is to prevent blackouts and disturbance, plan power consumption based on historical information and have total control with online real-time data from all substations. This careful planning of energy requirements and ability to optimize energy trades based on historical data contributes to lower energy consumption.

The benefits of advanced power system management require the automation of local operations and the collection, evaluation and forwarding of data on the power system status and plant condition to higher-level systems. At Skoghall, the power management system is connected to the System 800xA installation that controls the recovery process.

MicroSCADA was developed by ABB in the 1980s and is now in utility and industrial installations all over the world.

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Instrumentation

Gathering the data on which decisions are taken

The thousands of instruments fitted to equipment around a complex modern plant such as Skoghall perform a crucial function: they provide the information which operators use to run the production processes.

If the information is faulty, the decisions will be faulty and quality will suffer.

Instruments must therefore fulfil the highest quality standards, performing extremely accurate measurements, maintaining that precision over their lifetime and sending the data to a control system in real time.

Only then can operators adjust processes in such a way that they can get the highest quality and quantity with a minimum of energy and raw materials.

ABB has been making instruments for more than 100 years and has a range of products that meet the highest international standards. Each instrument is tested before leaving the factory and provided with a certificate of accuracy and performance. The devices are capable of providing measurements with an accuracy of as much as 99.96 percent.

ABB's products include meters that measure flow, pressure and temperature and instruments to analyze gases and liquids. ABB also has special training events, because it is not enough to receive accurate data: it is necessary to know how to interpret the information.

Instruments that monitor equipment for wear and tear are gaining in popularity because they can help avoid unnecessary maintenance stoppages that lower productivity and waste energy. These meters not only describe the fault and its severity, they also identify the probable cause and suggest a course of action.

Pulp and paper is one of the main industries served by ABB's Instrumentation business, along with food and beverage, water, chemicals, pharmaceuticals, oil and gas and power generation.

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Motor management systems

Motor management for energy savings and reliable production

Motors are big users of energy in industrial processes, but consumption can be reduced in several ways, starting with the selection of high-efficiency motors. Those that don't always have to run at full speed can be equipped with devices that adjust their speed to the process they are running, while savings for constant-speed motors can be achieved with low-voltage switchgear.

About 5,000 motors at Skoghall are controlled by ABB switchgear, including 400 that are linked to an 'intelligent' motor management system. Intelligent systems gather data about the performance and state of equipment and help to determine when maintenance is needed and what needs to be done.

These motor management systems make it possible to determine the required dimension of a constant-speed motor much more accurately than with traditional motor-protection technology. By dimensioning a motor more precisely, energy wastage can be avoided.

ABB's motor management systems not only reduce the power losses of an individual motor but optimize the coordinated operation of a whole set of motors in a plant.

For example, a factory may have 200 motors in continuous operation to run a process, all dimensioned at 37 kilowatts (kW). ABB's latest intelligent motor management system, called MNS iS, can help to optimize the process and calculate a more exact dimensioning of the motors, which may be only 30 kW per motor. In such an example, the annual savings would be 180,000 kilowatt-hours and 90 tons of CO₂ emissions.

Energy saving is the common feature for all ABB's intelligent electric products. In addition, the modern MNS iS monitoring technology helps prevent motor breakdowns and thereby increases the reliability of the whole plant.

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System 800xA

The brain of the recovery process

ABB's Industrial IT System 800xA is the brain of Skoghall's recovery process, where energy is produced to run the plant. This top-of-the-line control system is linked to thousands of devices that measure pressures, flow, temperatures, etc. on equipment around the plant. It compiles and displays the data in real time, providing the information needed for Skoghall's personnel to make critical business decisions.

By making full use of System 800xA's capabilities, the staff can adjust the process to run at its optimal level, reduce energy and raw material consumption, as well as keep the vital processes running without any undesired interruptions.

The control applications are specifically developed for the pulp and paper industry and are based on industry-specific application libraries and solutions. Together with ABB engineers' know-how and extensive experience it secures an installation with high quality.

The versatility of the control system is enhanced by its ability to integrate ABB as well as non-ABB products and systems such as quality control, switchgear, drives or instrumentation, which enables substantial cost savings and productivity gains.

By providing a robust and integrated working environment, System 800xA reduces the time to decision and action so that the operator can focus on improving and tuning the production process. In addition, the system can be used in combination with devices that monitor the state of the equipment to improve the planning of maintenance and reduce unnecessary stoppages. In this way, production time is increased and the customer can get the most out of the plant's assets.

One of the key advantages of System 800xA, which is based on ABB's patented Aspect Object technology, is that it provides a consistent and uniform method for accessing enterprise-wide data and for interacting with multiple applications. What's more, this can be done from any workstation in the plant or office and in real time.