

System Sweetens Bottom Line for Sugar-Making Company

FOCUS ON SOFTWARE?

RRB Sugar Mills Ltd. is one of India's largest sugar producers with a cane-crushing capacity of 400 tons of cane per day. While most industries rely on external power sources to fuel their operation, sugar manufacturers can produce their own power in a process called cogeneration. As part of the process of producing sugar from sugar cane, by-products such as bagasse — a leftover fiber from the crushing and extraction process — can be employed as eco-friendly fuel for power cogeneration. The bagasse can be incinerated to fuel a boiler furnace, which can be used to produce electricity. The power, produced by the furnace, can be used in the production of more sugar cane — a net positive energy gain.

Historically, sugar mills in India were permitted to produce only the energy they needed for their own operations. Most Indian sugar companies, therefore, adopted the practice of installing inexpensive boilers and turbines, which also happen to be notoriously inefficient. They typically would operate only during the sugar season. After all, why invest money in an expensive, efficient system when there is very little opportunity for a return on that investment?

In the mid-1990s, however, the Indian ministry of power began permitting companies to generate surplus energy. The energy could then be exported to the state electricity board or to other manufacturers in order to subsidize production costs, promote competition, and makes electricity more plentiful for everyone.

When exportation of energy was permitted, many plants, including RRB Sugar Mills, began to look for ways to increase the efficiency of their power plants. At its Wategaon facility, RRB installed back-pressure turbo-alternators with two high-pressure boilers, a turbine generator, and a back-pressure turbine generator. This required a new control system, and InduSoft Web Studio was chosen to develop an HMI/SCADA system that would ensure an efficient plant. Although the system was initially installed only to control the boilers, it worked so well that RRB expanded it to control the entire sugar-making and wastewater processes.

The Challenge

Project managers at RRB knew they needed a systems integrator to develop and implement the automation and control system, and they turned to Control and Solutions India Limited (CSIL). CSIL was chosen because it specializes in automation and control systems for process industries, building automation, and substation automation. After reviewing the existing cogeneration system, CSIL provided RRB several options for a centralized system that would meet its requirements. Ultimately, RRB selected an InduSoft Web Studio-based HMI/SCADA system with Honeywell PID loop controllers.

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The boiler control has many useful features that have made the process much more manageable. For example, it reads boiler process parameters from primary sensors and secondary instruments, which helps RRB control critical points in the process. The system also controls threshold deviations and activates alarms if thresholds are breached. History data logging is built into the system and a browsing feature provides access to the logs for a complete history of the operation.

The Solution

Designed for Microsoft Windows environments, InduSoft Web Studio uses open technologies to connect to monitoring and control hardware and third-party software applications. Honeywell's PID controllers are based on open technology and were easily networked to the InduSoft-based system.

To monitor the boiler temperature, temperature scanners were integrated into the InduSoft system through a Modbus communication driver. The application collects temperature data from these scanners, displays temperature values on color graphic screens, and logs the data where it can be used to generate graphs.

CSIL and RRB engineers developed the HMI/SCADA applications, which included control algorithms, alarm and reporting systems, and data logging functions. This full-featured performance management system was developed and implemented using InduSoft Web Studio's menu-based Rapid Application Configuration Environment (RACE). The InduSoft-based system presents real-time data from the boilers and turbines to the analyzing logic and then downloads appropriate set-point changes to the PID controllers.

Automating Production

After the power generation control system was updated, CSIL and RRB turned their attention to automating the sugar production process with InduSoft Web Studio. In the sugar industry, capacity utilization is conceptually different than most industries. It depends on three crucial factors: the tons-of-cane-per-day rate, the recovery rate, which primarily depends on the quality of the cane, and the length of the crushing season.

The production tonnage is a function of the plant capability and variables governed by the other two factors (cane quality and crushing season), both of which are dependent on plant location. The quality of the cane is outside factory control because cane is not usually transported great distances. Production plants must rely on local cane crops, the quality of which depends on climate and weather patterns as well as soil and geography. Likewise, the length of the crushing season also depends on local climate. Southern India, which has a tropical climate, has the longest crushing season and plants in the region tend to produce the greatest tonnage.

During the refining process, the natural sugar stored in the cane stalk is separated from the rest of the plant material as it moves through the sequential production

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phases. First, the cane is pressed to extract the juice. Next, the juice is boiled until it begins to thicken and the sugar begins to crystallize. Then, the crystals are moved to a centrifuge to remove the syrup, producing raw sugar. Finally, the raw sugar is sent to a refinery where it is washed and filtered to remove remaining non-sugar ingredients and color.

As you might imagine, the equipment that performs each step in the process is very complex, and careful monitoring is necessary to ensure both an efficient process and a safe work environment. First, a complex system comprising a boiler, a deareator, and a pressure reducing and desuperheating station (PRDS) is employed. The plant also contains a boiling house, which contains a mill, pan, and crystallizers. Finally, a steam distribution system and a wastewater system are employed to distribute steam and bleed off condensation.

Using InduSoft Web Studio, parameters at every step in the process are monitored for quality assurance of the raw sugar to maintain efficient cogeneration of power and, above all, to ensure personnel safety.

The Results

In addition to the production and quality gains they realized, RRB's engineers and operators were quickly trained on the new system. They can make adjustments to the system themselves so there is little need for field support.

All systems send information to the master control room where hourly MIS reports are generated and sent to the central office server. These reports can then be accessed by the executive office and quality control.

With InduSoft Web Studio-based solutions running on both boiler systems, the sugar-making processes, and the wastewater system, RRB Sugar Mills can evaluate the system's overall efficiency. In the cogeneration system, improved efficiency reduces the per-unit generating cost. Also, because the system is less volatile, the costly boiler and turbine are less prone to wear. The system's hardware modules also continue to perform reliably. Service calls have been substantially reduced and costly spare parts are rarely needed.

RRB has been able to gain a competitive advantage by automating their operation using an InduSoft Web Studio-based solution. Reduced cost and improved productivity, a natural by-product of this sort of high-tech automation, ensures more plentiful sugar for local consumption and export, an economic benefit to the local population, and affordable power for the region.

More information is available by contacting InduSoft, Austin, TX, at 877-463-8763, 512-349-0334, or info@indusoft.com. Parameters at every step in the process are monitored for quality assurance'

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