

## Solution

- **Distributed control solution**
  - Allows each segment of system to be controlled by separate unit
  - Easily expanded and networked
  - Monitoring system integrates with third-party equipment and collects, displays and logs data

## Results

- **Decreased system volatility**
  - Improved temperature and pressure variance from  $\pm 10\%$  to  $\pm 5\%$
  - Reduced equipment wear and tear
- **Increased overall system efficiency**
  - Cut per unit generating cost
- **Lowered maintenance costs**
  - Easy-to-use programming software enables quick adjustments by on-site engineers
  - Components rarely need repair or replacement
  - Cost of new system less than annual maintenance cost of previous system

# Rockwell Automation Distributed Control Solution featuring FlexLogix, improves pressure variance in cogeneration boiler from $\pm 10\%$ to $\pm 5\%$

System Integrator Energy Ventures develops cost-effective solution for Dhampur Sugar Mills Ltd., which dramatically reduces maintenance costs and enhances system reliability.



## Background

Sugar production, an important industry in India for centuries, experienced dramatic growth during the post-colonial period. In the last half of the twentieth century, the number of sugar mills operating in the country tripled and the installed capacity increased by more than ten times. Today, India ranks second only to Brazil as the world's largest sugar producers. The country generates between 15-20 million tons of sugar each year, and nearly all of it remains in country for domestic use.

India's dramatic production gains were achieved in large part due to forward-looking companies, such as Dhampur Sugar Mills Ltd. Established in 1933 with a cane-crushing capacity of 300 tons of cane per day (TCD), Dhampur Sugar Mills has expanded from its initial site at Dhampur to four locations throughout Northern India and Nepal. Today, the combined crushing capacity of its facilities stands at 32,000 TCD, making Dhampur one of India's largest sugar producers.

While most industries rely on external power sources to fuel their operation, sugar

manufacturers can produce their own energy using a processing by-product. Bagasse, the fiber of the sugar cane that remains after it has been crushed and the juice extracted, can be converted into an eco-friendly boiler fuel for cogeneration. Cogeneration is the simultaneous production of process steam and electricity.

Historically, sugar mills in India were allowed to produce only the amount of energy needed for their own operations. However, in the mid-1990s, the Indian Ministry of Power began to allow companies to cogenerate surplus energy and export it to the state electricity board or other manufacturers. Dhampur Sugar Mills was one of the first Indian companies to take advantage of this new opportunity.

Dhampur Sugar Mills Ltd. is a US\$111 million organization employing more than 6,000 individuals. In order to make its operations more sustainable, the group has diversified its offerings in recent years to include chemical manufacturing and cogeneration export.

## Challenge

Before the Ministry of Power's policy change, Indian sugar companies traditionally installed inefficient boilers and turbines in their captive power plants and created power only during the sugar season. Since they had an abundance of fuel and no opportunity to sell excess

energy, sugar companies had no incentive to install efficient cogeneration systems. Once exporting energy became a possibility, Dhampur Sugar Mills began to look for ways to increase the efficiency of their power plants.

To increase their energy-producing capabilities and facilitate year around production at their Rauzagaon facility, Dhampur replaced the low-pressure boilers (21ata/340°C) and back-pressure, turbo-alternators with two high-pressure boilers (65ata/480°C), one extracting cum condensing turbine and one back pressure turbine. A Distributed Control System (DCS) running on Modbus was installed to control the system.

Initially, Dhampur was satisfied with the performance of their new system. However, ongoing maintenance proved very costly. The DCS system was designed using complicated FBD and STL programming languages. Despite extensive training, Dhampur's staff discovered that making even minor adjustments to the system logic was difficult. On-site support by the system's supplier was often required, but the work was frequently delayed because the supplier had so few senior project engineers on hand to troubleshoot the system. In fact, the supplier often resorted to flying an engineer from Bangalore / Mumbai to the Rauzagaon site, which added

transportation costs to already expensive service charges.

In addition, the specialty analog PID modules, which controlled the temperature and steam pressure within the boilers, often failed and needed replacement. In fact, the replacement cost of the modules soon represented a significant proportion of the initial cost of the entire system. And even when the modules were operating correctly, they were allowing a boiler pressure variance of  $\pm 10\%$ , which compromised the system's overall efficiency.

## Solution

To improve the output of their cogeneration system and control maintenance costs, Dhampur Sugar Mills required a new user-friendly, reliable control system. The company approached Energy Ventures, an authorized Rockwell Automation® system integrator headquartered in New Delhi, for a solution. Since 1992, Energy Ventures has specialized in designing and installing automation and control systems for the sugar and energy industries. They have quickly built a solid reputation for helping their customers achieve stable operation and maximum production — for minimal cost.

After reviewing the existing cogeneration system, Energy Ventures provided Dhampur with both distributed control and centralized control options that would

meet their requirements. Ultimately, Dhampur selected a Rockwell Automation integrated process solutions based on Allen-Bradley® FlexLogix™. Dhampur directed Energy Ventures to apply the new control solution to one of the two boiler systems in the power plant.

FlexLogix, a highly adaptable multi-loop controller, is modular in nature and allows each segment of the cogeneration system to be controlled by a separate FlexLogix unit. The system is based on open technology and can be easily expanded and networked in the future. The controller is programmed with user-friendly RSLogix™5000, a Rockwell Software® tag-based programming language that simplifies documentation and integration with visualization programs.

Finally, Rockwell Software RSVIEW®32™, an integrated, component-based human machine interface (HMI), monitors the system. Designed for Microsoft™ Windows™ environments, RSVIEW32 utilizes open technologies to provide unprecedented connectivity to other Rockwell Software products and third-party applications. To cost-effectively monitor boiler temperature, third-party temperature scanners were integrated into the monitoring system via a Modbus communication port. The RSVIEW32 software collects temperature data from these scanners, displays temperature values on color graphic screens and, finally, logs the data to generate multiple graphs.

## Results

With the new FlexLogix solutions running on one boiler system and the old control system running on the other, Dhampur Sugar Mills can easily evaluate the new system's effectiveness. With improved PID control, the temperature and pressure within the boiler utilizing the new system is much less volatile. In fact, the variance within the boiler controlled by FlexLogix is  $\pm 5\%$ , while the boiler running on the old system still has a variance of  $\pm 10\%$ . This improved efficiency reduces the "per unit" generating cost. In addition, since the new system is less volatile, the costly boiler and turbine are less prone to wear and tear.

Thanks to easy-to-use RSLogix5000 and RSVIEW32, Dhampur Sugar's engineers and operators were quickly trained on the new system. And since Dhampur's engineers can easily make adjustments to the system themselves, there is little need for field support. The new system's hardware modules continue to perform reliably — service calls have been substantially reduced and costly spare parts are rarely needed. The overall reduction in maintenance expenses is dramatic. In fact, the new system cost less to install than the annual maintenance on the previous system.

The boiler upgrade was just the first of many successes at the Rauzagaon mill. The company also chose to convert their existing condensing turbine control system to the same FlexLogix system as the boiler.

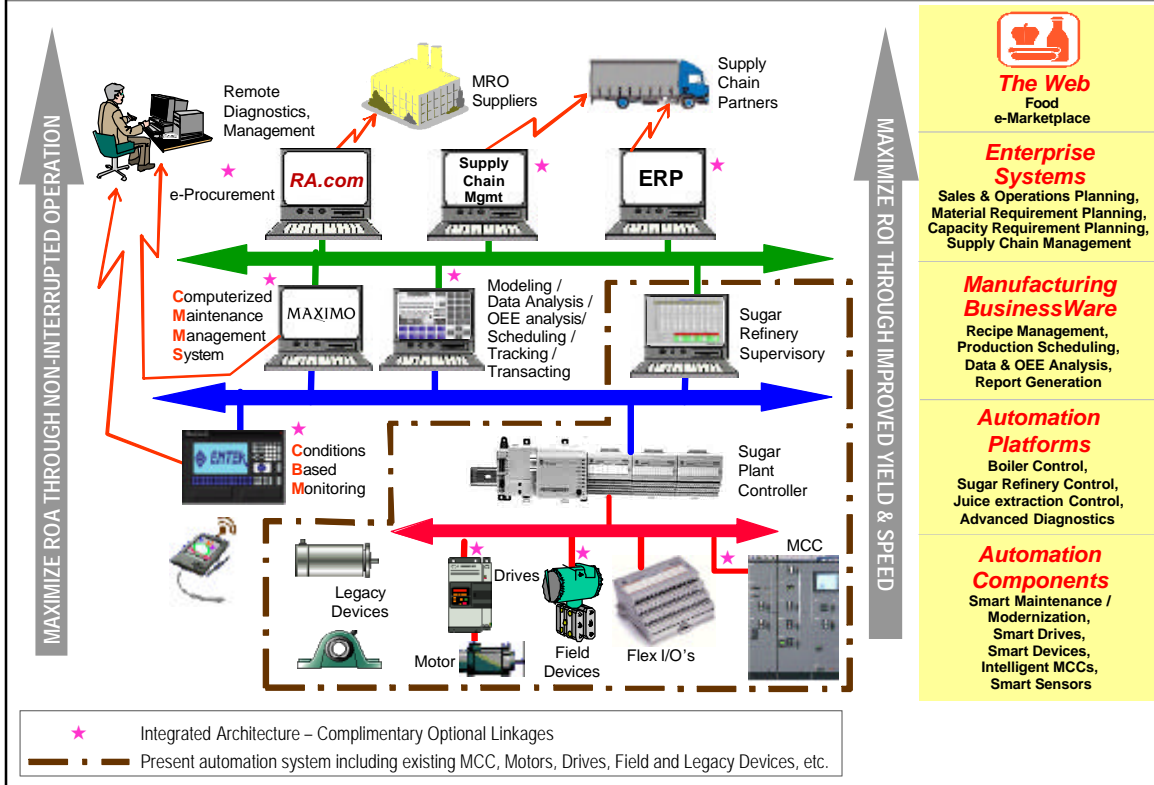
And an additional FlexLogix solution was installed to control a new, load-cell-based system for juice weighing. FlexLogix also controls various operations in the sugar refinery and the mill house.

Today, the boiler, juice weighing, sugar refinery and mill house FlexLogix are integrated on the same network. All systems send information to the master control room where hourly MIS reports are generated and sent to the central office server and can be accessed by the executive office and quality control. In the near future, Dhampur plans to use V-sat communication to transmit the MIS reports to their corporate office in Delhi.

Discussions are also underway to upgrade and integrate the second boiler system at the Rauzagaon facility. In addition, Dhampur Sugar has contracted with Energy Ventures to install FlexLogix systems at their chemical plant at Dhampur and sugar mills at Dhampur, Mansurpur and Asmoli.

The architecture on the following page depicts Rockwell Automation's concept of an Integrated Architecture. The area outlined with a brown dash line represents the present automation level under discussion in this document. The remaining portion illustrates a host of solutions that Rockwell Automation can provide today to integrate the plant floor to the enterprise and beyond.

## INTEGRATING PLANT FLOOR THROUGH THE ENTERPRISE AND BEYOND



**The Web**  
Food  
e-Marketplace

### Enterprise Systems

Sales & Operations Planning,  
Material Requirement Planning,  
Capacity Requirement Planning,  
Supply Chain Management

### Manufacturing BusinessWare

Recipe Management,  
Production Scheduling,  
Data & OEE Analysis,  
Report Generation

### Automation Platforms

Boiler Control,  
Sugar Refinery Control,  
Juice extraction Control,  
Advanced Diagnostics

### Automation Components

Smart Maintenance /  
Modernization,  
Smart Drives,  
Smart Devices,  
Intelligent MCCs,  
Smart Sensors

The foregoing results are specific to Dhampur Sugar Mills Ltd.'s use of Rockwell Automation products in conjunction with other products. Specific results will vary.

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