

addresses and ladder rungs. Making changes to the process is also simplified by FBD because function block drawings present the process clearly to developers and operators.

Online and offline programming is maintained separately to provide flexibility in handling online changes to a project. Frameworks permits online edits of the function block drawings so that process modification can be made without shutting down the production process. This is critical in a continuous process such as a lime kiln, where due to the lag time to heat up the thermal mass of the kiln, a shutdown can adversely affect both production output and product quality. Taking advantage of the multi-user capabilities will further reduce maintenance and commissioning time.

"Frameworks made it fly," Valentine said, "a system that was easy to do. It allows the PLC to communicate with RSView32 software. And because RSView32 and Frameworks are from the same company, there's excellent coordination, it's all integrated, and the support people do an excellent job helping to get it all meshed together." He said Frameworks also made designing and integrating the system more cost-effective, as well as less time-consuming to set up. "In the past, we would not have been able to do this with the PLC-5 to this degree of sophistication."

All of that of course means it was a simpler, more cost-effective

installation for Ash Grove Cement, allowing them to bring the Rivergate lime plant from the 60s up to a state-of-the-art facility without any downtime. The system provides the precise combustion control that allows the plant to use the less-expensive landfill gas and at the same time gives them a more user-friendly, less-complicated operating system. "It's a system



they can modify and continue to work with," Valentine said, "and it's made their operators' lives easier... it's easier to monitor equipment, a high level of automation, and provides them with more information."

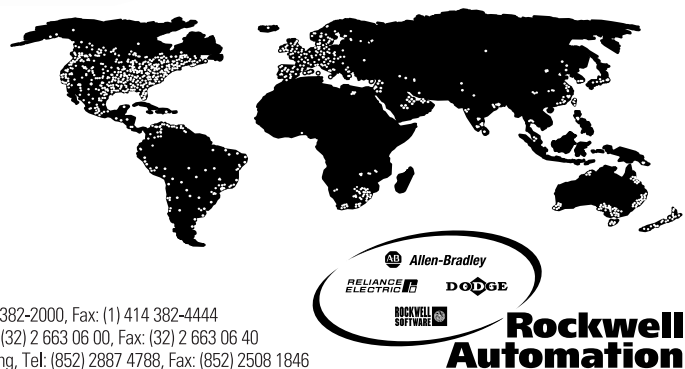
Wright added, "We have a simpler system, easier troubleshooting... and much more accurate, real-time data, plus historical trending and archiving."

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Control Solution Designed To Take A Lot Of Heat

Taking steps to be more environmentally friendly, Ash Grove Cement Company implemented a control system with RSView32 and RSLogix Frameworks to provide precise combustion control. They also now benefit from a simpler, more cost-effective and user-friendly control system.

An environmentally friendly fuel choice paved the way for a new control system at a busy lime plant in Portland, Oregon this spring. Every year 250,000 tons of limestone is sized, heated and processed into quicklime at Ash Grove Cement Company's Rivergate Lime Plant. For more than 30 years, the lime kilns at the heart of the process have been controlled by ten-foot-long control panels that were manually monitored by the operator.

The decision to utilize landfill gas as a primary fuel source for firing the kilns at the Rivergate plant made updating the control system a necessity in order to accommodate the more complex combustion control that would be required. This was the first major updating done on the three calcimatic kilns, which operate 24 hours a day, 365 days a year.

Ash Grove Cement, headquartered in Overland Park, Kansas, is the fourth-largest cement manufacturer in the U.S., operating eight cement plants and two lime plants in nine states across the country. Cement production at its plants equals more than 4.6 million tons

per year. The Rivergate Lime Plant was built in 1963.

In the three kilns at Rivergate, small pieces of limestone are heated to 2300°F, the temperature at which carbon dioxide is



released and the limestone becomes calcium oxide (quicklime), which can then be sold for use in steel and paper manufacturing, municipal water treatment, agriculture and construction. When Portland's regional planning authority approached Ash Grove officials about using the landfill gas, which is produced by the decomposition of garbage at the St. Johns Landfill Site in Portland, the company liked the



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idea. Although landfill gas has not been used this way anywhere else, the Rivergate plant had already been using old motor oil along with natural gas to fire its kilns, so agreeing to make use of another seemingly useless product was a natural step for them. Prior to the arrangement with Ash Grove, the methane was simply burned in flares at the landfill site, with no useful benefit. The gas now flows through a new pipeline to the kilns at Rivergate.

Choosing The New Control System. The new fuel mixture for firing the lime kilns required a more precise combustion control than the 1960s-era control system could provide at the Rivergate. “We had to update the system because of the complexity,” said Gary Wright, Plant Manager at Rivergate plant. “The variety of fuels we use, including fossil fuels, natural gas and landfill gas... exceeded the capacity of our previous control system. This was an opportune time to jump ahead.”

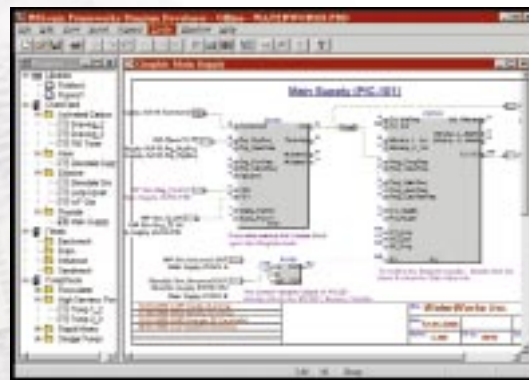
To handle the new combination of fuels, the system would have to be capable of the complicated combustion control needed to meter the fuel and control the fuel-to-air ratio. Also, in keeping with Ash Grove's standardization initiative, the system would have to utilize the Allen-Bradley PLC-5® and Rockwell Software RSVIEW32™ HMI software, both of which were already running successfully in another area of the Rivergate plant.

After considering proposals from three companies, Ash Grove chose the Ponder Burner Company, Portland, Oregon, to design and engineer the system. Ponder Burner specializes in industrial heat process and steam generation, and designs and builds custom burner management and combustion control systems throughout the Pacific Northwest. Created by Jack Valentine, Vice President of Ponder Burner, the Rivergate lime kiln solution is not only good for the environment, it fits Ash Grove's standardization plans and has resulted in an easy-to-use, state-of-the-art operating system. The system efficiently controls the three kilns with the specified Allen-Bradley and Rockwell Software products, and provides a lot of invaluable and previously unattainable information for the kiln operators.

The new system eliminates the cumbersome old control consoles, replacing them with three RSVIEW32 HMI stations, each capable

of controlling the entire facility. The RSVIEW32 HMI software communicates with three PLC-5s programmed using Rockwell Software RSLogix Frameworks™, with all stations existing on a single Ethernet® network.

RSLogix Frameworks turned out to be the key to successful programming and implementation of the system. “Frameworks allowed us to facilitate the implementation,” said Valentine, explaining that the control system was analog-intensive – ideal for Frameworks' Function Block Programming rather than traditional relay logic style programming.



“Because of the complexity of the project, it would have been difficult and bulky to do with ladder logic,” he said, “or they would have had to do it with someone else's product and Ash Grove wanted Allen-Bradley PLCs. Function Block Programming makes it simpler and faster and allows you to implement the programming like a traditional DCS.”

The decision to use Rockwell Software and Allen-Bradley products is part of a company-wide initiative according to Gary Wright. “We're trying to standardize,” he said. “We have eight cement plants, half interest in another one plus two lime plants, and as part of the initiative to standardize we wanted to use Rockwell products... this gives us the flexibility to move people around and to reference other plants. If I have a problem, I can call the manager of one of our other plants and he might be able to help.”

Processing The Stone. The limestone operation begins when limestone from Ash Grove's quarry in British Columbia, Canada is delivered by barge and unloaded at the Rivergate plant. There,

the limestone is moved to the kilns by conveyers and heated to 2300°F at which point CO² is released, converting the limestone to calcium oxide (CaO).

To achieve the complex combustion control required for this application, the system is designed to allow precise control of the fuel/air ratio. To provide the required control, the new system is



designed as a fully metered, cross-limited combustion scheme that uses the BTU content to determine how much air is required. Thus, the ratio always stays

within predefined limits, eliminating the risk of explosion due to a too-high ratio, as well as preventing a low fuel-to-air ratio that could allow the fire to go out.

The calcium oxide, also known as quicklime, produced in the kilns is sized and sold to customers in several industries. It's used extensively by steel mills and in the pulp and paper industry, for municipal and industrial water/wastewater treatment, and as an additive for road stabilization and construction projects. Some is further processed at Ash Grove to form calcium hydroxide and then sold to various industries.

Originally, Ash Grove had 10-ft. long control consoles providing the control for each kiln. Three RSView32 stations now provide precise, easy-to-use burner control. "Rockwell Software's products took us from old control panel relay logic into the 90s," Wright said. "What that has meant for us, is that our kiln operators have had to learn a new system – a computer-based HMI – and they've taken to it like kids take to candy. It has provided us with a more user-friendly, much less complicated operating system."

Function Block Diagramming. While developing the Ash Grove burner control system, Ponder Burner Company turned to the authorized Rockwell Distributor for the Portland area,

Consolidated Electrical Distributor (CED), who suggested Rockwell Software RSLogix Frameworks as the best alternative to ladder logic in this application.

"We could do it with traditional RSLogix™-type software," Valentine said, "but it would be very difficult with the kind of online changes we needed to do. Ladder logic would just have been too time-consuming, because of the complex algorithms, the variable heat content of the landfill gas and the blending in of the natural gas."

RSLogix Frameworks programming software provided the solution. Frameworks' Function Block Diagramming (FBD) fit the DCS system better than ladder logic. Function block programming provides a more structured approach for accessing and visualizing data. All information pertinent to the HMI, such as alarm status and process variables, can be contained in a single function block which localizes the information in a drawing. This reduces troubleshooting time because there is no need to search through program files to isolate a problem. While in traditional ladder logic it is possible for almost any instruction to access any other instruction's data at any time, FBD localizes variable access through the function block's connectors. It provides an easy transition path from Process and Instrumentation Diagram (PI&D) drawings to the process program.

In Function Block Diagramming, pieces of ladder logic are encapsulated in blocks that are each represented by a graphic and connected to each other in a fashion similar to a circuit diagram, designating the flow of data. FBD is particularly useful in process control applications, such as Ash Grove's lime kilns, because of the high degree of information/data flow that occurs between the control components.

A database-serving feature allows Frameworks to easily share information with the RSView32 HMI software. Tag names can be assigned in Frameworks and then used in RSView32, so information can be shared without having to know specific addresses as you would have to do with ladder logic. That eliminates duplication and saves programming time, allowing the program designer to concentrate on the process rather than