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## Technology in Action

### A Charming New Facility

Recycled Equipment, a New Automation System, Electronic Marshalling and Remote I/O All Go into a Greenfield Sulfuric Acid Plant

by Bryan Beyer, Southern States Chemical

**W**ilmington, N.C.-based Southern States Chemical ([www.sschemical.com](http://www.sschemical.com)), a division of Dulany Industries Inc., is the Southeastern United States' largest provider of sulfuric acid. Two locations (Savannah, Ga., and Wilmington, N.C.) combine to produce over 1800 tons per day, with total marketable tons exceeding 750,000 annually, and combined storage capacity exceeding 35,000 tons.

The company's existing Wilmington plant had produced around 500,000 tons of product per year, but the aging plant was almost entirely manually operated, and meeting EPA emissions limits was a concern. So to expand production capacity and ensure conscientious environmental stewardship, the company looked beyond expanding and upgrading the existing facility to building a new state-of-the-art plant on a 15-acre site next to the old plant with ready road and rail access to transport raw materials and finished product.

Another important consideration was the fact that this particular site meant that the principal byproduct of the sulfuric acid manufacturing process—steam—could be converted into a marketable commodity energy source. The new plant is located adjacent to the plant of Invista Wilmington, a large synthetic polymer and fiber manufacturer, which made a ready customer for a reliable supply of clean, high-pressure steam. The new plant would have three absorbing towers, a sulfur furnace, two waste heat boilers, two SO<sub>2</sub>-to-SO<sub>3</sub> converters, gas-gas heat exchangers, four liquid heat exchangers, four storage tanks, and truck and rail loading facilities.

Southern States also went all in with high-tech tools, abandoning its largely manual operations in favor of the latest in automation technology, including HART communications, remote terminal displays, flow elements, DeviceNet networking and a DeltaV automation system from

Emerson Process Management ([www.emersonprocess.com](http://www.emersonprocess.com)) along with Emerson's electronic marshalling system, the new characterization modules (CHARMs). All this technology comes together to regulate temperature, pressure, flow, level, conductivity and weight by means of around 235 I/O points.

#### Shopping in Wisconsin

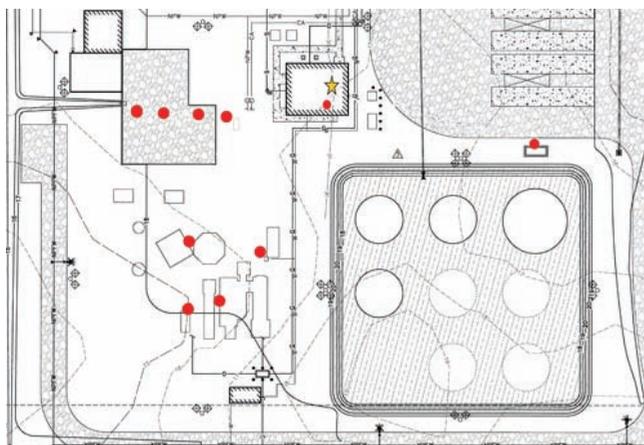
The company was challenged with keeping down the expense of building a new plant from the ground up. Among the solutions it found was the recycling of major components from a decommissioned government munitions plant in Baraboo, Wis., and transporting them to the Wilmington site. The Baraboo "imports" included all three towers, two gas heat exchangers, some acid pumps and most of the structural steel. To this equipment were added two new converters, a new furnace, new waste heat boilers, two new economizers, a new cooling tower and new storage tanks. This recycling effort gave the new plant its name—Wilbara, in recognition of the two contributing cities located 1100 miles apart. It also saved Southern States an estimated 20% on the cost of the new facility.

Relocating the old equipment and integrating it with the new was only the first challenge. With Southern States' new supplier relationship, reliability became a crucial parameter for the new plant. Southern States not only had to be a reliable supplier to sulfuric acid customers, but also reliable as a supplier of steam under a contract with its neighbor. The company could not afford to have delivery delays caused by start-up glitches or problems getting employees up to speed on the new systems.

#### Other challenges

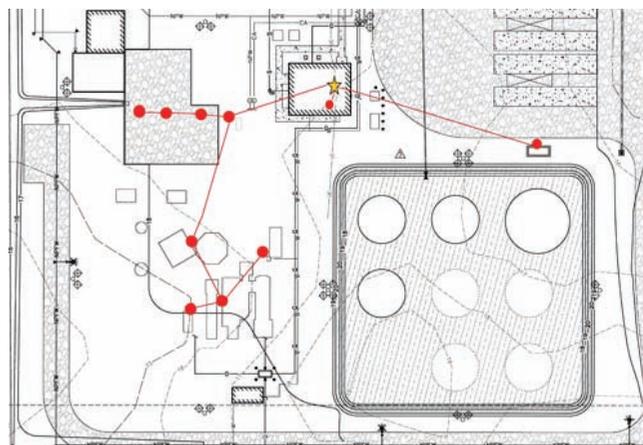
Furthermore, Southern States had little previous automation infrastructure within the corporation. Everyone from upper

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## CLUSTERED I/O

Figure 1. Because the I/O points are in clusters, Southern States placed 10 CHARM panels strategically near the clusters throughout the plant.



## DUAL ETHERNET CONNECTIVITY

Figure 2. Dual Ethernet cables connect the CHARM cabinets to the DeltaV cabinet (see yellow star).

management to the junior operators had to be shown how to look at things from an automation point of view. Training the on-the-ground personnel to operate the new system from a computer screen was another challenge. Working with automated equipment was a completely new experience for them and a challenge to the new plant's operational schedule. But staff took to the new equipment thanks to hands-on, in-the-field training.

Another potential challenge to the new system and technology's installation and start-up was the fact that Southern States was working with two different firms for system configuration and support, so coordinating the two teams' efforts without costly overlap, omission or schedule deviation was a concern.

Integration of technology between the two different companies went smoothly. Process automation consulting and engineering firms Control Southern of Suwanee, Ga. ([www.controlsouthern.com](http://www.controlsouthern.com)), and R.E. Mason of Charlotte, N.C. ([www.remason.com](http://www.remason.com)), the local distributor of Emerson and Fisher valve products, worked together during the entire project to provide a seamless handoff from inception to operation. The former firm ordered all the field devices, performed program-

ming and graphics design. The latter was involved in the initial concept, FAT, on-site installation and commissioning, then took over all on-going programming and site support. One R.E. Mason employee worked with Control Southern from the beginning to get an overall perspective on the project, and then the Mason team took over completely upon start-up.

### The heart of the system

To automate its processes, Southern States implemented Emerson's DeltaV v11 digital automation system. While that system has proven itself a reliable performer, Southern States took a leap of faith in the system's new CHARM technology. In fact, this project was one of North America's first installations of the new I/O technology.

The decision to use the new I/O technology came late in the planning process. Southern States had looked at a standard fieldbus system incorporating wiring all the way from the I/O point into the cabinet in the control room, but when the new field junction cabinets and I/O system became available, the company opted for them, as they appeared to promise big savings in engineering and



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construction costs, as well as increased reliability.

The characterization modules (CHARMs) enable I/O anywhere in the plant regardless of signal type. In the Wilbara project, Southern States terminated the total I/O among 10 junction boxes located throughout the plant, running all the signals from each junction box to the control room via two Ethernet cables. Traditional marshalling cabinets were completely eliminated, decreasing the amount of field wiring by half and cutting wiring cost by 40% (Figures 1 and 2).

The electronic marshalling technology eliminated one of the most tedious and costly tasks that almost invariably become a part of any plant construction or expansion project: late engineering changes. The I/O system's flexibility showed its value in several cases where an I/O point was located in a different cabinet from that originally planned, and it was very easy for the team to relocate the I/O module and reconfigure it in the control system.

## The results are in

Plant operation has been reliable, aided by the system's redundant controllers and CIOC, dual Ethernet communications and smart transmitters in key areas.

Emerson provided all the field devices, including valves, transmitters, thermocouples, RTDs and flowmeters. Among these, the company's mass flowmeters now allow truck and rail car tanks to be filled with acid in a very streamlined process. By tying the truck scale in with the flowmeter, operators input the target weight and, with the press of a button, can fill the tank accurately and concurrently print the loading bill. This dramatically reduces traffic, while increasing both reliability and throughput.

FAT had an added component of key operator/supervisor training. These operators and supervisors became our mentors during operator training and site commissioning. The digital control system's ease of understanding and operation reduced operator training and costs, with training completed in two weeks.

Southern States achieved substantial capital cost

savings, with construction and wiring costs 50% less than a standard DCS.

The start-up schedule was met by taking advantage of the characterization modules' flexibility when field I/O changes were implemented during construction. I/O additions were quicker and less costly because of the Ethernet communications backbone already in place. One of the changes made in the I/O during construction concerned a point originally planned for location in the field, which ended up requiring location in the control room where the system controller is.

Integration with Southern States' business systems is still a work in progress, but the production data now available is showing the way to continuous improvement. The digital automation system provides a wealth of production data that every segment of the corporation can use, enabling Southern States to provide outstanding quality, predict required maintenance quicker, control the process better and make better business decisions.

## Payoff time

The gamble to entrust a new plant start-up and ongoing process automation to a single supplier and its new electronic marshalling technology clearly paid off. The new plant is producing roughly 575 tons of sulfuric acid per day, versus around 150 tons per day at the old plant with the same number of personnel. Recent state SO<sub>2</sub> and acid mist emissions tests fell significantly below requirements. Further, the Wilbara plant is delivering as much or more steam per month to its neighboring customer as promised in its contract. The construction, wiring and change management savings provided by the electronic marshalling technology, along with subsequent reliability and performance have served as a model for future plant automation engineering.

Using this state-of-the-art technology, Southern States Chemical's new Wilmington plant stands as the crown jewel of the company. ■

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