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resurrected into
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facility** Page 7



Photo provided by Tom Harvey



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Thirty-five-year old plant resurrected into modern Southern States Chemical facility



Southern States Chemical, Inc.'s new state-of-the-art Wilbara sulfuric acid plant in Wilmington, N.C.

By: April Smith

At Southern States Chemical, Inc.'s recently opened sulfuric acid plant, what's old is not only new again, but innovative and highly efficient too. With a bias for conservation, the creators of the new facility took 35-year old army equipment, added heavy doses of multi-disciplinary teamwork, mixed in cutting edge technologies and fashioned the state-of-the-art Wilbara plant in Wilmington, N.C.

Just a few miles down the road from the company's existing Wilmington facility, the \$31 million Wilbara plant produces roughly three times as much sulfuric acid with fewer emissions. "With this new plant," said Key Compton, president of Southern States Chemical, "we are improving our environmental footprint while dramatically strengthening our overall supply capabilities." Southern States Chemical, a subsidiary of Dulany Industries, Inc., is the largest producer/supplier of sulfuric acid on the east coast. The Wilbara plant, the newest sulfuric acid facility to be completed in the U.S., solidifies this position.

Recycling war parts— Wisconsin to Wilmington

Though Wilbara started up in December 2010 after about 14 months of construction, in a way the facility began several decades ago

in the small town of Baraboo, Wis., the site of a decommissioned U.S. army munitions plant. The army plant, which manufactured nitrocellulose-based propellants for World War II, the Korean and Vietnam wars, housed several towers, heat exchangers and other equipment that would ultimately find their new home at Wilbara.

First commissioned in the 1940s to support the war effort, in its heyday the army plant produced smokeless powder, diphenylamine, sulfuric acid, rocket propellant and ball powder. It included housing for 4,000-

8,000 production workers and their families, as well as a school, a recreation center, a childcare facility, a cafeteria, a hospital and a transportation system.

In the 1970s, the acid lines were modernized with state-of-the-art technology for the time. But when the updates were complete in the late 1970s, the army no longer had use for the propellants. Except for some test runs and routine upkeep, the equipment was never operated and the plant was eventually put up for auction. Southern States Chemical was the successful bidder for the sulfuric acid plant.

In preparing for the new plant's construction in Wilmington, the Wilbara project team carefully evaluated all the equipment to determine what could be incorporated into the new design. In 2004, they secured the help of MECS, Inc. of St. Louis, Mo., now a wholly-owned subsidiary of DuPont. "MECS supported us a great deal in determining what equipment would be useful in the new facility," said Bryan Beyer of Southern States Chemical. Out of the original equipment, all three towers, two gas heat exchangers, some Lewis acid pumps and most of the structural steel was shipped over 1,100 miles from Wisconsin to Wilmington.

A concern naturally arose relating to the condition of the equipment, some of it over 35 years old. However, during the time the army plant was offline, the equipment was well maintained, and there was plenty of paperwork documenting its service, said Gary Cantrell, project/maintenance manager at Dulany Industries. "They had boxes and boxes of records, blueprints and manuals tracing back every component and vendor used in the 70s," explained Cantrell. The army documentation proved very useful in determining the equipments' eligibility for reuse in the new facility.

MECS was also on hand preparing the demolition plans at the army plant, which was dismantled and shipped in 2005. From



At the September 2009 groundbreaking, many were on hand to start construction of the new plant, which began operation in December 2010.



Bryan Beyer, Acid Operations Manager, Southern States Chemical, Inc. (left) and Gary Cantrell, Project/Maintenance Manager, Dulany Industries, Inc. (right).



Wes Livingston, Wilmington Operations Manager, Southern States Chemical, Inc.



Chris Bailey, CEO, The Roberts Co.



Rick Renaud, Project Manager, The Roberts Co.

the economizers and exchangers to pipe racks and ductwork to even instruments and control valves—all were packed and transported. “When the last truck pulled out,” said Cantrell, “the only thing left was the concrete foundation.”

Though the recycled materials were a good start, the addition of new equipment was necessary to complete the project in Wilmington. The new facility required two new converters, a new furnace, new waste heat boilers, two new economizers, a new cooling tower and new storage tanks. But fitting decades-old equipment with brand new material presented its own difficulties, recalls Cantrell. Fortunately, with the help of MECS as well as The Roberts Co., of Winterville, N.C., the Wilbara team successfully integrated all the equipment, young and old, into the new design.

And the recycling effort involved paid off. By using the old army equipment, Cantrell said, the team realized an estimated 20 percent cost savings.

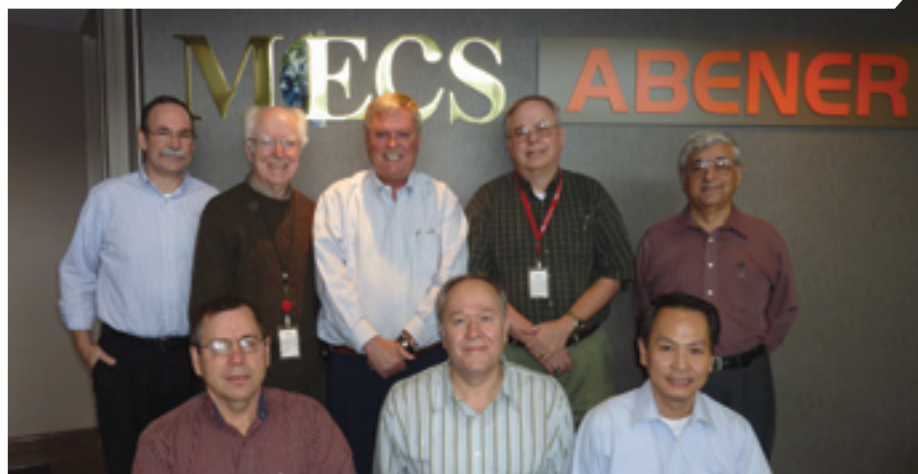
The successful reuse venture was also the inspiration for the next piece of the project—naming the new facility. Combining past and present, the project team took the new site location, “Wilmington,” added the old site name, “Baraboo,” and the new plant, “Wilbara,” was born.

Siting the facility — redefining “by-product”

In deciding where to locate the new plant, the project team went beyond just considering the best location to produce sulfuric acid. Weighing heavily on the decision was identifying the best location for their future facility’s by-product—steam.

More than just putting leftovers to good use, the Wilbara team regarded its leftovers as a highly desirable commodity. “In fact, the main product of our new plant is steam and sulfuric acid is the by-product,” said Beyer, a bit tongue-in-cheek. But since the amount of high-pressure steam created is 1.3 times the amount of sulfuric acid produced, and steam is a clean and valuable source of energy, the team wanted a location that would allow the plant to provide its “by-product” to someone who can use it.

That someone turned out to be Invista Wilmington, a synthetic polymer and fiber manufacturer, as well as neighbor and future customer of Wilbara’s steam. Prior to Wilbara’s start-up, Invista produced its own steam for production. Now steam is trans-



MECS, Inc.’s valuable service contributed to the new plant’s success. The MECS team included, in front from left to right, Roy Wall, Ted Cocos and Tu Phan. In back, from left to right, are Chris Brown, John Tully, John Horne, Mike Cook and Mehmet Altin.

ported from the Wilbara site to the adjacent Invista property via pipeline.

“This is the first time Invista has entered into an agreement to use another company’s by-product of production,” said Bill King, site manager for Invista’s Wilmington plant.

Besides the advantage of having a steam customer next door, the Wilmington location also has the infrastructure, particularly rail and roads, to support transportation of supplies and product in and out of the plant. “The material is fairly freight intensive,” said Reed Dulany III, president of Dulany Industries. “The Wilmington location was a natural fit.”



Photo credit: Badger Army Ammunition Plant



Left: Badger Army Ammunition Plant acid facility circa 1970s. Right: Blending old and new equipment together into Wilbara’s modern facility.

Heavy doses of teamwork

The success of Wilbara encompassed much more than compiling materials and spotting a location. Another vital ingredient was the coordinated effort among the project teams, contractors and suppliers. “Wilbara represents a remarkable achievement,” Dulany said, “which was successful only through an extraordinary amount of teamwork and focus by all involved.”

The Southern States Chemical/Dulany team leading the Wilbara project included Bryan Beyer, acid operations manager, who coordinated efforts between engineering firms; Gary Cantrell, Dulany Project/Maintenance Manager who lead construction contractors and procurement of plant equipment; Kevin Glover, vice president of operations, who was in charge of permits and overall construction management; Tom Penny, plant superintendent, who prepared all the new equipment for operation and lent his experience training operators for start-up; and Wes Livingston, Wilmington operations manager, who coordinated local efforts at the site.

The project team had the assistance of three engineering firms, MECS, Prime Engineering of Atlanta, Ga., and The Roberts Co. MECS was the process engineering firm. Prime was contracted to do the detailed engineering work, and Roberts Co. contributed construction management, site clearing, rail and road construction as well as equipment fabrication.

“We worked with Southern States Chemical on the basic engineering of the plant,” said John Horne, MECS’ sales director. “We did the process design, P&IDs, vessel design and equipment specifications. We also supplied our catalyst, Brink mist eliminators, ZeCor UniFlo distributors, Filmgard 5 acid coolers as well as commissioning and start-up services.”

The Roberts Co. was also vital in providing construction expertise. “We fabricated the sulfur burner, new converters and performed tower modifications,” said Rick Renaud, project manager at Roberts. “We were involved with the construction from concrete, equipment, piping, electrical, instrument controls and steel.”

The different companies rallied together throughout the vast effort. “Our team and the Southern States/Dulany team worked well together through all the challenges,” said Chris Bailey, CEO of Roberts. “And the project was very successful. We were able to get the job done on time and under budget.”

Numerous other suppliers contributed to the facility, including Acid Piping Technology, which supplied MONDI™ piping, Lewis Pumps for the acid and sulfur pumps, Technotherm for the waste heat boilers, Optimus for the economizers, SPX for the cooling tower, Toledo Carolina for the scales, General Electric for the electrically operated compressor and Emerson for its DeltaV digital automation system.

Adding the innovation

In designing its new facility, the Wilbara team satisfied some very stringent goals: keep

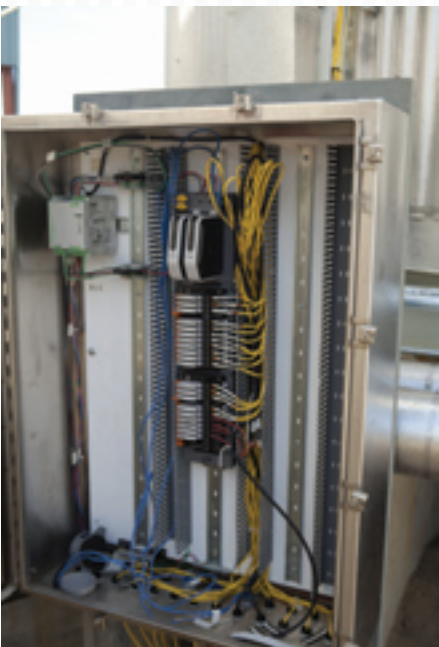
pressure drop and emissions as low as possible. For this they turned to MECS' catalysts for the plant's converters, specifically, the next generation low pressure drop XLP and the super cesium SCX-2000. Of Wilbara's two converters, the XLP catalyst was used in pass one in the first converter and the SCX-2000 catalyst was used in the fourth and final pass of the second converter.

"Southern States chose us particularly for our SCX-2000 super cesium catalyst," said Horne. "The SCX-2000 uses a unique formulation and catalyst support structure in order to get the lowest SO₂ emissions possible." The installation has met the goal—emissions at the plant have measured under half the requirement.

MECS also supplied Brink XP mist eliminator candles for the interpass and final towers to get the lowest acid mist possible while maintaining low pressure drop. The XP uses a high-efficiency Brownian diffusion fiberbed made with chemically resistant glass fiber. "XP provides 70 percent reduced emissions with 30 percent less pressure drop over conventional Brink fiberbed technologies," Horne said. Mist emissions for plants using the XP have been measuring well under what conventional fiberbeds can do, he added. The Wilbara installation has yielded similar results. "Emissions at the new facility are the lowest we've seen," Horne said, measuring well below MECS' guaranteed 0.075 lb/ton.

In addition to saving energy with lower pressure drop, the XP eliminators save on capital costs because their efficiency enables smaller, less expensive mist eliminator housing to be used. Another benefit of XP includes protection of downstream plant equipment due to reduced drainage from downstream cold pass heat exchangers.

The implementation of Emerson's DeltaV digital automation system represents another technological leap. "This is real cutting edge," said Beyer. "We are one of the first companies in the U.S. to install this system." The DeltaV uses CHARM technology that enables I/O anywhere it's required,



DeltaV digital automation system, supplied by Emerson, enables I/O anywhere it is needed while significantly reducing the amount of field wiring.



After utilizing all the materials possible from the old army plant, new equipment was required, such as this furnace, pictured above, and these tanks, pictured to the right.

from a local I/O cabinet to remote enclosures miles away. Field wiring of any signal type can be terminated anywhere and there is no cross-wiring required from the marshalling panel to I/O cards.

"The amount of wiring in the field is decreased by half," explains Beyer. "This means fewer construction costs, more reliability and less maintenance." Plus, new field wiring can be added out in the plant any time.

Emerson also provided its Micro Motion mass flow meter, which allows acid trucks to be filled in a very streamlined process. By tying the truck scale in with the flow meter, operators input the target weight and with the press of a button, the truck is filled and a bill is printed. "It cuts down on truck traffic and the reliability is high," Beyer said. "We are doing this for the rail side too."

Overcoming the challenges

From the very beginning, starting with the old Baraboo equipment, the project team's problem-solving skills were put to the test. Dismantling the army equipment was time-intensive, taking four months to complete. Some of the trickier equipment to move turned out to be the three brick-lined towers. "We actually installed inflatable bladders inside the towers to help support the brick structure," said Beyer. And it worked. "When we got the towers to Wilmington, there wasn't a brick out of place."

Besides the physical effort of moving, there was also a tremendous amount of paperwork involved with transporting the materials across state lines. Every state along the more than 1,100-mile journey from Wisconsin to Wilmington required its own set of permits and permissions.

Preparing Wilbara's new site presented its own separate project, as the 15-acre prop-



Fabricating the new converters, The Roberts Co. provided their valuable services to the project.



erty was partially wooded. A mile-long roadway from the plant site to the highway also needed to be built. With significant effort on the part of Roberts Co., the necessary space was cleared and the road created. Power, gas and phone lines were also put in place.

Yet another challenge Roberts Co. undertook related to synchronizing work plans with the neighboring Invista site to deliver the steam it would purchase from Wilbara. "There was a lot of coordination involved with the Invista tie-in," said Renaud. "We made sure to plan our timetable around their production schedule."

More issues were raised in terms of incorporating the older equipment into the new plan while preserving design efficiency. Both Roberts Co. and MECS were instrumental in fitting all the pieces together. Roberts Co. added their expertise retrofitting the old towers and fabricating new tower sections while manway design kept MECS busy. "Getting the manways to fit properly was a large undertaking," said Cantrell. "MECS worked very hard rotating them to mesh with the design."

The capabilities of the existing process vessels were another matter to resolve. Keeping an eye on costs, MECS adapted the vessels so that they could be retained in the design. "As much as possible we modified the existing vessels for the new duty," said Ted Cocos, MECS Vessel and Duct Consultant. Though some new designs were necessary, retrofitting what they could helped the Wilbara team save a lot of money on the plant, Cocos said.

Starting up

The opportunity to push through another challenge presented itself once again on a cold winter evening when Wilbara began operations for the first time. "We had a lot of freezing problems, which are not conducive to acid movement," Beyer said. Though below normal temperatures, ice and gusty winds slowed progress, the ingredients ultimately came together for a successful start-up on December 15, 2010.

"The weather did not dampen enthusiasm for the plant's first day," said Christopher Brown, MECS Process Engineer, who reported very good start-up results with a clean stack and low emissions.

The project team agreed. "Because of the technology of the mist eliminators and catalyst, we had very good numbers," Beyer said, describing a recent state test that measured both SO₂ and acid mist emissions at significantly below requirements.

And how have all these innovations been received among plant personnel? Very well,



ZeCor UniFlo distribution troughs for the interpass tower.



Topping off the stack at the new facility.



Oldies but goodies, towers from a Wisconsin-based U.S. army plant were incorporated into the Wilbara facility's modern design.



This decades-old tower from decommissioned Wisconsin facility ultimately finds new life over 1,100 miles away in Wilmington.

according to Wes Livingston, Wilmington Operations Manager. "The new plant has been an exciting change for the personnel at the existing Wilmington plant," said Livingston. Employees have received hands-on training with the new equipment, as well as in-field training. "We were used to older technology here, but the new plant was a huge step forward. The employees here have a lot of pride and ownership."

Future plans for the plant include completing the office and maintenance shop, and another storage tank. The plant is also projected to create about 25 more jobs by the end of the year. □