Ensuring Continuous Operations at Hylsa Steel

ChemLINE®
CASE STUDY

Located in the state of Puebla, south of Mexico City, the Hylsa Steel Plant produces steel bar and wire for the construction industry as well as other applications. At the plant, a patented process incorporates scrap iron and raw materials to produce a substance called "sponge iron." This Mexican technology, which is used in nearly 20 plants around the world, is easier and more economical to melt than other existing processes.

(Above) Installing pipe lined with ChemLine® coating to the scrubber, which is also lined with ChemLine® coating. (Left) Pipe section leading into scrubber lined with reinforced ChemLine® coating.

During the process, the sponge iron produces a gas containing hydrogen and five percent sulfuric acid which can get as hot as 120°C (248°F) along with a slurry of iron dust, carbon and water. The overall temperature of this sponge-iron gas varies from 82° to 93°C (180 to 200°F).

While the gas travels through a 120-meter length pipe to a scrubber, a number of problems can develop including, 1) extensive corrosion from the hot sulfuric acid, 2) abrasion from the iron dust which is 60 percent solids, and 3) constant expansion and contraction from varying temperatures. The total pipe consists of 20 pieces of carbon steel that are 24-36 inches in diameter, in lengths from 4-12 meters.

The Hylsa Steel Plant operates continuously – 365 days a year – and the working availability of that pipe is crucial to the successful operation of the facility. Not surprisingly, over the years the corrosion, abrasion, and temperature have taken their toll. To remedy the situation, the company has made several attempts at securing the integrity of the pipeline.

Hylsa looked at using stainless steel as the pipe material, but the cost of a the stainless steel exceeded, by several times, the cost of coating the pipe. Hylsa also

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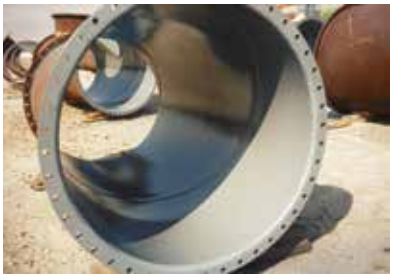
(Above) Spark testing the ChemLine® lining of the pipe before installation.



tried welding different alloys inside the pipeline but this proved to be more expensive than stainless steel, plus the added weight threatened the structural integrity of the pipeline.

Over time, the company conducted more than 25 repairs of the system – some while the plant was shut down, and others while the plant was still in operation where they would weld steel to the outside of the pipeline. In short, after all these attempts, Hylsa continued to search for an operative solution.

An Answer Close to Home

The solution to Hylsa's pipe protection need was actually closer than they thought, at the far end of the pipe where the corrosive gas emptied into a scrubber. In the mid 1990s, the scrubber, which also had been experiencing similar problems due to corrosive gases, was coated with the ChemLine® system from Advanced Polymer Coatings.

ChemLine® had been chosen as a scrubber coating because of its outstanding corrosion and temperature resistance. The two-coat system was used to line the scrubber. After many tests and applications, ChemLine® showed superior corrosion resistance when compared to other coatings. ChemLine® even outperformed stainless steel. In addition to ChemLine®'excellent temperature resistance of over 122°C (250°F), the coating also resisted the corrosive effects of the most aggressive materials, especially the sulfuric acid gases fed into the scrubber from the Hylsa pipeline. Since the application, the 2,500 square foot scrubber was inspected about once a month and reported to be working well. This scrubber was in service for 16 years before being replaced with a new one.

Pipe Lining Solution

Because of the successful ChemLine® performance on the scrubber, Hylsa decided to lab test ChemLine® for the pipe. Armed with positive test results from those studies, Hylsa decided to also coat the interior of the 120-meters of pipe with ChemLine®.

The first step was to prepare the pipe by gritblasting with 16/30 white sand grit to a profile of about 3-4 mils. A base coat of ChemLine® was applied as the primer, as the coating has superior bonding qualities, and allows for rapid re-coat intervals. That was followed by a fiberglass sheet of ChemLine®-based material approximately 40 mils DFT – dry film thickness.

In addition, some ChemLine® putty was used to fill in gaps and irregularities in the pipeline surface. All of the pipe's flange radius area was re-sanded before the final topcoat of a ChemLine® was applied to 40 mils DFT average. Of the 20 pieces of pipe, 19 were heat cured with one heater at 120°C for eight hours. The remaining pipe was heat cured with two heaters, one on each end of the pipe.

After unsuccessful attempts with stainless steel, different alloys, and thick pieces of welded carbon steel, Hylsa turned to the same ChemLine® coating that was used on its scrubber, which was the next leg of the production process. The ChemLine® coating's performance on the scrubber and its effective demonstration in Hylsa's test lab left little doubt that ChemLine® would be the ideal coating for its 120-meter long pipe that was such as crucial link in a production facility that needed to be on-line and operational 365 days a year. The pipe was also in service for many years, and was also replaced.

Hylsa has since coated ChemLine® on 8 more scrubbers and 10 tanks containing acid water from Sulfuric service.