

Building and Grounds

Corrosion inhibited in steel vessel stored outdoors

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Problem

Protecting process equipment between the time it is fabricated, delivered and put in service, is a recurring difficulty for major chemical manufacturers. Such was the situation for DuPont when a 15-ft diameter, 130-ft long, 8-stage carbon steel distillation column was slated for service at a Gulf coast facility.

The equipment would stand outside in salty, humid air during 18 months of changeable weather before going on-line for liquid chlorine service.

Because of previous experience with standby equipment, DuPont engineers knew the importance of protecting the internals of the vessel until it went on-line.

A nonflammable, non-toxic rust preventative system had to be found that would permit physical work in the column and some welding of non-pressure parts. The rust preventative could not be petroleum-based because of difficulty in cleaning and possible reaction with chlorine if not completely removed. Good retention to the vessel walls and ease of touch-ups after the internal work was completed was also important.

Solution

An amine carboxylate, water-soluble, vapor corrosion inhibitor (VCI) was chosen. This met the requirements for hazards and toxicity, and it was easy to remove.

The column was hydrostatically tested after fabrication, then internally brush-blasted to remove scale and rust.

A 5% VCI water spray solution, containing 1/2% wetting agent, was applied to the 12,000-sq-ft internal surfaces using conventional spraying equipment.

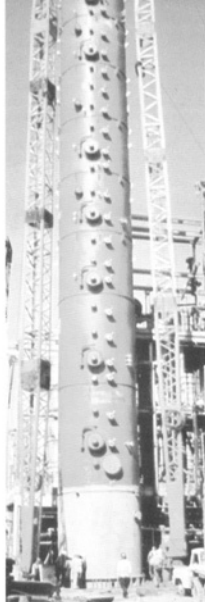
Based on the vessel volume of 23,000 cu ft, approximately 100 lb of crystal VCI was required. It was not necessary to completely wet all of the surfaces, since protection of the metal occurs from the vapor phase that is generated from the solid crystals and is attracted to uncoated surfaces.

After spraying, the unit was dried using circulated heated air. This drying phase is essential to prevent localized pitting caused by microbiologically induced corrosion. All openings of the vessel were sealed and a pressure relief device was added to prevent excessive vacuum or pressure due to temperature variations from ambient conditions.

Thus prepared, the unit was then shipped by multiple rail car about 1000 miles to the job site where it was erected. The unit was opened up while work was being performed on the inside of the vessel, with breathing air being supplied to the workers. The unit then was resealed to obtain full protection from the crystals that still existed on the vessel walls. Due to the optimized vapor pressure of the amine crystals, long life could be expected, even if the vessel would be periodically opened.

After the final internal work was completed, additional crystals were distributed within the vessel to increase the protection. Then the unit stood idle again for 14 months.

At startup time, the system was rinsed with water to remove the remain-



A portion of the 130'-high, 15'-diameter distillation column.

ing crystals, air-dried and then placed into service.

Results

Plant startup proceeded without any problems related to rust contamination from the distillation column system based on measurements of the process stream. The successful installation was attributed to early equipment protection planning. This planning eliminated a costly, if not impossible, task of brush-blasting the columns with the trays installed during the critical time just prior to startup.

VCI-309 water-soluble corrosion inhibitor for ferrous metals is a product of Cortec Corporation, 310 Chester St., St. Paul, MN 55107.