

### Integrity Municipal Systems Restores Bulk Emergency Chlorine Vapor Scrubber System for City of Tulsa, Oklahoma

As part of a major modernization of the Mohawk Water Treatment Plant in the late 1990s, the City of Tulsa, Oklahoma, installed a bulk emergency chlorine vapor scrubber system. This standby equipment, which is critical to the overall safety plan of the plant's chlorine gas disinfection system, uses liquid caustic soda to neutralize chlorine gas in the event of an accidental release.

As the scrubber system approached the end of its anticipated 20-year useful life, the city engaged Integrity Municipal Systems, LLC (IMS) to inspect the equipment and propose a system refurbishment plan that would ensure proper system performance and safe storage of the 30,000 gallons of corrosive caustic soda contained within it. Utilizing their 20-plus years of scrubber experience, IMS personnel developed a practical and cost-effective solution for the city that resulted in more than a half million dollars in savings when compared

to disposal and replacement of the existing system.

Because the Mohawk WTP is one of only two plants operated by the city, a key consideration for the project was the ability to preserve plant operations during the retrofit. The plant is adjacent to the nation's third-largest municipal park and less than 500 feet from a residential neighborhood, so operating without an online emergency chlorine scrubber system was not an option. To provide protection against a chlorine leak and allow plant operations to continue during the system refurbishment, IMS mobilized and installed a temporary emergency chlorine vapor scrubber system. The temporary scrubber included integral secondary containment, enabling quick installation on any level surface without the need for expensive civil work.

IMS safely transferred all caustic solution to a temporary storage tank for later reuse in the refurbished scrubber, eliminating the costs and hazards associated with hazardous waste disposal and complete caustic replacement. A portion of the preserved caustic solution was used to charge the temporary scrubber system provided by IMS.

After removal of the caustic solution, the scrubber system was acid washed to remove caustic solids and inspected by an independent FRP inspector. The portion of the storage tank in direct contact with caustic was severely corroded and required significant rehabilitation. Based on the recommendations of the FRP inspector, IMS ground down and repaired all raised surfaces, blisters, and surface cracks in the storage tank, and relined almost the entire corrosion barrier.

In addition to relining the storage tank, IMS upgraded to FRP the recirculation pump discharge piping, installed a new access manway in the tank sidewall, upgraded the internal liquid distributor design, removed the tank drain to minimize susceptibility to leaks, and replaced wear parts such as gaskets, fan belts, and instrumentation. All FRP surfaces were then recoated with gelcoat and all pumps and the fan were painted.

Before transferring and filtering the stored caustic back into the rehabilitated scrubber system, the FRP inspector returned to evaluate the repairs. All work was found to be properly completed and in excellent condition. The inspector's final report concluded that the refurbishment of the system should increase the service life of the tank by another 15 to 20 years, far exceeding original expectations.

Rachel Watts, Water Supply Engineer at City of Tulsa, stated, "IMS provided an effective turnkey project that allowed for the continued protection of both plant staff and the public, in addition to saving us hundreds of thousands of dollars in our capital budget. Thank you."



*Temporary emergency chlorine scrubber provides protection during rehabilitation*

**BEFORE**



*Leak at storage tank drain*

**AFTER**



*Leak fixed and drain plugged to minimize future leaks*



*Severe corrosion to storage tank interior – sample close-ups of 3 locations*



*Storage tank interior after repairs and relining*