

Tuesday, January 6, 2015

## *Dangerous, delicate and downright ingenious*



*Fire Damaged Concrete Structure Supporting 225-Ton Vessel*

### *First Edition E-Newsletter*

WHKS is pleased to introduce this first edition of our e-newsletter. We intend to make it a regular publication, allowing WHKS to communicate with past, current, and (we hope!) future clients, our employees, colleagues and friends. We are fortunate to be involved in many challenging and exciting projects, that create valued improvements for our clients and the public at large. We look forward to sharing information with you about these projects, and anything else that we think you might find interesting.



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Friday, November 29, 2013, the day after Thanksgiving, a fire broke out at the Rentech Nitrogen Partners, L. P. Fertilizer Plant in East Dubuque, Illinois. The fire in the ammonia process area of the plant broke out about 9 am and was quickly extinguished by fast acting employees and the fire department. The fire left a 225-ton vessel delicately balanced on a concrete frame that had sustained serious damage.

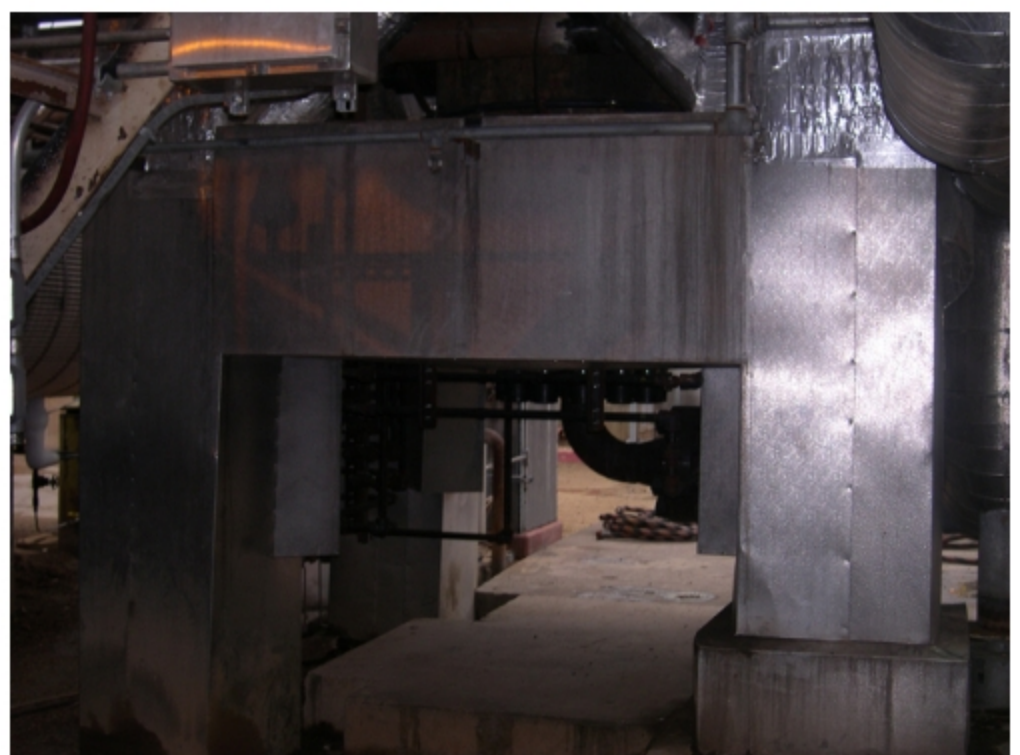
Within hours, WHKS structural experts were assessing the damage and calculating the load-carrying ability of the damaged frame. Looking under and around the precarious structure, it appeared that cracks in the concrete were widening and the risk of catastrophic collapse was growing by the hour.

Based on structural evaluations performed by two independent WHKS teams, the Rentech Nitrogen team of employees and contractors used available railroad ties, steel beams and hydraulic jacks to temporarily brace the damaged frame. Survey crews set up eight independent observation points to measure any movement. The next steps were to find and install a permanent solution.

Damage to the original concrete frame was too extensive for it to be repaired. Nor was it cost effective or desirable to move the 225-ton vessel that was supported by the frame.

After brainstorming a variety of solutions, the team decided to encase the damaged concrete columns with a new structure made of welded steel plates. Working carefully from below ground footings, contractors proceeded upward in stages to bring the new structural system up to the underside of the vessel. In a masterful demonstration of round-the-clock, fast-track construction, the upper stages were being designed, materials sourced, and parts fabricated while the earlier stages were being constructed on site.

The final stage combined a sliding steel collar and frame system. The collar pressed up against the underside of the original concrete slab, which balanced the vessel. Eight powerful hydraulic jacks were positioned to slowly shift the weight of the vessel from the old concrete columns to the new steel cladding. The fire-damaged concrete had actually compressed and the jacks were needed for restoration to the original height before the steel structure could begin to carry the load.



*Repaired Steel Encased Concrete Structure with Fire Resistant Insulation*

Everyone held their breath as the jacks eased the collar into place. To measure the incremental movement as the steel frame moved to its final position, dial extensometers, capable of measuring fractions of a millimeter, were placed between the sliding collar and the steel encasement. When the needed jacking force was reached and the measurements agreed with the calculations, welders scrambled up the tower to weld the steel cladding in place and make the load transfer permanent.

Exactly 30 days after the fire, with permanent repairs in place, the plant was all systems go and ready to start processing ammonia.