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Elevated Epoxy Grout Pumping

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Gene Baker has 25+ years of plant maintenance, reliability and power generation with rotating equipment. This includes 14 years of US Navy and commercial power generation. He is currently the Site Machinery Lead for the Lyondell LaPorte site.

Gene is a Principle Machinery Engineer for LyondellBasell. He has a BS degree in Nuclear Engineering from the University of Maryland and a PE in mechanical engineering in the state of Texas.

Kermit Palmer has over 40 years' experience in selling, distribution and application of precision grouting materials. His knowledge of the marketing and problem resolution of machinery grouting led him to develop a procedure for pregrouting of machinery baseplates and eventually holding a process patent entitled "Pregouted Baseplates for Supporting Rotating Machinery" U.S. Patent NO 6,405,992. The application of his patent is trade marked as Stay-Tru®. He has authored magazine articles and presented a paper he authored for the 2001 International Pump Symposium.

PROBLEM: A major petrochemical company was faced with the dilemma of grouting a primary component on the 4th deck of process unit during a turn-around. The machinery engineer required the use of epoxy grout for setting the equipment but was faced with numerous problems.



In developing a grout plan the engineer had to address:

- Limited access to the equipment
- Crane time to deliver materials was limited and possibly not always available
- Limited work area around the equipment for a crew of 8-10 workers with associated equipment, i.e. mortar mixer and wheelbarrows
- Grating structure was designed for personnel traffic and not adequate for tons of material to be assembled
- Timing was of the essence.





Crane Access



Insufficient work space for materials, mixer and additional personnel

CONSIDERATION: Develop a grout plan that would:

- Eliminate the need for as many personnel and equipment on the elevated deck.
- The plan should also eliminate the need for crane time to deliver materials during the grouting process.
- The grout plan under consideration was to deliver the material to the equipment by pumping from the ground vertically 80 feet (24 meters).

BUT the epoxy grouting industry had never pumped epoxy grout vertically to these heights.



SOLUTION:

A specialty grouting contractor was contacted. A pumping test was developed to vertically pump to over 80 feet plus 20 feet horizontally, plus 10 feet whip hose on the end of the vertical lift piping.

The test was accomplished using a crane to suspend the 80 foot PVC pipe riser and a MAN lift and a 30 gallon drum for depositing the material.



The test proved successful with excess pumping capacity to accomplish the requirements. The materials also pumped at a rate well within the working time of the material of 75 minutes.



THE PLAN: The first pour was 2” to lock in the frame. Filling of the skid was scheduled for the following night shift.

390 cubic feet of materials were marshalled at ground level.

The only materials on the deck were the aggregate extender used to allow for an 18” deep placement in one lift.



Materials marshalled at ground level



The project installed vertically 3 Teflon lined steel pipes 80 feet to the structure. The second pipe was a back-up in case there was an emergency shut down of the work area.



Vertical Riser at grade



Vertical Risers at the 80 feet level



Two pumps were used. One to lift the grout to the 4th deck.

Second pump was used to place the grout.



Transfer
pump on the
4th deck

A total of 520 cubic feet of grout and aggregate extender was placed in a time frame of 10 hours which included setup and cleaning of equipment.

**The actual pumping time was 6 hours.
Rate of placement was 86.6 cubic feet
per hour or approximately 41 units of
grout per hour.**

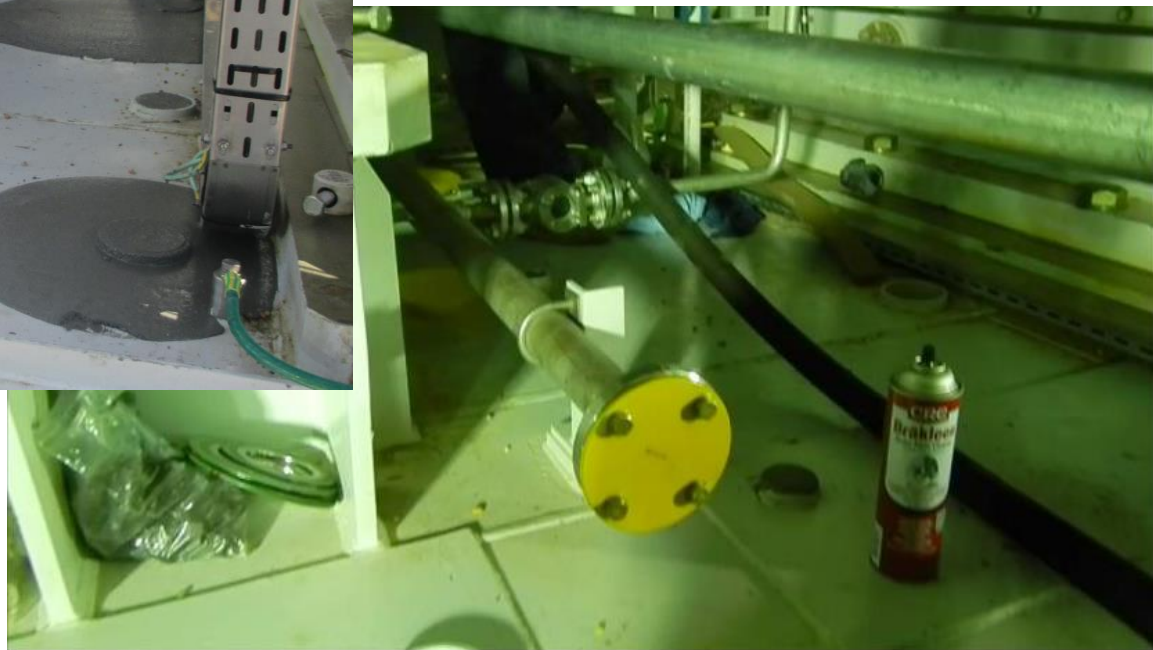


The grout placement was done at night due to the ambient temperature of 90 F during the day.

Working Time in Summer heat is 60 minutes.

Time from mixing hopper to nozzle is 5 minutes.





Clean deck plate of equipment during placement



LESSONS LEARNED: Epoxy grouts can be pumped vertically successfully. Any application above grade is a potential especially if deck space is limited.

- Personnel is reduced by 50%
- Work area around equipment and ground staging area is safer
- Equipment cleanup is dramatically reduced
- Installation is faster than the traditional bucket process
- Material placement is not limited by the working time of the material due to the fast delivery of the material
- The pumping process also allows for directing the material to the specific place required; you are not depending on a head box with hydraulic head to push the material several feet