ErgonArmor™ | PROJECT PROFILE

Installation of Precast Sulfur Pit Constructed with ErgonArmor's TUFCHEM™ Silicate Concrete

LOCATION
Houston, Texas

COMPLETION
1993

OPERATION
Sulfur pit

PRODUCTS
TUFCHEM™ Silicate Concrete
TUFCHEM™ II Membrane

Challenge: Sulfur pit replacement using a more chemical-resistant concrete than portland cement

Solution: Creation of replacement sulfur pit using TUFCHEM Silicate Concrete with TUFCHEM II Membrane outer lining

In 1978, a sulfur pit was completed at a plant in Houston, Texas. The structure of the pit was constructed of reinforced concrete, a chemical-resistant brick, and membrane lining. The primary purpose of this installation was to protect the concrete from the molten sulfur environment. After operating for seven years, instability in the brick liner led to collapse of the lining at certain locations exposing the concrete directly to the molten sulfur.

As a result of this corrosive activity the tank underwent reconstruction, which included a stainless steel bottom. The stainless steel began to deteriorate as well. This corrosive activity developed from water infiltration into the pit when the water combined with the sulfur to create sulfuric acid. According to the plant engineer at the Houston plant, one rainfall can produce as much as 4 to 5 inches of water. This moisture factor attributed to excessive corroding.

Consequently, one section of the tank is always subjected to more corrosive activity than usual. Periodically the level of the molten sulfur inside the tank fluctuates. The area at which this fluctuation is most frequent is usually where most corrosion occurs, due to the abundance of oxygen and the presence of sulfur. This fluctuation is often a result of charging and discharging material to and from the tank. Because the corrosion was more extensive in one specific area of the tank, an application of ErgonArmor's TUFCHEM Acid-Proof Gunite was proposed to make the necessary reparations and extend the life of the tank.

TUFCHEM Acid-Proof Gunite is a single component, chemically hardening, 100% potassium silicate, inorganic acid-resistant cement designed for application by the "Dry Gunite Method." ErgonArmor's "Dry Gunite Method" attributes significantly towards minimum shutdown time, which is extremely crucial for the quality of consistent productivity. The Guniting process is excellent for patching or restoring existing linings, which was exactly the case with the Houston Plant. The restorations lasted an outstanding eight years with minor repairs. Over an extended period of time such reparations can become quite costly. Thus a new ErgonArmor product was proposed that would eliminate even long term restorations: TUFCHEM Silicate Concrete Foundation Grade (TSC-FG).

In considering a new sulfur pit, ErgonArmor had a choice; construct the pit conventionally with portland cement concrete (PCC) and corrosion resistant liner or use TSC-FG as the structural lining as well as the corrosion resistant material. Although TSC-FG is significantly higher in cost per cubic feet than PCC, a TSC-FG pit has similar structural properties, and saves time in construction. In addition the structure would be chemical-resistant thorughout, rather than having a 2-inch thick corrosion lining.

ErgonArmor opted for a sulfur pit entirely constructed from TSC-FG. Reinforcement was similar to that for a PCC structure, in addition an acid proof urethane asphaltic membrane TUFCHEM II Membrane was installed on the back side. To limit downtime the pit was cast in two sections and joined together. ErgonArmor's TSC-FG is a more economical, higher strength and rapid setting acid-resistant silicate concrete than other silicate concretes. This product is specially formulated for the casting method of construction and is treated similarly to Portland cement concrete with respect to forming, mixing, reinforcing, placement, and curing. The plant engineer said that he was very pleased with the two week installation period, which resulted in minimum shutdown time and quick return to the plant productivity.

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1. Steam pipes that are used to dissolve the sulfur when the sulfur pit is in full operation.

2. Installation of the first half of the sulfur pit being lowered into the ground.

3. The second half of the sulfur pit being assembled with the first half.

4. Completed sulfur pit from a ground view

5. Completed sulfur pit from an aerial view

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