Job Story:

CHALLENGE:
Re-insulate chemical storage spheres to maintain a temperature range of 35 – 40°F and control condensation, without interfering with the fireproofing system.

SOLUTION:
Two thicknesses of 1-1/2-inch Armaflex with a minimum R-value of 8.4.

Project:
Shell Deer Park Chemical Plant
Chemical Storage Spheres Re-insulation

Location:
Houston, Texas

Elastomeric Foam Insulation Meets Multi-faceted Requirements of Demanding Shell Petrochemical Project

David Lopez, Pressure Equipment Inspector and Coatings Specialist at the Shell Deer Park Chemical Plant just outside of Houston, Texas, was involved from the beginning in the plans to re-insulate the two 82-ft. diameter butadiene storage spheres. Planning the re-insulation of the spheres was an involved process that required exhaustive research and testing before Shell ultimately decided to use AP Armaflex closed-cell elastomeric foam as the insulating material.

The primary purpose for insulating the tanks was energy efficiency and savings. The butadiene must be maintained within a temperature range of approximately 35 – 40°F. If it gets too warm, it will vaporize and lead to costly product waste. By combining two thicknesses of 1-1/2-inch Armaflex, Shell was able to achieve an R-value of better than 8.4.

To keep the butadiene within this temperature range, it is circulated through a chiller pack that sits adjacent to the two storage spheres. The chemical is constantly moving to and from the chiller pack, except during cooler weather when outdoor temperatures are sufficient to keep it within proper range. Insulation is required to minimize heat gain and thus reduce the load on the chillers. With a massive amount of fluid circulating through the tanks, this energy savings is significant.

Condensation control was also extremely important. Chilled butadiene spheres sweat if they aren't tightly insulated. Any moisture that is allowed to accumulate beneath the insulation increases the risk of corrosion under insulation (CUI), a situation that could potentially compromise the structural integrity of the vessel. So it was extremely important that the insulation adhere to the sphere like a second skin, without any gaps where moisture might accumulate. AP Armaflex addressed all of these concerns because:

1. Its firm, yet smooth skin could be tightly adhered to the surface using Armaflex® 520 BLV Adhesive

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2. Its closed-cell structure and very low water vapor permeability provide a material that neither absorbs nor transfers moisture.

Special Fireproofing Requirement

Shell had selected an Epoxy Intumescent Fireproofing system to protect the tanks in the event of a fire. This thick, paint-like material is sprayed onto the surface of the spheres before the insulation is applied. When heated to extremely high temperatures, like one might see in a high temperature fire, this material expands and forms a protective shell around the vessel and its contents. It was critical that whatever product was chosen to insulate the tank didn't interfere with the reaction of the fireproofing in the event of a fire. Shell ordered the coatings manufacturer to perform high temperature burn tests at their R&D facility in the UK.

"This was a very complicated burn test. It simulates pool and jet fires – the type of high temperatures you would see in a petrochemical manufacturing facility or offshore rig fire," explained Lopez. The test showed that while Armacell elastomeric foam meets the 25/50 flame spread and smoke requirement for insulation, it will disintegrate as needed at very extreme temperatures, allowing the fire proofing system to swing into action. It also provided the final assurance that elastomeric foam was the right insulating material for this demanding application.

Fast, Easy Installation

While the planning process was intense, the installation process was quite simple. According to Ismael Jimenez, Brand Energy Solution's Insulation Superintendant of Projects & Turnarounds at Deer Park, it was one of the easiest insulation projects he has tackled. The installation crew worked with 4-foot wide rolls of AP Armaflex, installing several lengths at a time using the Armaflex® 520 BLV Low VOC adhesive. (Low VOC adhesives were required to meet Shell's stringent health and safety standards.)

"It was definitely easier than other projects we have done because it lies so flat," said Jimenez.

The final step was installing a rubber membrane cladding onto the insulated exterior to serve as a weatherproof shield. Interior applications of AP Armaflex would not require such cladding, but because the spheres would be exposed to all forms of weather and ultraviolet rays, it was required.

As a result of their exhaustive qualification process, the Shell project team is confident the Armaflex material will provide the necessary thermal performance and interact with the fireproofing system as needed. When coupled with the ease-of-installation, this is an insulation system that will deliver consistent and reliable performance.

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