

Project Highlight

Extending the Life of Produced Water Filtration Tanks

In the hot and acidic liquid environment of oil production, tank linings can fail rapidly and cause leaks within months. The cost of tank repair or replacement, unplanned downtime, and the risk of environmental damage initiated the demand for a better solution.

Oil production companies frequently have tank corrosion issues due to the hot water produced during the oil extraction process. Steam and chemicals are shot down wells to loosen the thick crude oil, and then the hot acidic mixture is extracted from the ground. Before being re-used, the produced water is separated from the oil and cleaned in an extensive water filtration process.

After repeated premature tank failures, despite cutting edge surface preparation technology and a novolac epoxy with a proven track record in high temperature environments, Goodwest Linings and Coatings was asked by an oil production company in Kern County, CA, to design a solution that would extend the longevity of their Weak Acid Cation filtration vessels.

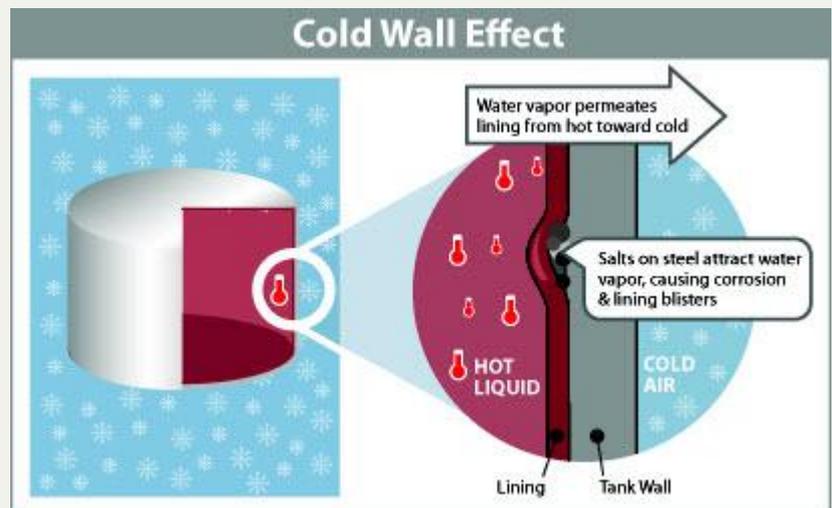


Severe steel corrosion in water filtration tank

The hydrochloric acid in the vessels

Is Your Tank in Hot Water? Cold Wall Effect Causes and Solutions

Is the temperature differential between the liquids inside your tank and the lowest outside temperature 70 degrees Fahrenheit or more? If your operation utilizes hot water, the “cold wall effect” may be a very real problem for you. The damage caused by this can lead to premature failure of tank linings, resulting in unplanned downtime, repair or replacement costs, and safety and environmental issues.



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The cold wall effect occurs when there is a major difference in temperature between the contents inside a tank and the outside temperature. The hot liquid inside the tank is drawn to the colder exterior temperatures by the same force that heats up the outside of a ceramic mug when it holds hot coffee. This causes the hot liquid to permeate the tank lining at a significantly faster rate than if the interior and exterior temperatures were similar. The greater the temperature differential, the faster the permeation rate.

When the hot liquid reaches any salt deposits on the steel, corrosion cells will form and grow. This eventually causes blisters in the lining that will rupture and expose the steel to chemicals and oxygen in the tank.

The following three techniques are often part of Goodwest Linings and Coatings' cold wall effect mitigation program:

1. **The primary technique is the removal of soluble salt from the steel surface.** Salts such as chlorides, sulfates, and nitrates form corrosion cells when the liquid permeates the lining and reaches the steel. If salts are not present on the steel, a corrosion cell will not form and the water molecule will simply permeate the lining at the molecular level while leaving the lining intact to continue protecting the steel from the oxygen

was used at 190° F to 210° F; the company determined that a lifespan of five years or more was acceptable. The first tanks relined by Goodwest with this program have been intact for nine years without repairs and are still going strong!

The winning solution was a rock-hard graphite-reinforced natural rubber lining called the Blair VE925BNG. The key advantages of the lining material in this application are:

- High temperature resistance.
- Trace amounts of hydrocarbons in the vessels cause most rubber linings to swell and become more permeable. The tightly cross-linked molecules of this rock-hard lining take much longer to break down in the presence of hydrocarbons.
- Natural rubber linings resist hydrochloric acid better than most other rubber linings.
- Thermal insulation. The .250" thickness reduces the temperature differential between the hot tank interior and cold tank exterior, which reduces the tendency of the hot liquid to permeate the lining (see "Is Your Tank in Hot Water?").

The oil production company has experienced huge cost savings from the lack of interruption in the production process. This innovative solution has subsequently been implemented for other oil production companies throughout California.

Ryan Sears, president of Goodwest, stated, "Working on complex problems with our customers is what we do best; and reducing the amount of unplanned downtime for some production operations can save millions of dollars."

and corrosive chemicals inside the tank. Salts are usually removed from the steel by water jetting at pressures from 10,000 psi to 35,000 psi and using a cleaning agent that dissolves salts.

2. Thick-film linings such as rubber or elastomeric polyurethane will reduce the temperature differential between the exterior and interior of the tank. Not only does a thick film lining serve as thermal insulation from the interior, it will also take the hot liquid much longer to permeate the lining before it reaches the steel. On their own, thick film linings can reduce the temperature differential by about 30° F. With the addition of ceramic brick courses laid over the lining, the temperature can be reduced at the lining interface by 50° F to 100° F.

3. Polyurethane foam insulation on the outside of the tank. As an example, let's say the outside temperature falls to a minimum of 40° F and the liquid inside the tank is kept at a minimum of 150 degrees; this is a 110 degree temperature differential. Polyurethane foam insulation would increase the exterior steel temperature, thereby reducing the temperature differential between the hot liquid inside and the exterior environment. Exterior insulation significantly reduces the rate at which the hot liquid will permeate the lining.

These solutions are crafted to provide long-lasting linings for carbon steel tanks in high temperature environments. Carbon steel-lined tanks cost much less than stainless steel tanks and are stronger and more repairable than fiberglass tanks. The combination of carbon steel tanks and well-engineered linings can provide the most cost effective solution.

About Goodwest

Goodwest has installed dependable protective lining and coating systems since 1961. Providers of water, oil, power, transportation, and other key infrastructures rely on Goodwest to ensure that critical equipment stays in service as long as possible.

Goodwest specializes in applying materials resistant to the most aggressive chemical, abrasion, and high temperature environments.

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