TANKWRAP™

ENGINEERED REPAIR SYSTEMS

STORAGE TANKS

TANKWRAP™
ENGINEERED REPAIR SYSTEMS

HJ3 provides the most comprehensive line of strengthening products in the world for rehabilitation of process piping systems, tanks and concrete infrastructure.

Over the last 20 years, HJ3 has been proud to service clients around the globe on over 15,000 applications. From large scale piping projects to heavy industrial repair applications, HJ3 has strived to provide unmatched support, products and engineering to keep clients on-line and profitable.

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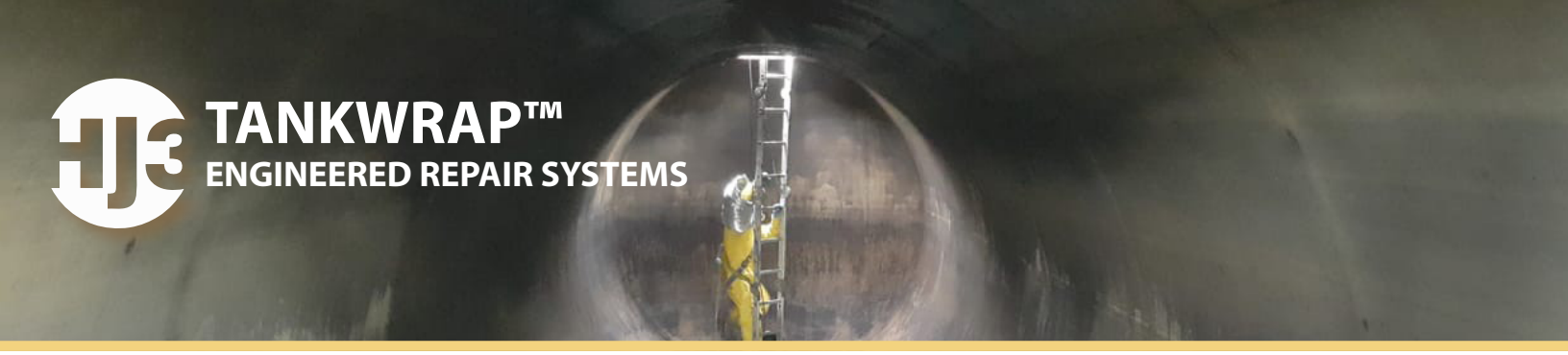
Introduction to API 653 Compliant Rank Repairs

Corrosion and chemical attack of tanks in process facilities is an ongoing problem. Managing the integrity of tanks between scheduled outages and without costly disruptions to operations can be a challenge. In May of 2020 the American Petroleum Institute published Addendum 2 (2020) of sections 3.22, 9.4 accepting carbon fiber as a suitable repair method for API 653 tanks. For the last 20 years, HJ3 has been on the front lines of these issues and has worked directly with operators, designing in-place, in-service composite repairs to extend the life of their critical assets. Through years of testing, development and successful installations, HJ3 has maintained their position as the leader in composite tank repair, offering reliable, safe and and now, API 653 compliant repairs to clients around the globe



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TankWrap™

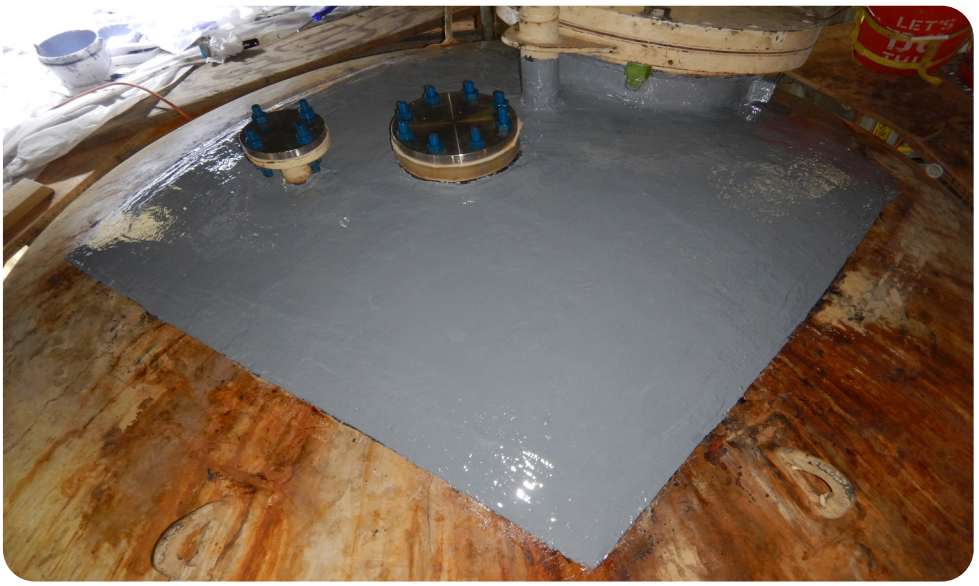
TankWrap™ is an API 653 compliant structural repair system used to rehabilitate internal or externally corroded storage tanks. When installed internally, the system can double as an internal liner, restoring steel loss while protecting against harmful chemicals in immersion.

TankPatch™

TankPatch™ is an API 653 compliant, cold-applied system that offers a safe and cost effective alternative to welded patch repairs on above ground storage tanks. TankPatch can be installed on internal or external tank applications and offers a wide range of chemical resistance for long-term performance.

TankFlex™

TankFlex™ is a flexible, tough, composite system used to repair corrosion defects on the roofs of aboveground storage tanks. TankFlex™ is designed to withstand pressurized chemical vapors and ultra-violet (UV) exposure. TankFlex™ conforms



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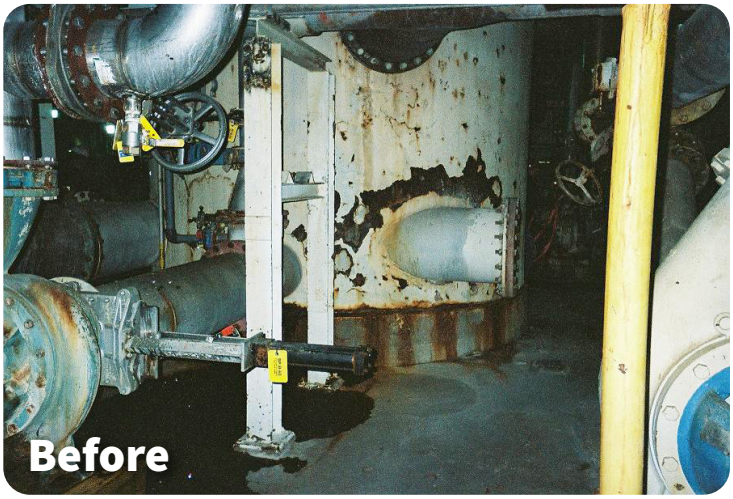
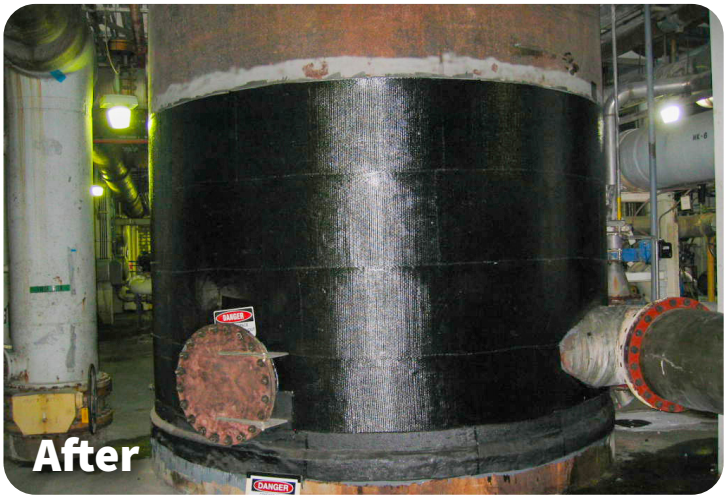
CHEMICAL RESISTANCE



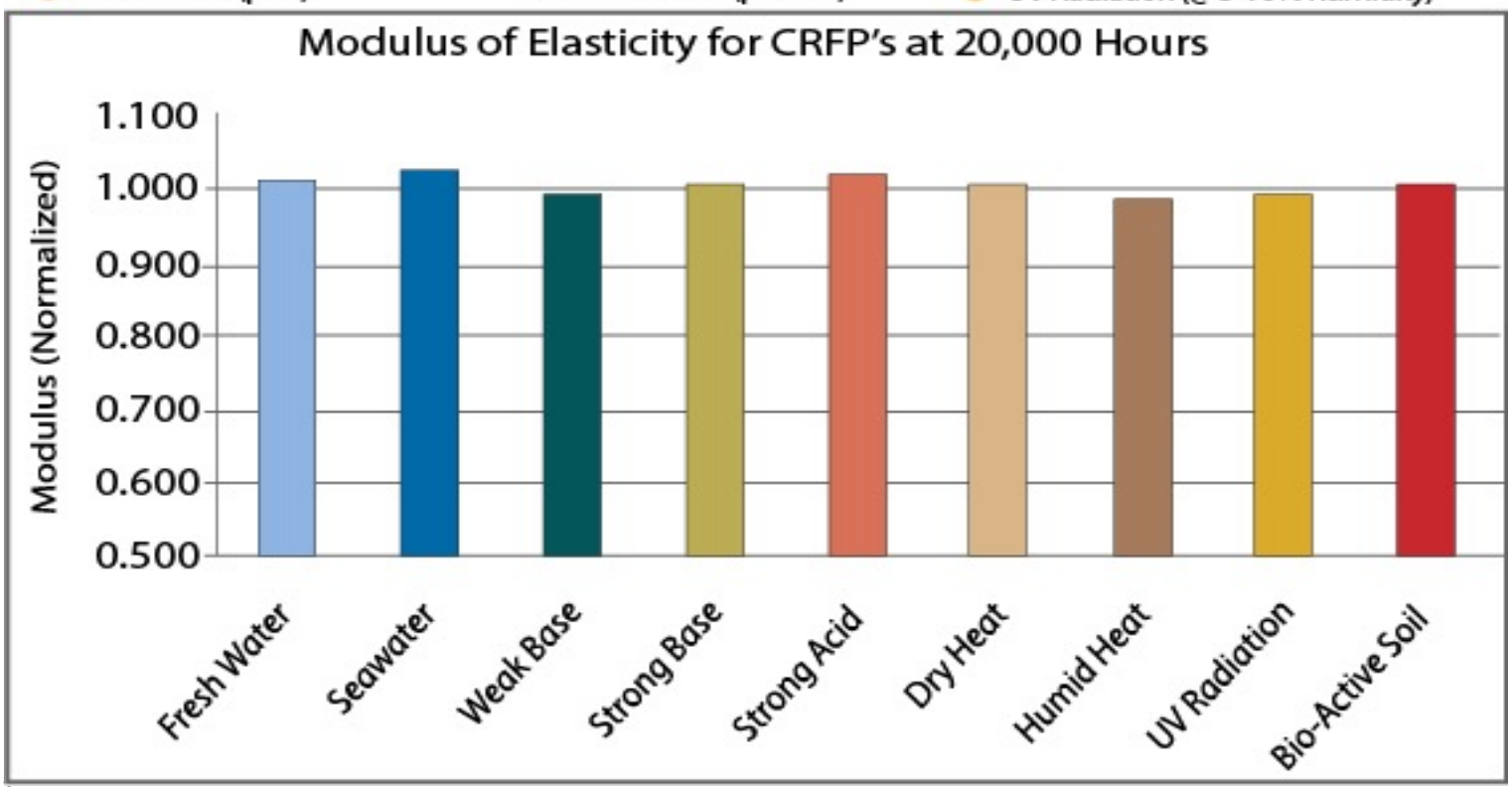


Carbonseal Carbon Fiber - Shown Above Before The Chemically Resistant Topcoat Application

The CarbonSeal™ Steel Tank Repair System is resistant to corrosion and aggressive chemicals, so no future maintenance is needed on the repair.

Typical Chemical Resistance of CarbonSeal™ by Industry Type
95% Retention of Strength After 20,000 hours Durability Testing in pH ranging from 2.5 to 14

- Calcium Hydroxide (pH 12.5)
- Alkali Water Solution (pH 10)
- Fresh Water (pH7)
- Hydrochloric Acid (pH 2.5)
- Sea Water (pH 7.25)
- Alkaline Soil (pH 10.5)
- Dry Heat (140˚ F @ 5% humidity)
- Humid Heat (122˚ F @ 95% humidity)
- UV Radiation (@ 5-10% humidity)



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STORAGE TANKS CASE STUDIES

COPPER MINE TANK REPAIR

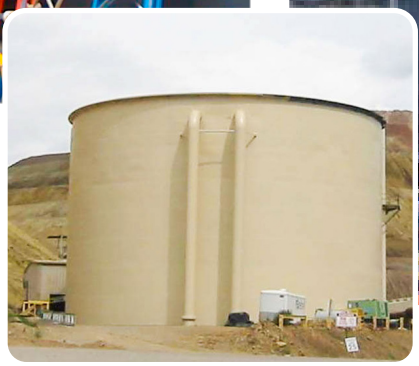
A 2.5 million gallon steel wastewater tank corroded, causing cracks & leaks.

Corrosion to the tank walls ranged from 25% – 60% steel loss, putting the tank at risk of structural failure. Welded repairs had been attempted in the past, but accelerated the rate of corrosion. The severe corrosion had resulted in fatigue, cracking, and leaks in the tank's steel shell.

HJ3's protective liner was applied to the tank's interior, and the CarbonSeal™ carbon fiber fabric was then saturated and bonded to the external walls.

The finished tank was painted to match the client's aesthetics. HJ3's CarbonSeal™ installation was completed within 8 weeks, and required no interruption to plant operations.

TOTAL SAVINGS: 3 Million compared to replacement costs.



Repaired & Painted Tank

POWER PLANT TANK REPAIR

A geothermal power plant had severe corrosion on its primary clarifier and demister tanks. The clarifier, 43ft tall with a 125' diameter, had approximately 80% steel loss on its sidewalls, upper tank ring, and dome The exterior temperature of the sidewalls was 140°.

Several areas of the clarifier required repair: a wall patch, the tank sidewall and dome roof connection, dome roof, and a 36 ft. diameter overflow pipe. The steel was cleaned with an abrasive blast and primed, then lined with HJ3's CarbonSeal™ carbon fiber system.
A chemical and temperature-resistant topcoat was applied to protect the system from the tank's extreme temperatures.

The CarbonSeal™ repair restored the clarifier's 20-psi required hoop strength. The power plant saved $3 Million in replacement costs by repairing the clarifier tank and demister vessels.

Environmental savings:

Overall 602 tons of steel were prevented from potentially going to scrap, almost 1200 tons of CO_2 emissions were prevented from polluting the atmosphere, and more than 35 million gallons of water were saved that would have been used for the manufacture of steel.

Tank Repair vs. Replacement

Cost: $1m vs. $4m

25%

Energy Used: 40,824 kWh vs. 408,240 kWh

10%

Water Consumption: 150 gal vs. 60m gal

0.0%

Repair Time: 3 weeks vs. 6 months

12%

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STORAGE TANKS CASE STUDIES

NITROGEN TANK

This steel tank T-932, contains 57% concentrated nitric oxide. Spilling occurred that exposed the exterior of the tank to the 57% solution of nitric oxide. Severe corrosion of the shell-to-floor weld and associated heat affected zone (HAZ) was observed in two distinct areas. Both areas were found to be approximately 1-inch wide. The largest area was 36-inches long and the smallest area was 10-inches long.

HJ3's CarbonSeal industrial composite system patched the 1-inch x 10-inch and 1-inch x 36-inch defect areas and returned them to their original steel strength, bringing the tank back within API-653 allowable corrosion allowance. The repair also mitigates future corrosion in this area as the CFRP patches protect from future nitric oxide spills.

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STORAGE TANKS CASE STUDIES

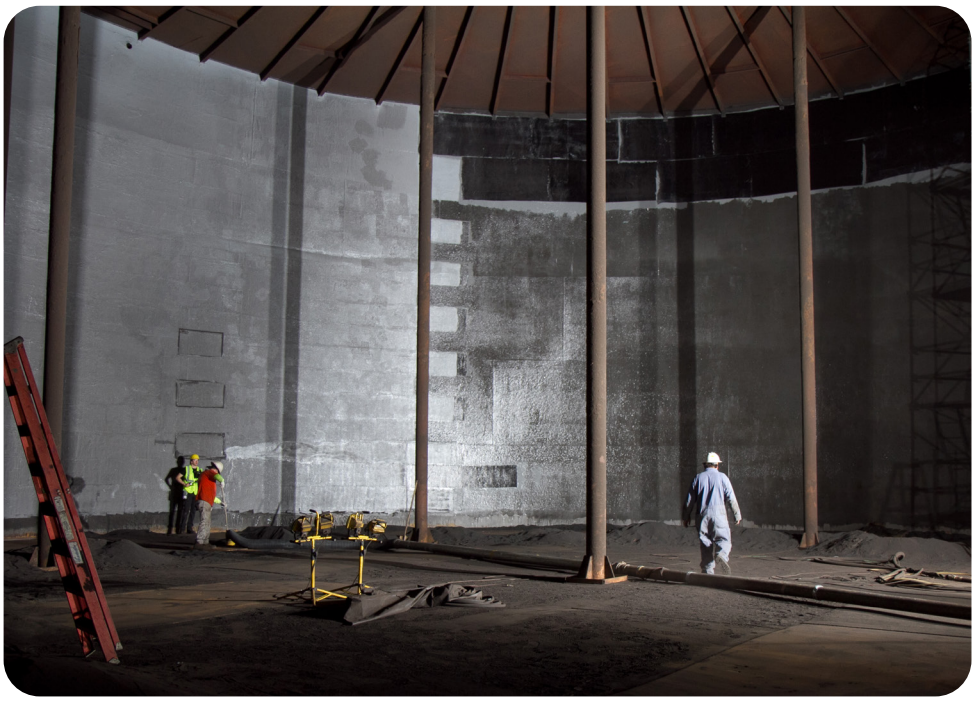
POWER PLANT TANK REPAIR

A 2.5 million gallon wastewater tank was leaking. Previous patch attempts had been made, however all had failed. The tank was so degraded that it had to be fully replaced or repaired.

Corrosion had caused multiple through-holes and leaks in the steel wastewater tank. The floor of the tank was coated with fiberglass, and the steel tank wall was severely rusted.

HJ3 Installers prepared the tank by first removing all the surface corrosion and fiberglass coating, cleaning the tank, and patching the holes to prepare the surface for the CarbonSeal™ carbon system. CarbonSeal™ carbon fiber was then installed on the tank's walls and floor.

After installing HJ3's CarbonSeal™ system on the interior of the tank, a chemically resistant topcoat was applied to protect it from future corrosion.



HJ3's CarbonSeal™ system provided a long-term repair for the steel tank at a fraction of the cost of replacement. Not only did the client save approximately $3 million and 5 months of downtime by completing the wastewater tank repair with carbon fiber, but because no replacement steel had to be manufactured the environmental savings were also significant.

Tank Repair vs. Replacement

Cost: $1m vs. $4m

25%

Energy Used: 40,824 kWh vs. 408,240 kWh

10%

Water Consumption: 1,000 gal vs. 600,000 gal

0.2%

Repair Time: 3 weeks vs. 6 months

12%

STORAGE TANKS CASE STUDIES

PULP & PAPER PLANT LEAKING STEEL TANK

Pulp and paper plants utilize large, steel, high-density tanks to store pulp. In this particular pulp and paper facility, a steel tank that stood 100 feet tall and 50 feet in diameter experienced significant corrosion resulting in over 900 through-wall holes.

Corrosion to the steel tank walls ranged from 30% to 50% steel loss on the upper 50% of the steel tank. Replacing the existing tank with a new tank would have cost $2.5 million. However, the company wanted to avoid the interruption to plant processes and the associated downtime costs.

After lowering the volume of the tank to 50% capacity, the steel substrate was abrasive blasted and cleaned to white metal. After surface prep, 900 through-holes were patched to create a consistent surface. Next, the surface of the cleaned tank was primed. After priming, the CarbonSeal™ carbon fiber was saturated and bonded to the steel tank walls. Installation was completed in 6 weeks with no facility downtime.

The CarbonSeal™ repair system saved the client more than $2 million dollars over the cost to replace the facility's high density tank. While the plant stipulate the repair to last 3 years, it has been

> *"We found some 900 holes that needed patching. HJ3 came in to restore the structural integrity of the tank. That was in 2005 and we haven't had a problem."*
>
> **J. Meredith**

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