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INTRODUCTION

The Refinery discussed in this case study processes a wide variety of petroleum products. Reinforced concrete columns and beams support extensive process piping throughout the plant. Overtime, exposure to the freeze thaw cycle and vibration caused extensive cracking of the concrete columns, delamination of the concrete and corrosion of the reinforcing steel rebar, causing OSHA to tag the columns.



PROBLEM

During a plant survey it was shown that reinforcing rebar within the column had deteriorated up to 25% as much of the rebar was completely exposed to the external environment. The resulting damage of the columns and beams compromised the structure's fire rating, endangering plant operations and worker safety. Given the extent of the damage, the plant considered three alternatives: replacement, resurfacing of concrete and

reinforcement with HJ3's Composite System, and only resurfacing the concrete. The plant chose to resurface the structures with a cement based grout to reestablish the fire rating of the structure and then strengthened the patched area with HJ3's Composite System. The use of HJ3's Composite System was selected to handle shear forces from thermal expansion and contraction and continued vibration that caused the initial damage to the columns.

INSTALLATION

The columns were first wire brushed and cleaned of all loose concrete material. Corroded rebar was then cleaned and treated to prevent further corrosion. Then a 6000-psi grout was used to resurface the columns back to their original shape. After surface preparation, the columns were primed with 10 mils of the HJ3 PC-100 Primer Coat. Then 2 layers of HJ3's carbon fabric were saturated with SR-400 Saturating Resin and wrapped to the columns.



CONCLUSION

In total, 17 columns and 4 beams were repaired and strengthened with the HJ3 Carbon Composite System. The total installation was completed in 8 days and resulted in 70% cost savings for the client when downtime and fines were considered. The main advantages of the HJ3 Carbon Composite System were as follows:

- 10 x Tensile Strength of Steel
- Corrosion Resistant
- Speed of installation
 - Minimized Downtime Cost
 - 70% to 80% Cost Savings over alternatives – Including Replacement
 - Columns are 20% stronger than initial design



HJ3™

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