



Case History: Client- Benicia Refinery, California

Problem:

Cooling tower water supply had been affected by EPA regulations banning chromates. Replacement phosphates have not been as effective at controlling corrosion and fouling rates. Exxon had also been experiencing pH swings and low flow rates which further accelerated the fouling. As a result heat exchanger life dramatically reduced while fouling decreased production and increased down time. Additional cleaning cycles needed to be incorporated into turnarounds.

Solution: Curran International's patented system for in-situ application of an epoxy coating system was utilized. Tubes in cooling water service from 1990 are still in excellent condition and have never needed to be cleaned. Curran International additionally called to apply an epoxy coating to the tube ID of two gas-condensing exchangers (debutanizers). C4 was the process material on the shell side and cooling water circulated through the tube ID. The two exchangers were heavily corroded with pit depths ranging from .030" to .100". Tube material was SA-214 12 BWG. Normally a two-coat application is adequate protection for cooling water service but a third coat was needed to fill and cover the deep pits. Final dry film thickness of coating measurements ranged from 10 to 14 mils. Random spark testing was performed with no pinholes detected.

Results:

The exchangers were returned to service. Performance for heat rate and flow was calculated and compared to two other pairs of exchangers in the same process-cooling tower, supply pump circuit.

Unit Data

	Coated Exchangers	Uncoated Exchangers
Process	C 138 F to 109 F	A 138 F to 111 F
Delta T	D 109 F to 76 F	B 111 F to 80 F
Btu/hr	17 million BTU	13 million BTU
Calculated from Delta T of cooling tower		
Flow rate	734 GPM	414 GPM
Measured by ultrasonic flow meter		

Conclusion:

Flow rates increased by 77%. After 1.5 years operating at peak service temperature the exchangers show no depreciation of Delta T or flow rates and are predicted to perform at maintenance free levels for years.