Curran international

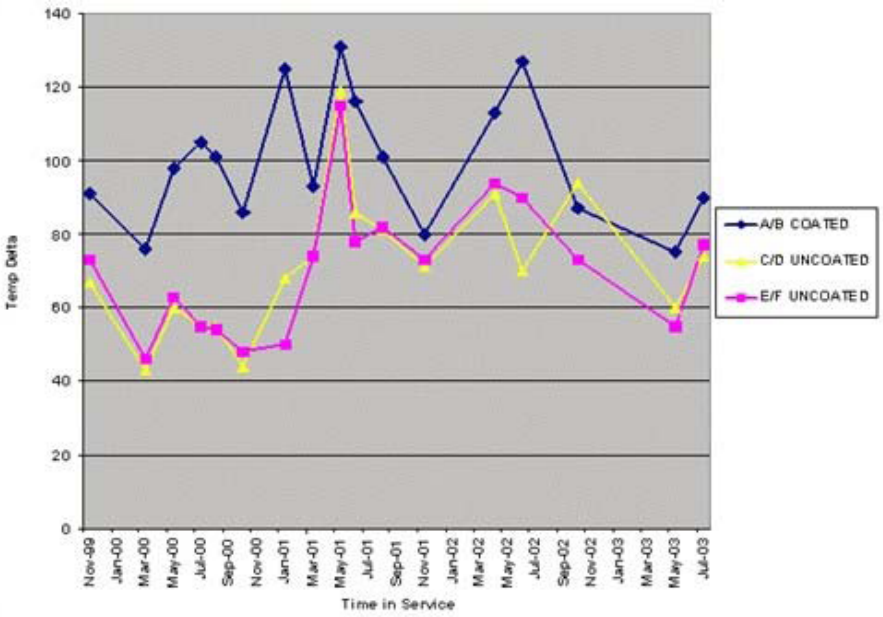
Applying coating solutions

Texas refinery increases flow rates of light end condensers to 1150 GPM from 570 GPM – 101% increase

Process outlet temperature drops to 110°F from 142°F – 22.5% improvement

Problem:
Light end condensers had a long record of low flow, high fouling and corrosion. Hydro-blast cleaning cycles averaged six to twelve months and bundle replacement averaged four to five years.

Solution:
In September of 1999 all bundles were replaced. As a trial, two exchangers (A&B) received high bake phenolic coating to the tube IDs. Flow rates and temperature differentials were taken at start up and monitored every two months. See heat rate table below.



Conclusion:
After more than 3 years of service the coated exchangers have exceeded expectations; the delta T of process outlets continues greater than uncoated tube bundles, and 30ºf lower than the uncoated exchangers. The uncoated exchangers have been through 2 maintenance cleaning cycles and were replaced with coated exchangers in late 2003. The coated bundles(A&B) continued uninterrupted in service through 2004.

Refinery Saves >$2.0M in Annual O&M Expenses – Using Coated Exchanger Tubes Summary Report of Heat Exchangers with Coated Tube IDs

A Gulf Coast refinery realized significant maintenance and production savings as a result of using coated carbon exchangers as an upgrade of carbon steel bundles in cooling water service. The 420,000 barrel per day refinery complex has tracked the performance of 209 carbon steel bundles with full length coated tube IDs used since the early 1990's – the annual savings to the plant have been estimated at more than $2.0M . More than 25% of its exchangers in cooling water service have been replaced with coated carbon steel bundles.

The refinery initially evaluated coated carbon steel bundles on “bad actors” – bundles with severe fouling, leading to MIC and aggressive corrosion causing tube leaks and short useful life. The plant began to use carbon steel bundles with coated tube IDs in the early 1990's. Since then the plant has documented significant reductions in process leaks as a result of tube side corrosion and increased the time between normal maintenance. Performance data compiled by the plant shows:

- The mean time between leaks has decreased to .5/per month from 6.5 per month.
- The service life of coated bundles has increased to 13+ years from 2.5 years.
- The average time between maintenance outages has increased to >4 years from 15 months.
- Annually – the plant averages 120 fewer bundle outages.
- Using coated bundles has saved O&M expenses by >$2.0M annually, and saves an additional $500K annually in re-tubes.

Results cited in 3 Case Studies:

Performance in an overhead cooler – Problem: Cooling water tube side maintenance cleaning recurring every 6 months at an estimated annual maintenance and production cost of $190,000/year. Solution: New coated bundle installed in 1995, plant recovered payout in 2 months – no unscheduled outages.

Feed, Deethanizer and Ammonia condensers – Problem: Train of condensers combined for average of 10 outages a year, tube side fouling would require cut back of cats as a result of front end pressure. Maintenance/production loss estimated at $1M annually. Solution: New coated bundles installed on train at cost of $1MM, plant recorded 1 year payout. Since coated bundles have been installed, there have been no outages for cleaning or tube leaks. The bundles do not foul and there's been no cutback required of Cat.

Admiralty cooling water bundles- Problem: Under-deposit corrosion leading to tube side MIC on brass bundles creating a failure mode of 1-3 tube leaks per year. Maintenance and production cost as a result of outage estimated at $650K annually. Solution: Coated carbon steel bundles replaced brass bundles. In 5 years since installing coated bundles the plant has saved about $3M in maintenance and operation expenses – the bundles have been cleaned only 1 X since being installed.

The plant estimates it saves about 25-50% in acquisition costs by using exchangers with coated carbon steel tubes when compared to alloy upgrades