



## Increased Tube ID Flow Rates, Improved HTR; 20% Improvement of $\Delta T$ at Process Outlet

**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 1999 all bundles were replaced. As a trial, two exchangers received high bake phenolic coating to the tube ID. Flow rates and temperature differentials were taken at start up and monitored every two months. See heat rate table below.

### *Coated Tubes – A&B Units*

DATE	WATERSIDE			FIN FAN OUTLET (F)	PROCESS SIDE	
	"A&B"	"B"	"A"		"A"	"B"
	WATER IN ( F)	WATER OUT (F)	WATER OUT (F)		OUTLET (F)	OUTLET (F)
11/5/1999	78		110	177	118	96
11/10/1999	72	84	110	181	116	90
1/3/2000	69		101	174		82
3/3/2000	79		115	175		
3/9/2000	83	96	121	177	126	101
5/1/2000	81	97	120	196	132	98
7/12/2000	90	104	130	210	144	105
8/30/2000	96	106	138	211	149	110

### *Uncoated Tubes – C&D Units*

DATE	"C/D"			FIN FAN OUTLET (F)	PROCESS SIDE UNCOATED TUBES	
	"C&D"	"D"	"C"		"C"	"D"
	WATER IN ( F)	WATER OUT (F)	WATER OUT (F)		OUTLET (F)	OUTLET (F)
11/5/1999	78		142	172	139	107
11/10/1999	72	110	146	173	142	106
1/3/2000	69		141	166		106
3/3/2000	79		160	175		
3/9/2000	83	146	165	174	167	131
5/1/2000	81	154	167	192	179	132
7/12/2000	90	157	176	192	180	137
8/30/2000	96	160	180	197	187	142

**Conclusion:** The 4 uncoated exchangers were hydroblasted of ID fouling in 2001, and eventually replaced during a 2003 TAR with new coated exchangers. The 2 coated exchangers were in service for more than 5-years without hydroblast maintenance.

## Alky Unit: Improved Duty, Reduced Expense

**Problem:** Tesoro Golden Eagle Refinery in Martinez Cal. had constantly suffered bottleneaking problems in their Alkylation unit. Exchanger ID fouling reduced unit throughput by 50%. A 6,000 HP compressor was constantly recycling 2,000 HP of the units gas. Historically these exchangers would typically drop from 5,000 GPM when new or “just cleaned” to 700 GPM in six months. High pressure water cleaning cycles averaged one year.

**Solution:** Curran International was contracted to coat the ID of two effluent refrigerant condensing exchangers which cooled butane in the unit. After 30 months of service flow rates have remained a constant 5,000 GPM. The unit has not stopped for cleaning. All compressor gas recycling has been eliminated which boosted the unit output from 13,000 B/D to 16,500 B/D even on the hottest August days. As an added benefit the compressor back pressure has dropped 5 PSI which has saved substantial energy costs to power the compressor.

**Full length tube ID coating – an exchanger bundle (left) and a fin fan air cooler – coated with  $<.010$ ” film of coating. A polymerized, homogenous thin film applied down full length tube IDs reduces friction and drag at the substrate. Tube ID coating sustains flow of cooling water through tubes; by reducing fouling and “backpressure” long term performance of the carbon steel exchanger is realized. Normal bundle maintenance, including hydroblasting, is reduced or eliminated. Contact Curran International for project references.**

