

Case Studies (FIS-188)

CO Boiler Convection Replacement

An Illinois refinery had a carbon monoxide (CO) boiler in their Fluid Catalytic Cracking (FCC) Unit. The CO boiler was more than 40 years old. The CO boiler’s convection section is used to preheat the FCC charge and also generate superheated steam at 600 psig/710°F.

The boiler had three problems:

1. Low economizer tube metal temperatures were reaching dew point levels
2. High super-heated steam temperature
3. Problems with tube support in the hottest zones.

CO Boiler Convection Section Replacement

Item	Units	Before Revamp	After Revamp
Heat Duty Total	MMBtu/hr	182.45	220.83
Process Heat Duty	MMBtu/hr	81.55	104.91
Process Flow	BPD	41,995	48,000
Process ΔT	°F	674 - 459	694 – 459
Steam Heat Duty	MMBtu/hr	100.90	115.92
Steam Flow	lb/hr	155,170	190,000
Steam Outlet Temp.	°F	765	714
Economizer TMT	°F	301	318
Stack Temp.	°F	636	577
Efficiency	%	68.0	72.6
Fuel Savings	\$ / annum	0.55 Million* * Based on \$3.0 / MM Btu	

Furnace Improvements Services

Clean & Efficient Combustion

Case Studies (FIS-188)

The refinery approached Furnace Improvements Services (FIS) to provide thermal design for replacing the convection section of the CO boiler. We carried out the engineering study for replacing the convection section by conducting a detailed operation analysis of the existing CO boiler and building a model of the existing design. With the model built, we were able to simulate the current operating conditions and predict the heater performance for the future operating conditions.

We developed a better design and overcame the drawbacks in the existing CO heaters. The convection section was redesigned to:

- Increase the FCC feed flow
- Improve the CO Boiler efficiency
- Prevent cold end corrosion of the economizer
- Eliminate flow distribution problems

The new design was developed retaining the existing soot blower locations, same platform elevations, and no additional firing requirement. The detailed engineering drawings of the convection section vendor were also reviewed.

The proposed revamp took care of all the issues with the existing CO boiler. It was estimated to save the client almost \$550,000 per year. The boiler was commissioned in March 2003 and is still running continuously today.