

**Case Studies (FIS-276)**

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## **Convection Section Modifications in CO Heater for SCR Installation**

An Illinois Refinery has a CO heater (CCU-1) in their FCC unit. It is used to combust the FCC off gas (mainly CO gas) from the spent catalyst regenerator unit.

The hot flue gases generated from combustion of FCC off gas are used to preheat the oil and generate super heated steam @ 600 psig / 700 °F. COP is installing a new SCR unit downstream of the CO Heater as a part of the consent decree agreement to reduce the NOx emissions.

The new SCR requires a flue gas inlet temperature in the range of 680-700 °F, which required reconfiguring the heat transfer surface in the convection section.

Furnace Improvements Services (FIS) modeled the convection section for 5 proposed cases and provided a revised design. The client approved FIS design and we are currently working on the detail engineering of the revamp convection section.

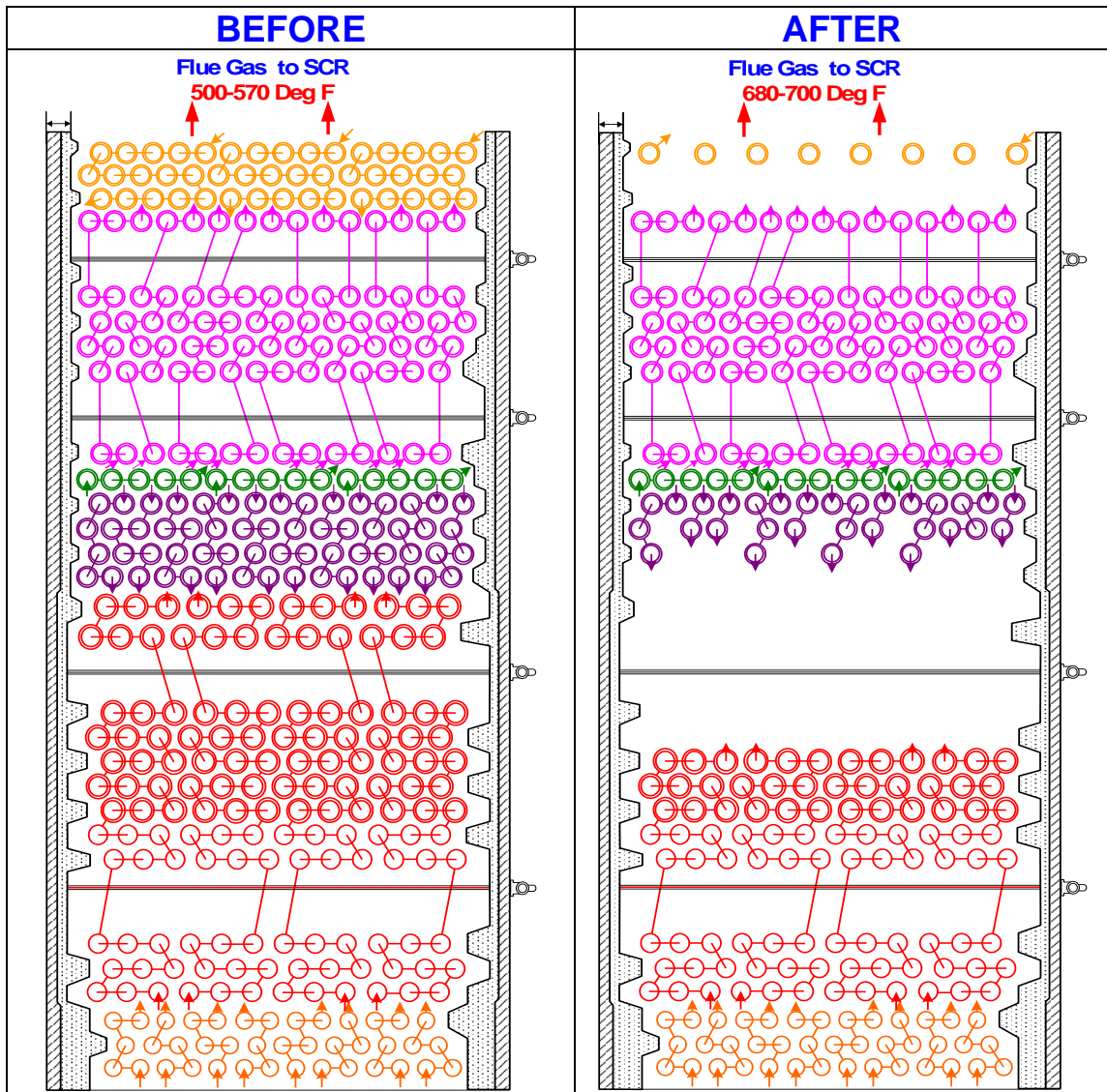








The Refinery was also having CO slippage problems and post combustion in the convection section. FIS analyzed this issue as well and came up with a practical solution.

FIS developed a CFD model of the existing combustion chamber and found out that mixing of FCC off gas and air was very poor in the combustion chamber leading to incomplete combustion in the firebox and post combustion in the convection section.

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	Steam Generation Coil 1
	Oil Preheat Coil
	Steam Super Heater Coil
	BFW Coil 1
	Steam Generation Coil 2
	BFW Coil 2

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**Combustion Chamber Modifications in CO Heater (CCU-1)**

FIS also found out that the burners were oversized and they were operating at a very low fuel gas pressure.

FIS developed a CFD model of the proposed design and the model suggested a marked improvement in the combustion of CO. Some of the modifications FIS suggested are as follows:

- Install correct size burners
- Install a baffle wall in the combustion chamber
- Inject FCC off gas in the flame zone.
- Increase the air velocity through over fire air port

FIS also conducted the CFD modeling of the FCC off gas plenum chamber to study the distribution of FCC off gas. The modeling suggested a mal distribution of about 42% between the first and the last port. FIS recommended installing splitters which will help distribute the FCC off gas equally to all the burners.

All modifications to CO Heater (CCU-1) will be executed during February 2008 turnaround.