

**Case Studies (FIS-263)**

## U40 Boiler NO<sub>x</sub> Reduction Project

There was a carbon monoxide (CO) boiler in a refinery's unit 40. The boiler was originally designed to generate 450,000 lb/hr steam @ 600 psig / 750°F by firing a combination of CO gas and refinery fuel gas.

Furnace Improvements Services (FIS) was approached to revamp the boiler to a refinery fuel gas fired boiler only and reduce the NO<sub>x</sub> emissions to 0.02 lb/MMBtu (15 ppm). They were seeking the reduction as part of the consent decree agreement they signed with EPA.



FIS conducted a study and provided COP with various options for NO<sub>x</sub> reduction. ConocoPhillips selected the option of Ultra Low NO<sub>x</sub> Burners with flue gas recirculation for detail engineering. FIS' scope of services was comprised of the following:

- Detail engineering of Ultra Low NO<sub>x</sub> Burners and flue gas recirculation scheme
- New economizer to increase the efficiency by 3%
- Design of additional rows of super heater coil
- Remove CO burners from firebox and seal the CO ports with additional heat transfer surface
- Process and instrumentation support for the new revamp conditions
- Computational fluid dynamics (CFD) modeling of the existing and new burners to predict the combustion scenario

FIS has completed the detail engineering and the project is currently in the erection phase. The boiler was commissioned in December 2007.