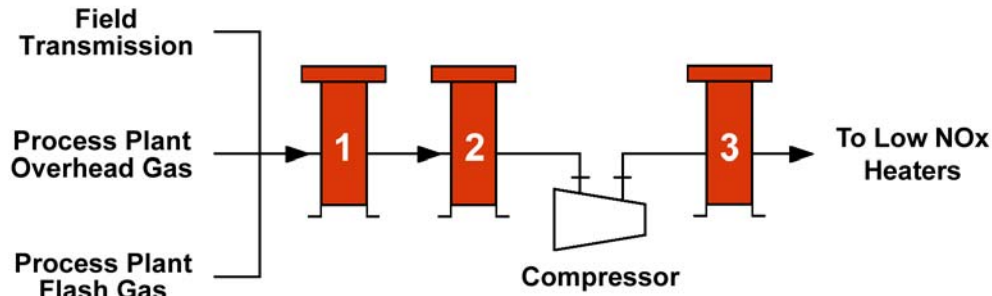




# Low NOx Heaters



Low NOx Heater Technology has become increasingly important in the United States refinery and chemical markets, due to increasingly stringent government emission regulations. With these tighter government regulations, operators have been forced to closely monitor and reduce by as much as 90% the amounts of NO and NO<sub>2</sub> in the fuel products sent to their heaters for combustion. Reductions are provided through a variety of steps including fuel pre-treatment, staged combustion, multi-stage fuel injection, internal furnace gas re-circulation, etc. Perhaps the most critical component to the low NOx technology is the specially designed burner tips within the heaters. Fouling of these burner tips can cause unacceptable increases in NOx emissions and maintenance costs.

Fuel gases are typically a combination of process off-gas streams from within the plant and pipeline natural gas. Neither gas stream is typically treated on-site prior to inclusion in the fuel gas system and can contain solids such as pipe scale or catalyst fines and liquids such as hydrocarbons, amine or water vapor.

## Operational Problems

1. Fuel nozzle and combustor fouling

## Solutions

1. A Nowata Filtration Model GSX vane scrubber should be used to remove any liquid slugs in the fuel gas stream prior to the fuel gas compressor.
2. A Nowata Filtration Filter/Separator using 1 or 0.5 micron NFG filter elements should be used to remove hydrocarbon / water vapor mists and solids from the fuel gas stream prior to the fuel gas compressor to prevent fouling of the compressor.
3. A Nowata Filtration Coalescer using 0.3 micron NFF coalescing filter elements should be used to remove lube oils from the fuel gas that are introduced during the compression process. These coalescers may be installed on either the primary fuel gas stream or at each individual heater. This will prevent fuel nozzle and combustor fouling in the plant process heaters.