TIP SHEET:
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Limiting NOx Formation in the Natural Gas Combustion Process

Combustion engineers of burners today, specifically those used in boiler applications, ovens and furnaces, are very aware of the by-product emissions resulting from the oxidation process. They also know consumers today seek out companies that are environmentally conscious, proactively working to minimize their emissions levels.

The Cleaver-Brooks ProFire V Burner with FGR (Flue Gas Recirculation) reduces the NOx footprint to less than 20 PPM.

In recent years, the U.S. Environmental Protection Agency (EPA), in concert with science and industry, has been stringently enforcing the Clean Air Act, particularly in those heavily industrialized and/or densely populated areas such as California, Texas, Louisiana and New Jersey. The government agency's enforcement of clean air standards is spreading throughout the nation, impacting an ever increasing number of states and locales.

One of the key pollutants the EPA is seeking to mitigate is Oxides of Nitrogen, commonly referred to as NOx (NO and NO2).The NOx the agency is trying to reduce is called Thermal NOx and forms during fuel oxidation, especially where the flame is very intense (in excess of 2000 degrees F), averaging approximately 100 to 120 PPM NOx when the flame temperature is not controlled or the effluent is not treated through chemical means such as catalytic reduction. One chemical solution, though very effective in reducing NOx to almost zero, is complicated to apply and often prohibitive in cost.

Addressing an ever-growing need, the combustion industry has engineered and adopted a very effective way of reducing NOx in gas-fired burners. The solution is called Flue Gas Recirculation (FGR), and it not only assists in greatly reducing the NOx footprint to less than 20 PPM, but working in conjunction with advanced burner technology, it can reduce NOx emissions to below 9 PPM. FGR requires only a nominal investment, compared to other post-combustion chemical solutions such as selective catalytic reduction (SCR) and non-selective catalytic reduction (NSCR).

FGR works by metering a percentage of the flue gas into the combustion air supply, increasing or decreasing the percentage of FGR based on the amount of reduction in NOx required. For instance, 20 PPM may require a 25% FGR supply while 30 PPM may only require 15%. The intent of the FGR/combustion air blend is to then reduce the peak flame temperature(s) without quenching the flame, thereby forming excessive amounts of CO. This is accomplished through the proper introduction of the FGR blend, turbulence, flame geometry and furnace matching.

Today, through the combination of theoretical engineering and field-proven technology, FGR has become the standard for lowering NOx at a very affordable price while at the same time acknowledging the air we breathe is finite, and the combustion engineer is doing his part to preserve it.