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Fired Equipment and Thermal Incinerator Optimization

With a clear need to reduce green house gases, particularly CO₂, operators of direct fired equipment are looking at optimizing these processes in an effort to minimize their impact on the environment and the cost of operation.

Optimization of Direct Fired Equipment and Thermal Incinerators

Currently, most direct fired systems have access to fuel gas flow, combustion temperatures and usually combustion air flow (at least the primary air source). While this information is enough to operate these systems in a safe manner for both the process and environment, it normally results in a very conservative operating philosophy. Typically, the residual oxygen level in the stack gas is between four and ten percent while the optimal value is between two and three percent. This commonly corresponds to an excessive fuel gas usage of twenty to sixty percent and sometimes can be higher. Under these circumstances, excessive CO₂ emissions cannot be avoided.

Optimization of direct fired equipment includes minimizing fuel gas usage, which minimizes CO₂ production, ensuring adequate combustion efficiencies of combustibles and contaminants, and ensuring that ground level concentrations of all combustion products are below safe levels.

If the system is licensed or permitted by environmental regulatory bodies, the following parameters are usually evaluated during the optimization process:

- Minimum combustion chamber temperature and/or stack top temperature;
- Maximum concentrations of certain components in the combustion products stream;
- Maximum tonnage of certain components in the combustion products stream;
- Maximum ground level concentrations of particular components.

The on-site optimization program includes sampling and analysis of the combustion products or stack gas to determine the destruction efficiency of the system and level of residual oxygen concentration. From this data, the system can be tuned to find the optimized conditions and will define the overall combustion efficiency of the system at these conditions. Should a plume dispersion study be necessary, the test data will be used as the basis for this model. Completion of the program will include the optimized conditions for the system as well as a continuous optimization procedure that can be used by operations. If the data supports optimized conditions that are not within licensed values, the operating company can apply to the regulatory body for a new license with the submission of the optimization program report and supporting data.

The end result of the program will include significant fuel gas savings as well as a dramatic reduction in green house gases.