Optimizing Combustion Efficiency and Emissions in a Burner Design Using Spiral Mixing Technology; Year Two of an Ongoing Study

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Fuel costs, depletion of energy resources, and emissions are environmental concerns in many industries today. Even a small improvement in burner efficiency could potentially save millions of dollars, conserve valuable energy resources, and reduce atmospheric emissions. Herein, is a proposed solution for a more efficient burner intake design that uses spiral mixing technology. A testing system that included an industrial-type furnace and prototype burner was constructed to validate this theory of spiral mixing technology. Various diffusers, fitted within the mixing chamber, were constructed to alter the flow characteristics of the air/gas mixture. The data recorded during this experiment was compared to baseline information from various U.S. government sources. A combustion analyzer and infrared pyrometer was used to quantify combustion gas emissions (CO, CO2, O2, excess air, and calculated efficiency) and temperature. Out of the five different diffuser designs constructed, diffuser #5 proved to be the most efficient and had the least amount of undesirable emissions. Diffuser #5 had a similar temperature rise as the other designs along with similar amounts of CO2. However, it had the lowest flue gas temperature and produced no measurable carbon monoxide. Diffuser #5 has steeper blade angles and deeper slots creating more turbulent flow within the mixing chamber. Reference data shows these results to be superior to industrial burners currently in use. This research shows that spiral mixing technology can effectively reduce fuel costs, save our natural energy resources, and reduce flue gas emissions.

Awards Won: