Continuous Fiber Ceramic Composites (CFCCs) Improve Radiant Burner Efficiency

CFCC reverberatory screens have proven to substantially increase the efficiency of natural gas burners in industrial applications, such as paper or paint drying, metal treating, and glass forming. These screens act as a secondary source of radiation, improving the overall performance of the burner system.

The concept of employing a screen adjacent to a radiant burner has been known for some time. However, attempts to use high alloy steel screens for this application have met with failure due to severe corrosion and embrittlement of the metal screen.

In the Department of Energy CFCC Program, DuPont Lanxide Composites, Inc., has been working with Alzeta Corporation to optimize the design and installation of these burner screens. Thermal fatigue testing of 10,000 thermal cycles to temperature and 15,000 on-off cycles has been conducted with no damage to the CFCC screens.

In addition, tests of 1,000 hours at temperature have been performed and were terminated since no change in the properties of the screens was noted. Burners incorporating the reverberatory screens will be installed in industrial plants in 1998, and new industrial applications are being evaluated.

BENEFITS:

- The energy savings potential for this application is estimated to be 0.2 Quads/yr.
- Significant reduction in both NO_x and CO_2 emissions accompanying the more efficient use of natural gas is projected.
- Economic benefits due to longer life, increased thermal efficiency, and lower maintenance will result from the incorporation of reverberatory screens in radiant burners for industrial applications. Process furnaces use less natural gas and can have increased product throughput with the higher radiant heat flux.

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In 1992, the Department of Energy initiated a 10-year joint R&D effort between industry, academia, and government to develop advanced ceramic composite materials for industrial applications. Continuous fiber ceramic composites (CFCCs) are lighter, stronger, and more damage tolerant than other materials available for high-temperature use. This cost-shared program will provide significant energy savings for industry and contribute to the economic prosperity of the United States.

CONTINUOUS FIBER CERAMIC COMPOSITE MATERIALS