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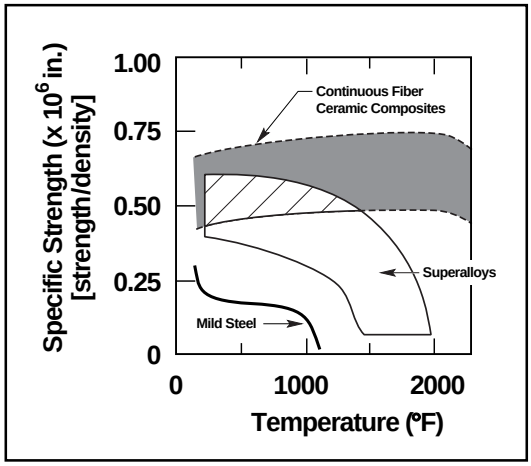
# Continuous Fiber Ceramic Composite (CFCC) Heat Exchanger Tubes Increase Efficiency

Thermal shock limits the usefulness of traditional ceramics in elevated temperature heat exchangers. CFCC tubes eliminate thermal shock damage and offer the potential of increasing the operating temperature, reduced fouling, and improved corrosion resistance.

In the Department of Energy CFCC Program, McDermott Technology, Inc., and E. I. duPont de Nemours & Co., Inc., performed long-term evaluation of tubes in an operating industrial incinerator. This successful test included over 2000 hours of operation at temperatures to 1800˚F and showed very little chemical attack on the oxide composite materials.

This graph shows the strength advantage that CFCCs have over alloy steels.




**Benefits:**

- Heat Exchangers with CFCC components are able to operate at higher temperatures than those with metal tubes. The increased temperature allows for more efficient operation.

- The reliability of CFCC tubes in heat exchangers is a prominent advantage. The fiber reinforcement prevents catastrophic failure from thermal shock which is common in monolithic ceramic components.

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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