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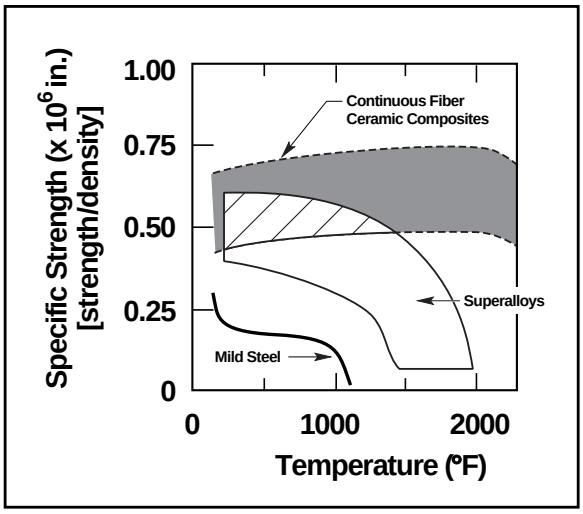
Continuous Fiber Ceramic Composites (CFCCs) Improve Reformer Efficiency

CFCC reformer tubes allow higher operating temperatures than metals and are expected to make significant improvements in reformer efficiency. The improved corrosion resistance of CFCCs at elevated temperature in contact with reformer by-products, such as methanol, hydrogen, and ammonia, will assure lower life-cycle costs.

Tests conducted in steam cracking processes under the Department of Energy CFCC Program indicate superior performance of CFCC components. Preliminary results in tests of over 100 hours showed the coking is inhibited, which will reduce the demand for steam in reformer processing, reducing energy consumption and lowering processing costs. These tests will be continued and will be followed by field tests prior to full implementation of CFCC tubes in a reformer.

The advantage of CFCC components over high alloy steels at elevated temperatures is shown in this graph. Efficiency of reformers is improved with higher temperature operation.



BENEFITS:

- Energy efficiency is improved by enabling higher temperature operation in chemical reformers. Current temperature limits of 1650°F can be extended to at least 1800°F by substituting CFCCs for metal components.
- Maintenance and downtime are reduced by inhibiting the formation of coke, caused by the catalysis of carbon in contact with metals. Extending the time interval for required maintenance by up to 60–90 days has been projected for reformers with CFCC 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