



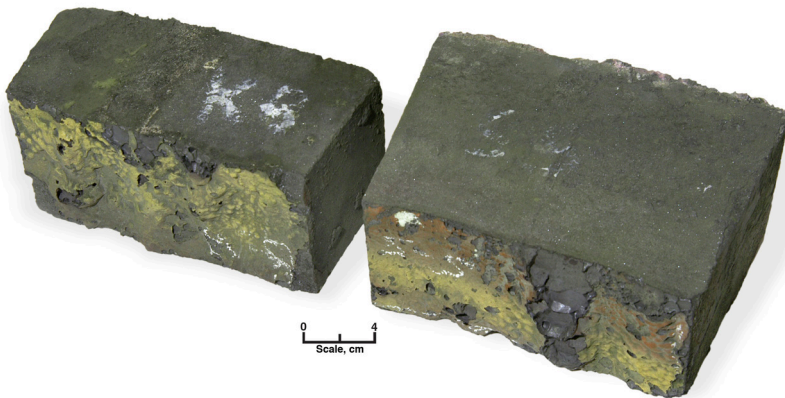
the **ENERGY** lab

R&D FACTS
Materials Science

Improved Refractory Materials for Slagging Gasification Systems

Advances in technology are often directly linked to materials development. For gasification, the reliability and affordability of slagging gasifier operation depend directly on the service life and performance of the refractory materials used to contain the high-temperature gasification reaction. The National Energy Technology Laboratory (NETL) is working with industry to develop high-performance, affordable materials for this application.

In the most severe areas of a slagging gasifier, where tons of molten slag each day flow by at temperatures in excess of 1350 °C, refractory service life can be as short as 90 days, requiring complete shutdown of the gasifier island every 3 months for material replacement. Unless there is a second gasifier available, these shutdowns result in no syngas production, and therefore no product for up to 14 days. The costs of these shutdowns, including lost opportunity costs, reach into the millions. To help address this issue, scientists at NETL developed and patented a new refractory designed specifically for longer service life in this application. Field tests of this new refractory at several commercial gasifier sites in the United States showed significantly improved performance relative to other commercially-available materials. Based on field test results, Harbison-Walker Refractory Company licensed this technology and now markets this material to the gasifier industry as Aurex® 95P.



Refractories removed from adjacent positions in the gasifier. The NETL refractory has approximately 50 percent more material remaining after the test.

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Materials development work continues at NETL to design new materials and systems that can match or beat current refractory performance at a lower cost and with less environmental impact. The target is an affordable refractory material that will provide superior service life regardless of the feedstock used, offering the gasifier operator true fuel flexibility and the opportunity to achieve the industry's goal of 90 percent + on-line availability.

In addition to the improved refractory, an NETL-designed thermocouple assembly is also being developed with the goal of providing longer and more consistent temperature measurement to the gasifier operator, leading to better operational control of the system.



Test thermocouples being installed in a commercial gasifier.

Current generation thermocouples are very susceptible to the harsh operating environment inside the slagging gasifier and often fail within hours of gasifier start-up, leaving the operator with no real-time means of temperature measurement. NETL's newly designed thermocouple incorporates improved fabrication and installation methodologies with an enhanced ceramic protection system that can better shield the thermocouple from the corrosive components of the molten slag. Field tests in commercial gasifiers continue to optimize the concept.

Improvement in materials service life translates directly to improved gasifier reliability and reduced operational costs, both of which are necessary to make gasification a viable means of generating energy from fossil fuel sources.

Field tests to date have been run at the Eastman Chemical Company's Kingsport, TN, site; at Tampa Electric Company's Polk Power Station in Lakeland, FL; and at the Wabash River Power Station in Terre Haute, IN. Funding for this project comes via the Department of Energy, Fossil Energy's Advanced Gasification Technologies and Advanced Research—Materials technology lines.



Test panel inside the gasifier just prior to removal. The circled area is the origin of the two bricks illustrated on page one.

