This Week at NETL

August 19, 2013

Article Published on Enhanced Oil Recovery Research

The second article in a three-part series on chemical enhanced-oil-recovery (EOR) research funded by NETL from 2008 to 2010 has been published in the August issue of *E&P* magazine. The article, entitled Designing Chemical Floods for Kansas Reservoirs, highlights NETL and DOE efforts to promote surfactant flooding in Kansas reservoirs that have been waterflooded and have very high water/oil ratios. The study identified efficient chemical systems for crude oils from nine reservoirs and leases in Kansas. The Pleasant Prairie, Trembley, Vinland, and Stewart oilfields were the most favorable of the studied reservoirs in which to implement a pilot chemical flood.

Report for Gas Hydrate Production Test Project Released

The final scientific and technical report for the NETL-sponsored ConocoPhillips Gas Hydrate Production Test has been formally accepted and released publicly via DOE's Office of Scientific and Technical Information and the NETL website. The report fully details efforts under the project, including site evaluation and selection; test planning; drilling, logging, and instrumentation of the Iġnik Sikumi #1 gas hydrate test well in 2011; production testing conducted in that well in 2012 using both gas exchange and depressurization-based approaches; and the collection, assessment, and initial analysis of resultant data.

New Stainless Steel Coating for Fuel Cells Developed

In a 9-month-long NETL-sponsored project, researchers at NexTech Materials (Lewis Center, Ohio) have developed a new, low-cost process to apply aluminide diffusion coatings to stainless steel. This alternative to conventional aluminization processes shows promise in satisfying the corrosion resistance requirements of solid oxide fuel cell systems, as well as in applications in the broader power generation market. Excellent high-temperature oxidation, chromium volatilization, and coking resistances were demonstrated on a range of commercially important alloys. The next step will be to further optimize this new technique and demonstrate the viability of the coating process in meeting durability requirements. NexTech will do this with continuous input from third-party customers ensure the relevance of the project's results in industry.

Progress Made in High-Temperature Hydrogen Sensor Development

As part of an NETL-sponsored project at West Virginia University, researchers have developed and tested a material capable of sensing hydrogen at temperatures up to 1,000 °C. The fibrous, coarsening-resistant material exhibits excellent hydrogen sensitivity and stability at elevated temperatures. In a recent trial, the material was tested for 150 hours at 1,000 °C, with no degradation of the material or its sensing capability noted. These capabilities will prove essential in the high-temperature, high-pressure environments of future power generation systems.

AVESTAR Team Develops NGCC Model with Startup and Shutdown Capabilities

NETL's AVESTAR team has developed a high-fidelity, real-time dynamic model for a natural gas combined cycle (NGCC) power plant capable of simulating operating scenarios ranging from plant startup to shutdown. Using the combined cycle section of AVESTAR's integrated gasification combined cycle (IGCC) dynamic simulator as a starting point, the team implemented the dynamic model changes required to match the NGCC steady-state design results. Dynamic simulation results for the shutdown of a single gas turbine from full-load

conditions (182 MW) followed by the startup of the gas turbine after a hot-hold period of 8 hours were presented at the 2013 ASME Power Conference and published in the conference proceedings. The results showed that significant temperature gradients occur during the ramping up from 20 and 80 MW, thereby indicating a need for future work to improve startup operations and reduce the impact on equipment damage, especially for the final superheater in the heat-recovery steam generator. Under the auspices of a cooperative research and development agreement with Invensys Operations Management (Houston, Texas), work is underway to finalize the NGCC operator training system, including modifications to the human-machine interface graphics and process controls, as well as additional characterization and modeling of turbine emissions.

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