



Method for Determining Solids Circulation Rate

Opportunity

Research is currently active on the patented technology “Method for Determining Solids Circulation Rate.” The technology is available for licensing and/or further collaborative research from the U.S. Department of Energy’s National Energy Technology Laboratory.

Overview

This invention provides a method to measure the rate of solids circulation, particularly in those applications where the solids are recycled back to processes for further use. The applications include processes such as circulating fluidized bed gasifiers and combustors, as well as chemical looping.

In the above applications, determining solids circulation rates is needed to predict and control quantities such as solids concentrations within reaction zones, gas-solid chemical reaction rates, solids residence times within a reactor, and heat and mass transfer rates. In the past, however, determining these rates has been difficult because the high temperatures and gas compositions commonly found in these processes are relatively aggressive to intrusive instruments. Also, high pressures with particulate-laden flows make the sealing of mechanical motion detectors across the pressure boundary very difficult.

This patented technology does not require the sealing of instruments across the pressure boundary, and it does not require the maintenance of delicate instruments or windows in an aggressive operating environment. This technology involves the use of two gas tracer measurements to determine both the bed-void fraction as well as the solids circulation rate. This technique can be used in all solids circulating systems at elevated or ambient temperatures as well as high or low temperatures. Also, a variation of the technology can assist in predicting needed flow rates of gas used to purge or strip gaseous contaminants from solids flows, or the amount of product gas being entrained with the bed and recycled upstream with the solids.

Researchers expect the technology to ultimately be used in a variety of systems including circulating fluidized bed combustion, circulating fluidized bed gasification, transport reactor, chemical looping, and any other process where solids move in a packed bed with flowing gas.

Patent Details

U.S. Patent No. 8,116,992 titled “Method for Determining Solids Circulation Rate.”

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Significance

- Provides a method to determine solids circulation rates
- Resolves measurement problems associated with high temperatures and various gas compositions
- Does not require instrument sealing
- Does not require maintenance of delicate instruments or windows

Applications

- Circulating fluidized bed combustion systems
- Circulating fluidized bed gasification systems
- Transport reactor systems
- Chemical looping systems
- Other related systems

Contact

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