

Circulating Fluidized Bed Operation and Optimization Testing

The Chemical Engineering Department at Southwest Research Institute® (SwRI®) designs, constructs, and operates fluidized bed processes and applies this expertise to help our clients develop, optimize, and troubleshoot their new and existing processes. In its simplest operating mode, SwRI's circulating fluidized bed (CFB) provides process-variable histories and small quantities of product liquids for testing (FCC analog), or it can be easily reconfigured for unique ebullating or circulating fluidized bed operation. The design assures that results reflect practical conditions as well as special operating modes.

Features

SwRI's laboratory-scale CFB reactor system has the following specifications (dependent on circulating solid particle type):

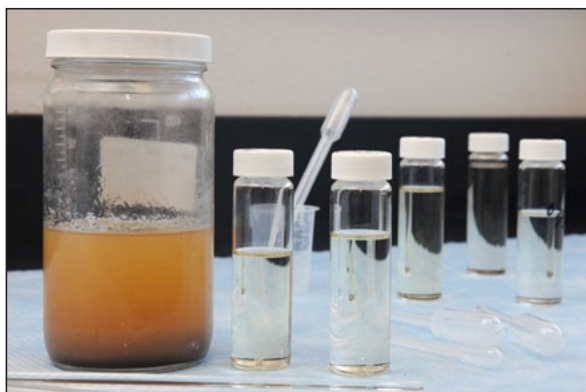
- Solid, liquid, or high-viscosity feedstocks
- Steam, inert, or other fluidizing gas options
- Reactor/riser superficial velocities from 4–1000 ft/s
- Reactor/riser residence times of <0.01 to 6 seconds
- Feed flow rates ranging from <1–200 mL/min
- Temperature range up to 1200°F (649°C)
- Pressure up to 30 psig (2 bar, 207 kPa)
- Process control system for various modes of system automation
- Process data acquisition system
- Sampling and analytical capabilities for most needs

SwRI's responsive staff can support your work for concept development, process selection, lab-scale and pilot-plant testing, optimization, and engineering package preparation. Using commercial process simulation programs, we can help with design reviews, process hazards assessments, and development of piping and instrumentation diagrams (P&ID).

Applications

The CFB can be used for a wide variety of applications including:

- Pyrolysis of biomass, plastics, residuum, heavy oils, and organics
- Fluid catalytic cracking (FCC) analog to produce test quantities of products
- Co-processing of biomass and petroleum feedstocks
- Catalytic pyrolysis
- Gasification
- Catalyst and feedstock evaluations



SwRI can process and upgrade a variety of biocrude and unconventional feedstocks, such as the biofeed shown here on the left with processed products in the smaller vials.

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The catalyst regenerator is ignited at the start of the process.

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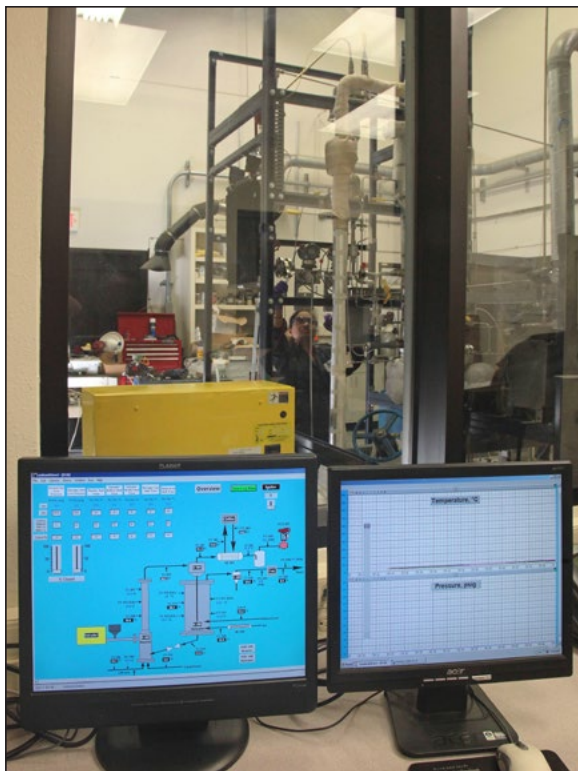


The CFB and analytical staff constantly handle high-viscosity feedstocks.

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SwRI's scientific and analytical staff has significant knowledge across a full range of both organic and inorganic analytical services for petroleum-based and aqueous samples. These services include standard and non-standard American Society for Testing and Materials (ASTM) procedures and custom method development.

SwRI's facilities are equipped with a variety of processing units available for our clients' testing needs from laboratory-scale to pilot-plant testing. Existing equipment can be modified to meet clients' specific needs.



The CFB's process controls allow for safe operation in a range of different process conditions.



The reactor/riser is capable of processing diverse feed types such as solids, liquids, or highly viscous feeds.



Southwest Research Institute is an independent, nonprofit, applied engineering and physical sciences research and development organization using multidisciplinary approaches to problem solving. The Institute occupies 1,200 acres in San Antonio, Texas, and provides more than 2 million square feet of laboratories, test facilities, workshops, and offices for nearly 3,000 employees who perform contract work for industry and government clients.

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