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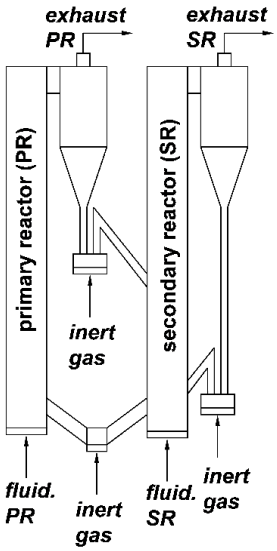
The Dual Circulating Fluidized Bed (DCFB) Reactor System

The Dual Circulating Fluidized Bed (DCFB) concept, developed by Vienna University of Technology links two circulating fluidized bed reactors in a novel way to improve scale-up potential of gasification and CO_2 capture processes.

BACKGROUND

The general idea with dual fluidized bed reactor systems is to expose two different gas streams to a circulating stream of solids transporting heat and, in a selective way, also mass. Typically, these dual bed applications feature one transporting reactor and another reactor fluidized in bubbling regime. The problems that emerge with bubbling regime are limited gas-solid contact and limited scale up potential.
Systems combining two circulating fluidized bed reactors have also been already proposed. However, these concepts require the solids to pass at least both cyclone separators in order to close the loop.



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The DCFB technology solves the problem of limited gas-solid contact in bubbling regime by operating the secondary reactor in turbulent or fast fluidization regime. It allows gas-solid contact over the whole height of the reactor and potentially allows operation with lower solids inventories which is especially relevant at increased plant capacities.
Another important feature of the DCFB concept, compared to the state of the art systems using two circulating fluidized bed reactors, is the inherent stabilization of solids hold-up obtained by the direct hydraulic link between the two circulating fluidized bed reactors, i.e. the loop seal connection in the bottom region of the risers. Only the primary reactor entrainment is responsible for the global solids circulation between the two reactors while the secondary reactor operation can be optimized with respect to maximum fuel conversion.

POTENTIAL APPLICATIONS

Technology	Purpose of solids	Importance of gas-solid contact
(biomass) gasification	heat transport, catalyst	partially for tar reforming in the gas generator
sorption enhanced reforming	CO_2 and heat transport, catalyst	high in the reformer/carbonator, low in the calciner (heat-driven)
carbonate looping	CO_2 and heat transport	high in the absorber/carbonator, low in the calciner (heat-driven)
chemical looping combustion/reforming	oxygen and heat transport	high in both reactors, no gas phase conversion without solids

ADVANTAGES

- High global solids circulation decoupled from secondary reactor fluidization
- Excellent gas-solids contact in both reactors
- Possibility to optimize the secondary reactor with respect to chemical conversion and low particle attrition rates

REFERENCE:
M013-07

OPTIONS:
- Patent sale
- R&D cooperation
- License agreement

KEYWORDS:
gasification, chemical looping combustion, carbonate looping, chemical looping reforming

DEVELOPMENT STATUS:
Pilot plant in operation

IPR:
IN patent pending
AT, US, CA, EP patents granted

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