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Call for Papers

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Title:

Development of equipment design tools from experimental data using the example of autothermal reforming

Abstract:

Autothermal reforming is a well known alternative for the production of synthesis gas from natural gas and has already been applied in GTL and CO plants where CO-rich syngases are required.

The reaction volume inside the ATR consists of a first zone without catalyst and a second zone where the reactions are supported by catalyst. As the feed / steam mixture and the oxidator meet and pass through the reactor several reactions like partial and full oxidation, steam reforming and water-gas shift take place producing a so called raw synthesis gas consisting mainly of hydrogen, carbon monoxide and carbon dioxide as well as remnant methane and water.

ThyssenKrupp Uhde is maintaining an ATR development programme and operates a pilot plant since June 2009. A considerable amount of operating data has been collected which covers the entire operating area relevant for ATR. From these data design tools for industrial scale reactors have been developed. Among these tools are a one dimensional representation of the reaction kinetics to determine the volumes of the catalyst-free combustion zone and the catalyst bed for given operating conditions and a CFD calculation to optimize the geometry of the combustion zone.

The paper briefly covers the design of the pilot plant, the experimental programme and the data acquisition and describes in some detail the development work for equipment design tools for industrial scale reactors.

A special feature of the ThyssenKrupp Uhde ATR reactor design is the arrangement of several oxidator nozzles around the circumference of the combustion zone whereas most

other designs use single central burners. The different reactor concept has a considerable influence on flow and temperature distributions inside the reactor.