

Bachelor/Master's thesis

Design, manufacturing and commissioning of fixed-bed experimental facilities with coupled heat dissipation

Content:

Heterogeneous catalytic methanation is the essential process of the Power-to-Gas technology. The critical problem of this process is how to keep the temperature below the catalyst limitation temperature to prevent the sintering of the catalysts due to a high reaction temperature. Heat dissipation treatment is usually applied to the reactor to avoid excessive temperature in the reaction bed, for example, using a flow of cooling medium to dissipate heat from the reaction bed. Therefore, investigating the detailed heat transfer inside a fixed-bed reactor considering the heat dissipation is essential for predicting the temperature distribution in this kind of reactor bed.

For this thesis, the primary job is to design and manufacture the experimental facilities for the research idea above. The flowing high-temperature air or nitrogen through the fixed-bed is under the standard atmospheric pressure. The cooling medium is initially considered as water. The final aim is to build three cylindrical fixed-bed experimental facilities of different diameters with a cooling jacket. After assembling the whole experimental facilities, it is preferred to make a commissioning for them and get the temperature profile at the central axial position of these experimental facilities. Formulating of the safety consideration for these experimental facilities is necessary.

Tasks:

- Literature research: heat transfer in fixed bed
- Design calculation for the experimental facilities.
- Technical drawing after the design calculation.
- Assembling and commissioning of the facilities.
- Formulating the safety consideration for the experimental facilities.
- Written documentation of the thesis to summarize the design work.

Your profile:

- Motivation and interest for mechanical design.
- Basic knowledge of Catia V5.
- Working independently.
- Teamwork with the supervisor.

Start: as soon as possible

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