MSc Project “Bubble dynamics in fluidized bed”

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Why: Fluidized bed reactors are widely used in industry: from Fluid Catalytic Cracking (FCC) or plastics production, to drying or Atomic Layer Deposition (ALD). High reactivity between the gas and the solids, combined with good mixing properties, make fluidized beds a useful tool in many industrial processes.

To optimize process efficiency, we need to understand the mechanics of what happens inside this fluidized bed. We can build mechanistic models or do numerical simulations, but both need to be validated with experimental data.

As fluidized beds are opaque, techniques to measure inside of them are limited. Pressure sensors and optical probes can tell us parts of what happens inside, but to really see the bubbles in the bed, we need X-ray vision!

At Chemical Engineering, we have a state-of-the-art X-ray tomography setup to do exactly that: look inside opaque systems.

What: In this MSc project, you will use X-ray tomography to investigate the dynamics of bubbles inside a fluidized bed. Previous studies have been done on fluidization behavior in general. However, this is a complicated system to validate against models and simulations.

For this project, we want to focus on the dynamics of single bubbles as they form and rise in the bed. By carefully controlling the bubble generation in the bed, you will study single bubble properties, but may also study interaction between two bubbles, like coalescence, or bubble break up. The collected data will be used for the development of CFD simulations, and will contribute to the general understanding of fluidized bed hydrodynamics.

X-ray tomography on dynamic systems is a new and exciting technique. Do you want to be one of the first in the world to see what really happens on the inside? Contact us!

Who: We are looking for a MSc student in chemical engineering or applied physics, with an interest in fluid dynamics or reactor engineering. You are interested in using complex experimental techniques and image processing.

Supervision: The project is supervised by:

Luis Portela, *Chemical Engineering/Transport Phenomena* (scientific supervisor)
Evert Wagner, *Chemical Engineering/Transport Phenomena* (technical supervisor)