TUHH Hamburg University of Technology

Institute of Process Imaging

# Tutor - Process Imaging SoSe 26

*12.02.2026*

The Institute of Process Imaging (IPI) offers the Process Imaging module, which focuses primarily on established imaging techniques relevant to chemical and bioprocess engineering. Additionally, the module includes a project-based learning (PBL) practical course, where students work in small teams to investigate an experimental setup, a gas-solid fluidized bed, using two imaging techniques: Magnetic Resonance Imaging (MRI) and optical imaging. The aim of the PBL is to investigate key process parameters of gas–solid fluidized beds, which are widely used in chemical and bioprocess engineering applications, including the pharmaceutical and food processing industries. In a gas-solid fluidized bed, solid particles interact with an upward-flowing gas. Above a critical gas velocity, the particles become suspended, and part of the gas forms bubbles while the remainder flows through the particles. Gas bubble characteristics, such as bubble size, bubble size distribution, and bubble rise velocity play a crucial role in determining the hydrodynamic behavior of the system. During the PBL these properties will be investigated by using two imaging techniques, while also evaluating the strengths and limitations of each method.

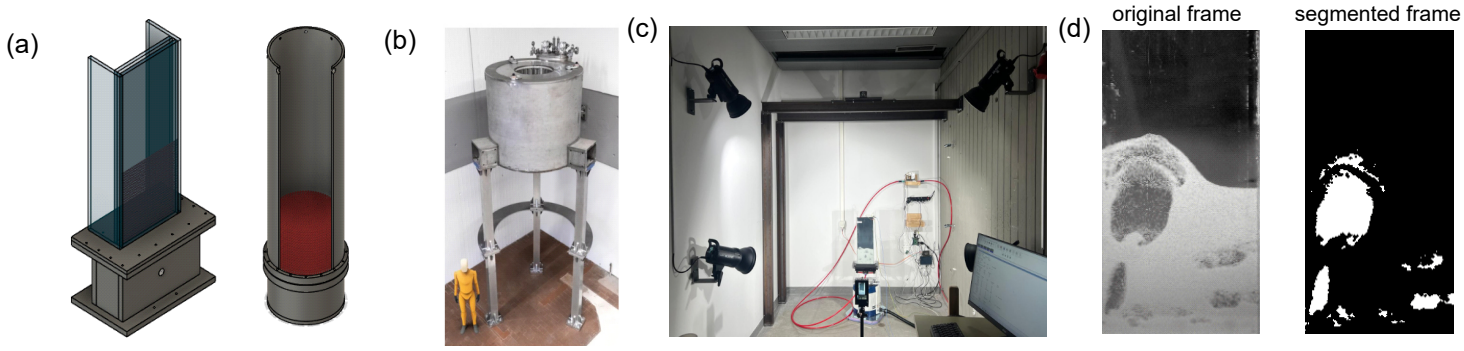


*Figure 1: (a) Schematic models of pseudo-two-dimensional (pseudo-2D) and three-dimensional (3D) gas-solid fluidized beds. The pseudo-2D fluidized bed is designed to eliminate the third dimension by using a thin rectangular vessel, enabling optical imaging. The 3D fluidized bed is employed for MRI measurements, as MRI does not require optical access and can provide non-invasive investigation of complex 3D hydrodynamics of gas-solid fluidized beds. (b) Large-bore vertical MRI system, specifically designed for the study of process engineering reactors, located at IPI. (c) Experimental setup for optical imaging of the pseudo-2D fluidized bed. Front illumination is provided by LED light sources, and a high-speed camera records consecutive frames to enable quantitative analysis of bubble properties. (d) Representative optical image of the pseudo-2D fluidized bed. The acquired images are processed to segment and identify gas bubbles (white).*

We are looking for a tutor for the PBL component of the module to assist mainly with experiment preparation and to guide students during the experiments.

Your profile: Ideally, experimental work experience and programming with Python.

Starting date: 16.04.2026

Duration: 3.00 SWS - 3 months

Contact people:
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