

Project „SPI“ – Smart Process Inspection

*At Line and In Situ Multi Parameter Analysis
by Photo- and Electro-Optical Measurement Technique*



Forschungsnetzwerk
Mittelstand



Supported by:



on the basis of a decision
by the German Bundestag

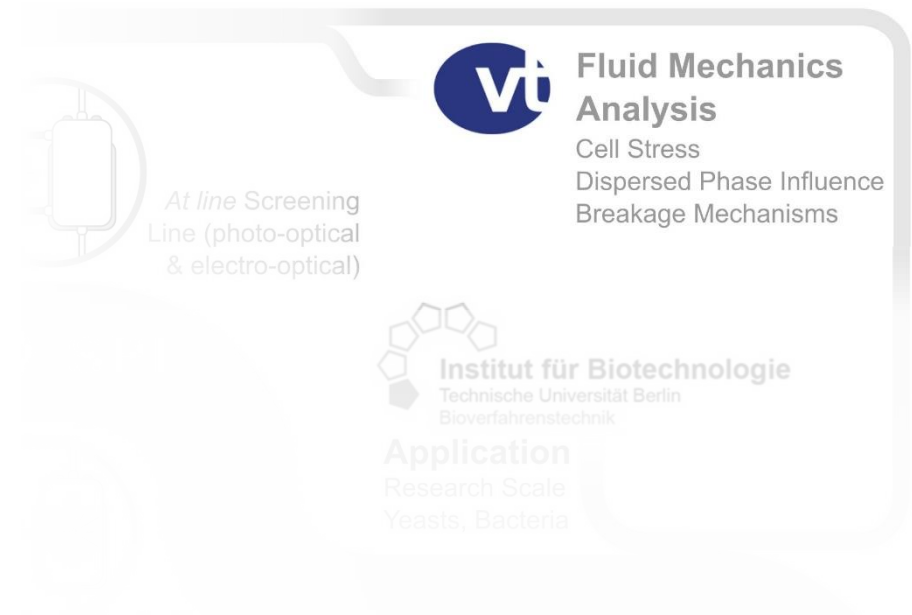


Robert Panckow

Room 190 A
Ackerstrasse 76
13355 Berlin

panckow@tu-berlin.de
Tel.: 030 314-25538

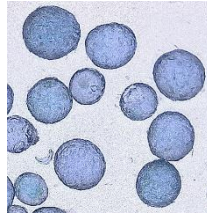
- Characterization and correlation of *local particle size distributions* in multiphase reactors
- Specification of the influence of *further dispersed phases* on systems with microorganisms
- Flow and particle investigations in a *single-use bioreactor* (SUB) and an *aerated stirred tank*



Methodology and Experimental Setups

- Characteristics of mixing

- Suspension behaviour of microcarriers



- Mixing time

- Wave-mixed single-use bioreactor

- CELL-tainer® 20L



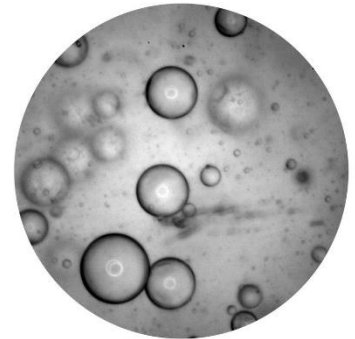
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- Substitute systems

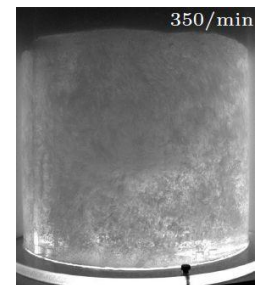
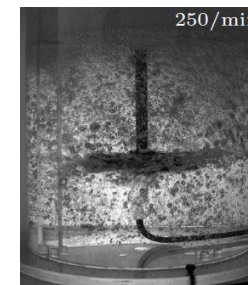
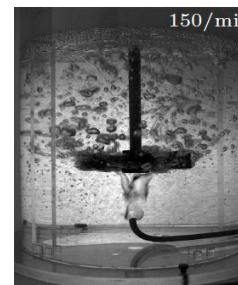
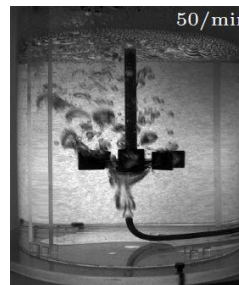
- Solid-liquid system (Blue clay (Blauton) / Water + NaCl)



- Liquid-liquid system (Synthetic Oil/ Water)

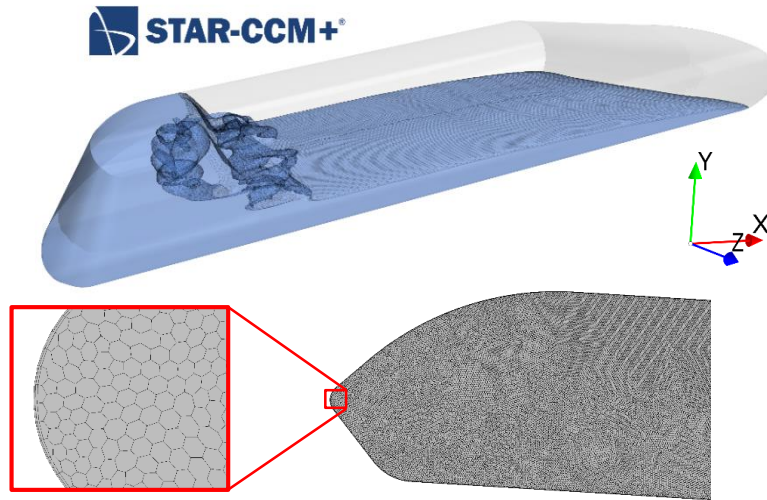


- Aerated stirred tank

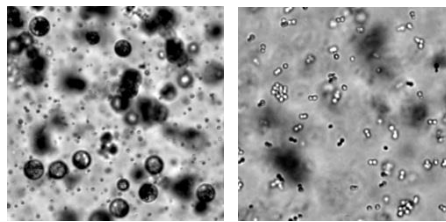


Measurement Techniques

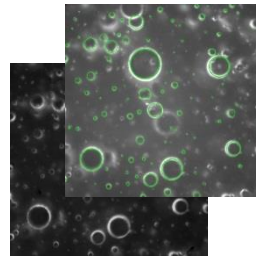
- CFD (flow analysis)



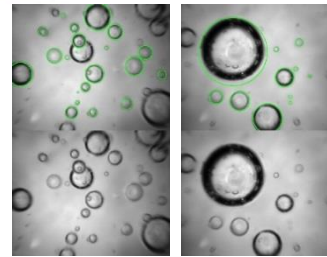
- Endoscopic measurements of dispersed phases



cell suspensions



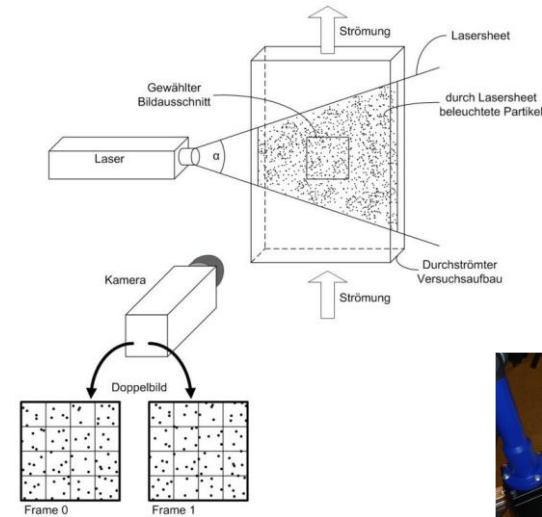
droplets



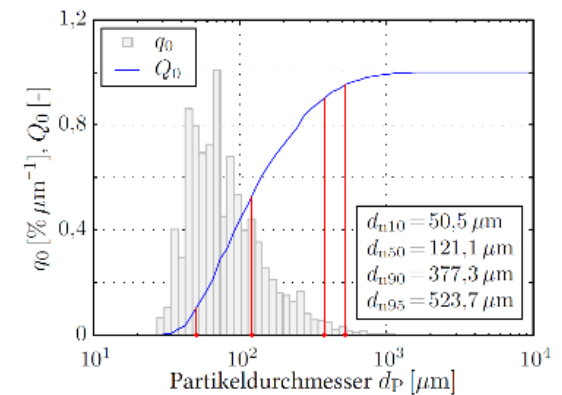
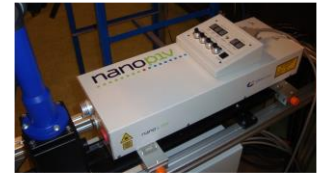
bubbles



- PIV (flow analysis)

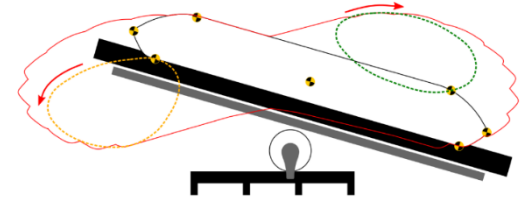
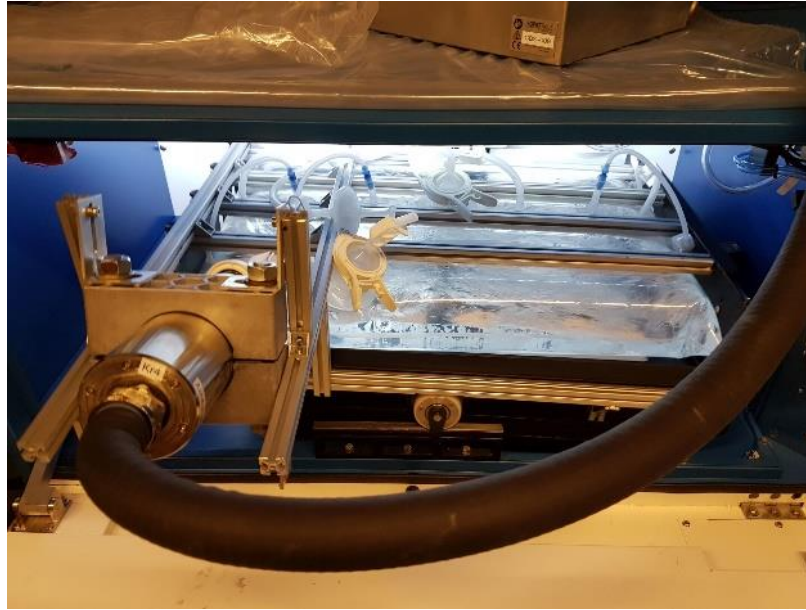


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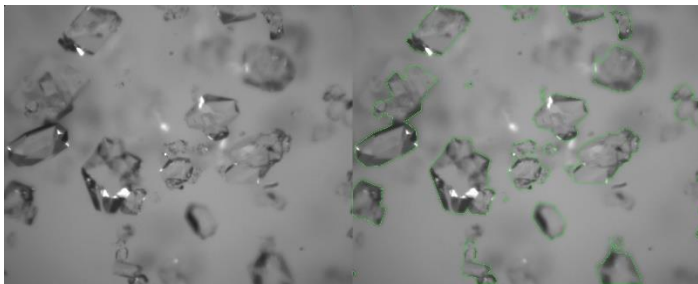
Endoscopic Measurements in CELL-tainer

- Attaching endoscopic probes on apparatus



- Particle detection by *neural networks*:
calculation on GPUs

– Recognising complex shapes



– Determining surface aeration

