

# Atomization for Entrained Flow Gasification

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## Objectives

**Model based description for atomization of non Newtonian suspension fuels at high pressure, validated by experimental data:**

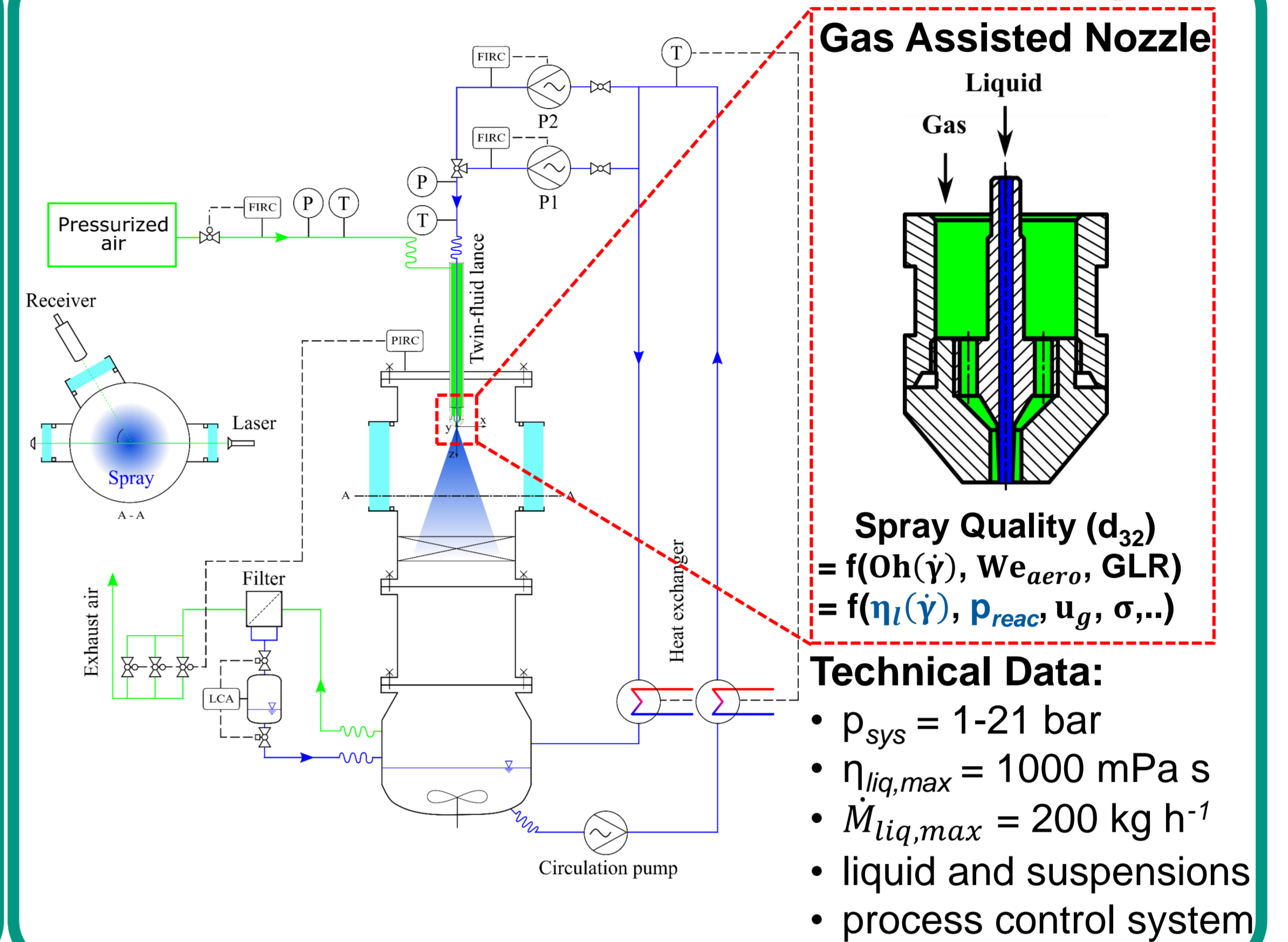
- Description of primary breakup (mode,  $\alpha_{sp}$ ,  $f_{prim}$ )
- Measurement of local drop size distribution and velocity
- Input/validation data for numerical simulation of technical EFG

## Challenges

**Detailed experimental investigation of atomization process of high viscous non Newtonian suspension fuels at pressurized conditions:**

- Adaption of measuring techniques to high pressure and high viscous fluids
- Atomization at high system pressure (PAT 21 bar | EFG 80 bar)
- Atomization of high viscous fluids with complex rheological behavior

## Pressurized Atomization Test Rig



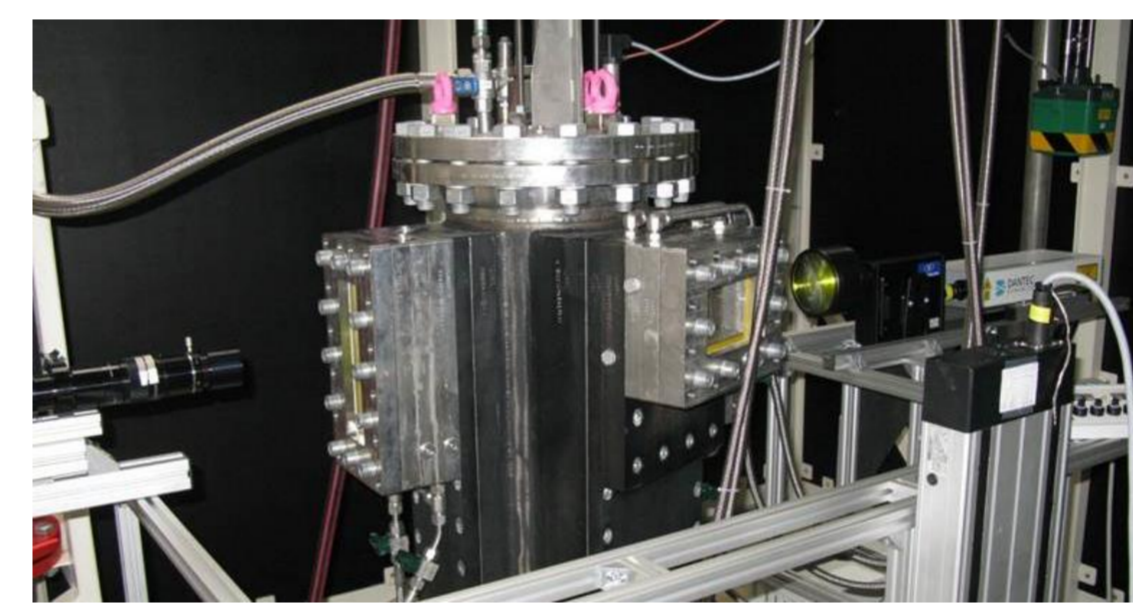
## Complementary use of Measuring Technique

### High-Speed Camera



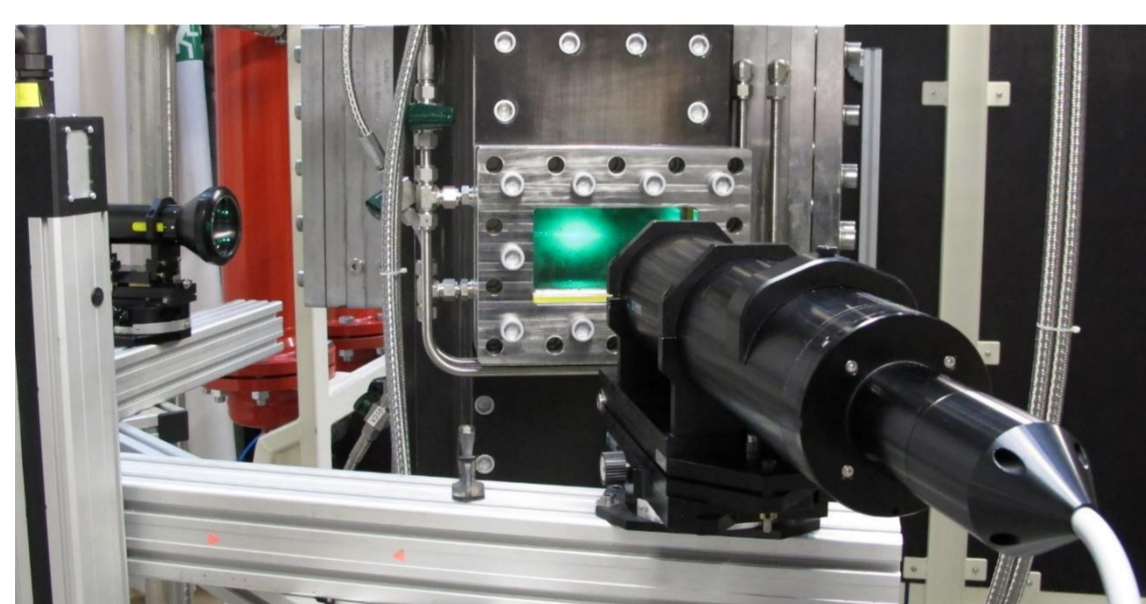
- System Properties:**
- resolution: 1024 x 1024 Pixels
  - frame rate: up to 500 kHz
- Application:**
- breakup morphology / spray angle
  - breakup frequency / effective visc.

### Shadow-Sizer



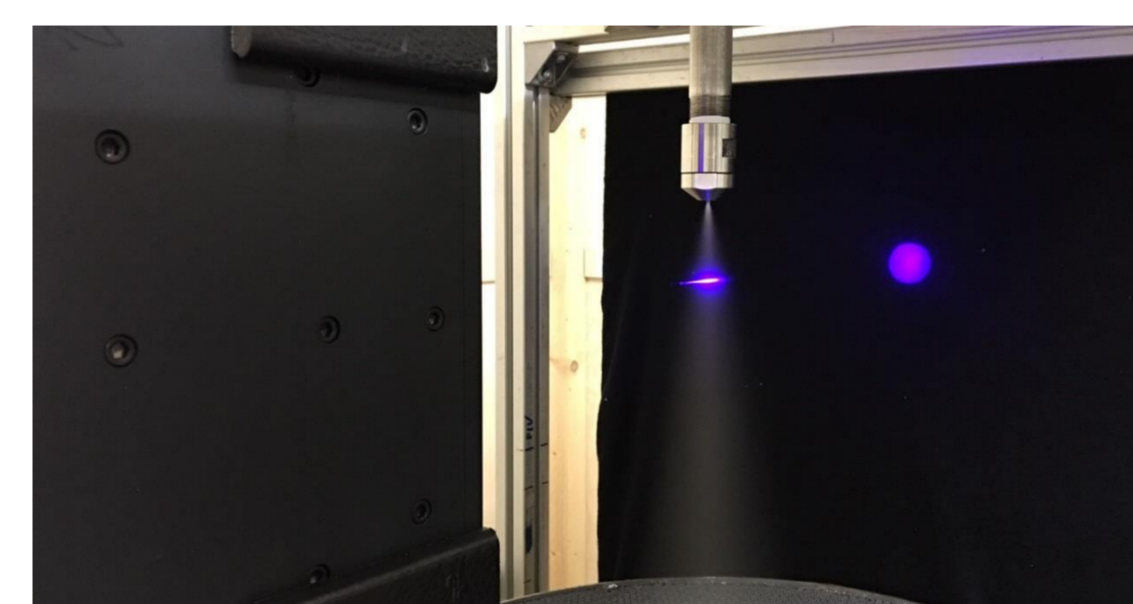
- System Properties:**
- resolution: 2048 x 2048 Pixels
  - double frame rate: up to 12 Hz
- Application:**
- drop shape and size of large drops
  - validation tool for PDA & SpraySpy

### Phase-Doppler Analyzer



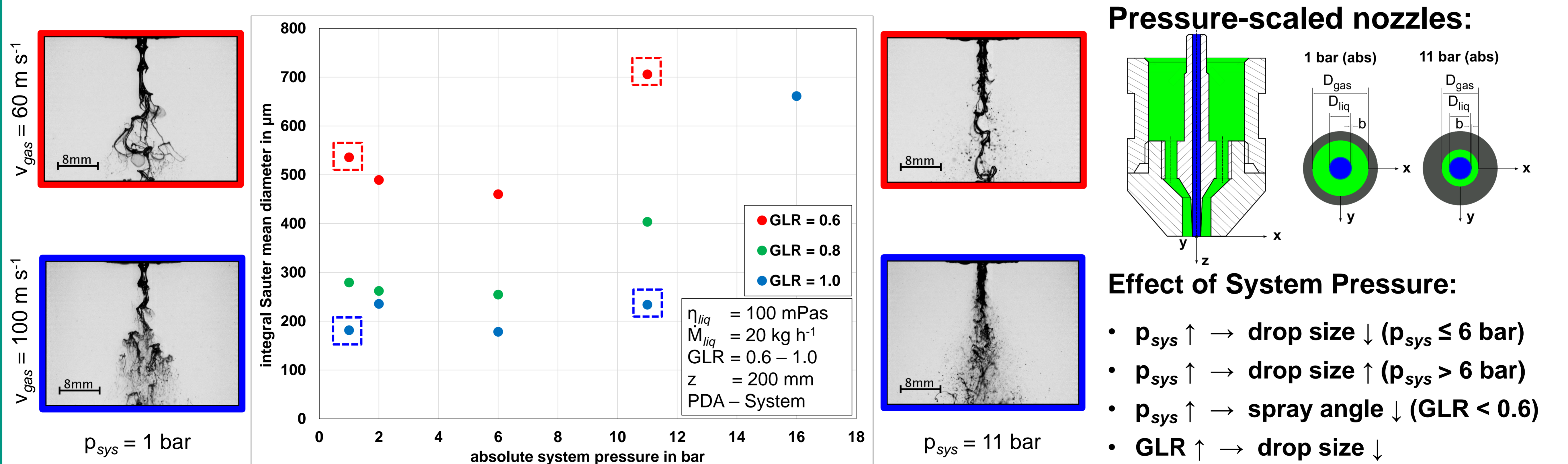
- System Properties:**
- measuring volume:  $\leq 250 \mu\text{m}$
  - focal length: 1000 mm
- Application:**
- local drop size and velocity
  - transparent liquids

### SpraySpy



- System Properties:**
- measuring volume:  $\sim 100 \mu\text{m}$
  - focal length: 250 mm
- Application:**
- local drop size and velocity
  - all kinds of fluids & suspensions

## Separating the Effect of System Pressure on Spray Quality applying Pressure-scaled Nozzles



## Ongoing Work

- Pressure scaled nozzles / atomization of suspensions
- Improved CFD-Modelling
- Data-based model atomization of viscous suspensions

## Future Work

- Experimental investigation of different nozzle geometries
- Data based sub-models of atomization integrated in CFD  
 $\rightarrow$  Virtual Spray Test Rig

## Cooperations

