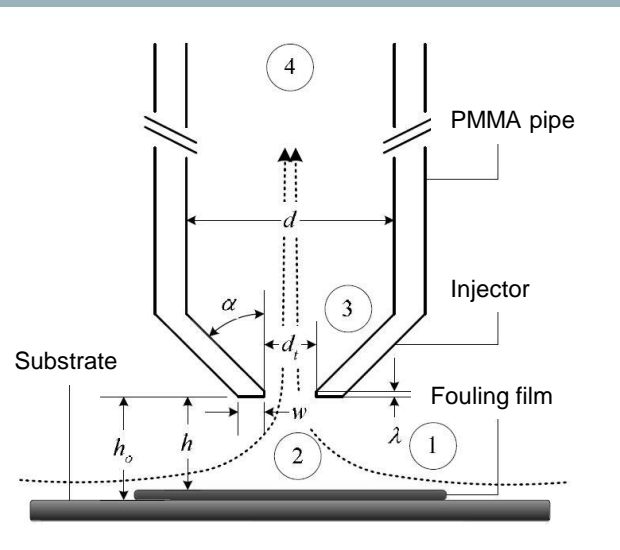


Fluid Dynamic Gauging

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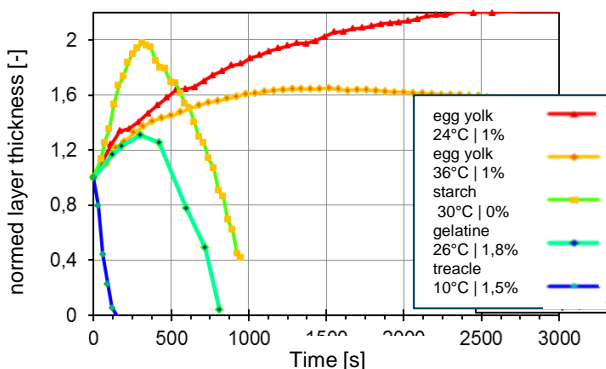
Objective

- Determining the thickness of soft fouling films
- Measuring the swelling behavior of soft films
- Analyzing adhesion and cohesion failure as a function of cleaning-relevant parameters (i.e.: temperature, detergent concentration, film thickness)



Accessories

- Device for tempering
- Automatic fluid refill
- Injectors with various diameters
- Extensions to change the hydrostatic head h



Research

- Swelling behavior of food films (starch, gelatine)
- Determination of adhesion of fouling films (lipide, agar)
- Determination of adhesion and cohesion force of biofilms

Principal of measurement

- The sample with a fouling film is being placed in the tank under the injector
- The distance between the injector and the sample can be adjusted with the micrometer gauge/ linear optimization
- The mass flow is proportional in reference to the distance between the injector and the sample
- The effective shear force can be increased by reducing the distance between injector and sample

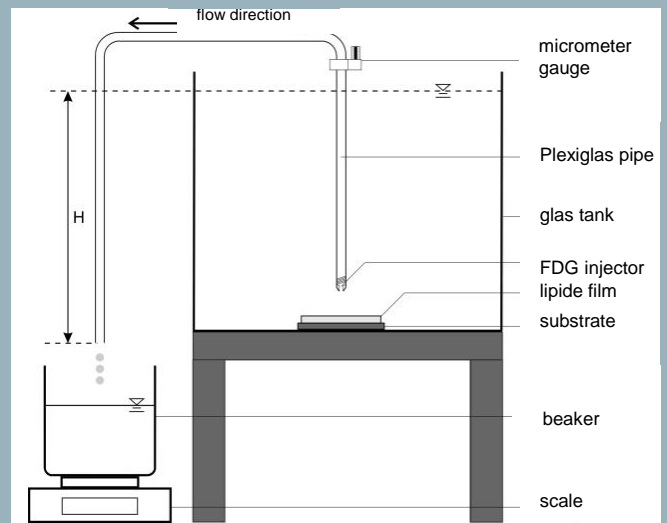
Equations

Dimensionless mass flow:

$$C_d \equiv \frac{4m}{\pi d_t^2 \sqrt{2\rho(P_1 - P_2)}}$$

Shear stress:

$$\tau_w = \frac{3\eta V}{4\pi \left(\frac{h}{2}\right)^2 r_t}$$



Literature

- W. Augustin et al.: Messung von weichen Foulingschichten auf festen und porösen Oberflächen mit dem Fluid Dynamic Gauging; Chem. Ing. Tech. 84 (2012), S. 46 - 53