

# Laminar Flow Channel

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## Objective

- Experimental investigation of deposit formation on heated surfaces (Fouling)
- Experimental investigation of deposit removal on heated surfaces (Cleaning)

## Measurement parameter

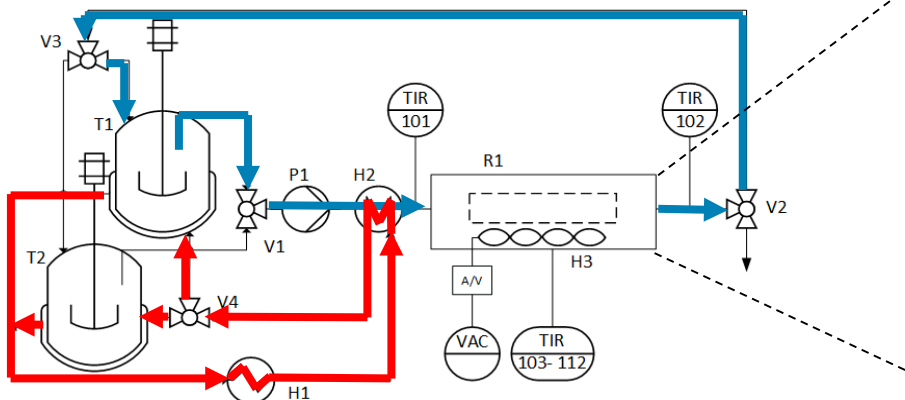
- Surface temperature and fluid temperature
- Fouling resistance, heat flux
- Fouling mass, residual mass after cleaning
- Cleaning time, thermal cleaning rate
- Fluid sampling downstream of the flow channel and external analysis (e.g. pH,  $TN_6$ )

## Capabilities

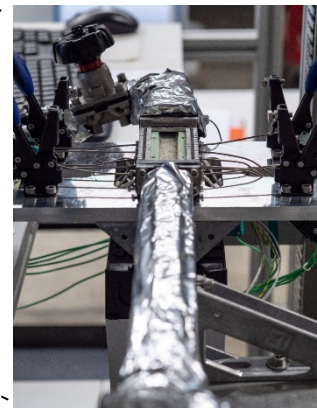
- Screening tests in a laminar flow ( $250 \leq Re \leq 775$ )
- Fluid temperature: 25°C – 75°C
- Surface temperatures: 40°C – 98°C
- pH 4 – pH 10
- Open or closed flow channel, open or closed loop operation
- Heat transfer surfaces exchangeable (dimension: 20mm x 80mm)

## Duration of Measurement

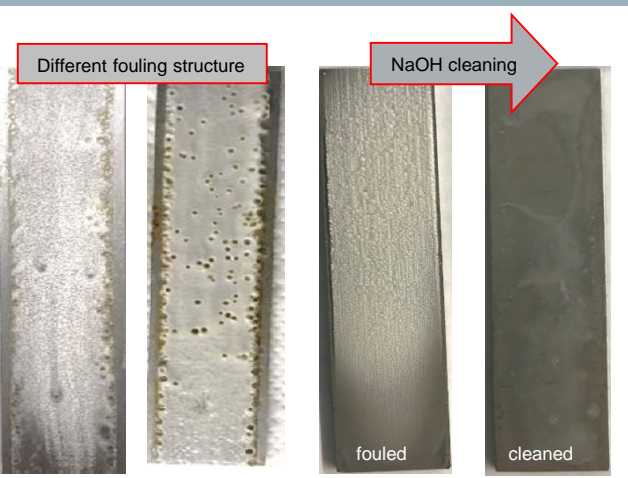
- Depending on foulants, fouling rate, cleaning agent, operational mode
- 5 min to 2 weeks



Flow diagram of experimental setup



Laminar operating flow channel



## Experience

- Fouling of whey protein and milk powder as well as simulated milk ultra filtrate.
- Influence of structural changes of milk fouling (ageing) to thermal properties of deposits during processing.
- Cleaning of low temperature and high temperature milk fouling generated with the Batch Fouling Apparatus.

## Literature

- Schnöing, L., Augustin, W., Scholl, S.: Thermal Ageing of Mineral and Proteinaceous Fouling Layers during Growth Phase, Proceedings of the 13th Int. Conf. on Heat Exchanger Fouling and Cleaning (2019)