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Wet sieving and magnetic separation for the treatment of radioactive secondary waste produced from waterjet abrasive suspension cutting

Muhammad Junaid Chaudhry et al.

Correspondence to: Muhammad Junaid Chaudhry (muhammad.chaudhry@kit.edu)

Karlsruher Institut für Technologie

Federal Ministry of Education and Research

Wet sieving and magnetic separation for the treatment of radioactive secondary waste produced from waterjet abrasive suspension cutting

Muhammad Junaid Chaudhry

Institute of Technology and Management in Construction (TMB)
Institute for Nuclear Waste Disposal (INE)

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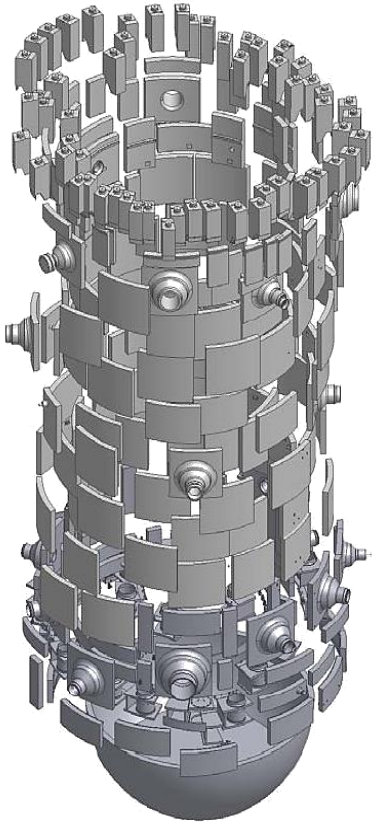
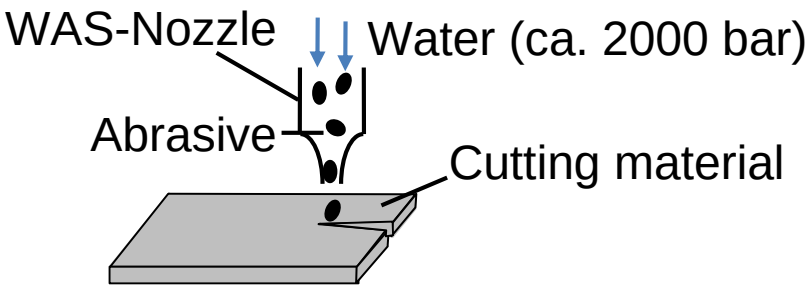
Waterjet Abrasive Suspension Cutting (WAS)

Dismantling of the
RPV and its internals



Reference: AREVA GmbH



Reference: ANT AG

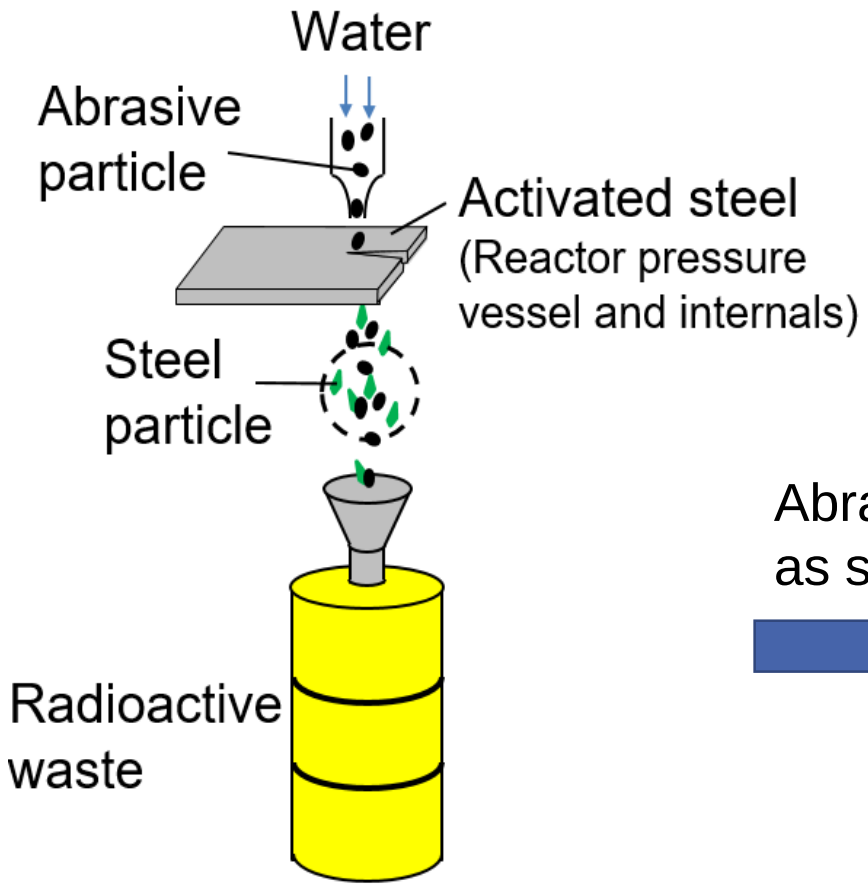
Technical advantages:

- Remotely controlled to provide maximum safety for the operating personnel
- No aerosol byproducts
- Cutting capability for a wide variety of materials
- Application also underwater

Downside:

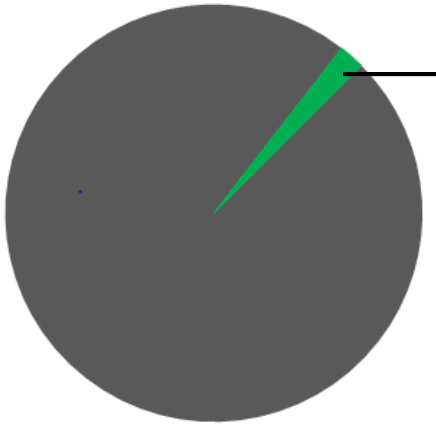
- Large amount of secondary waste

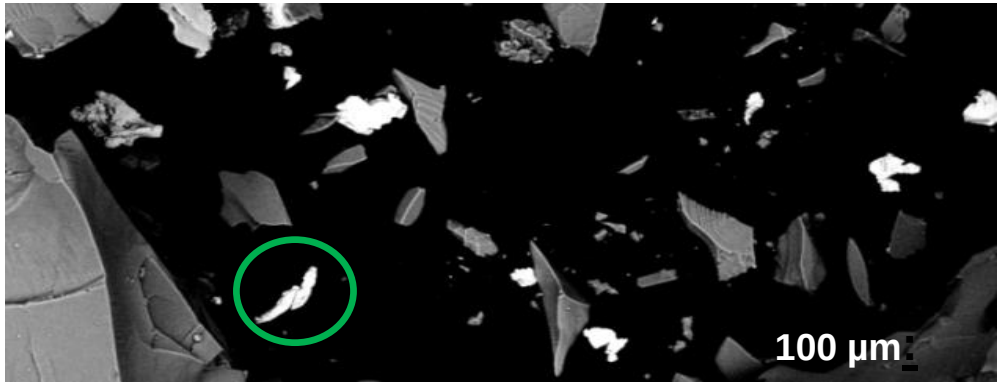
WAS-Cutting and secondary waste



Abrasive product as secondary waste

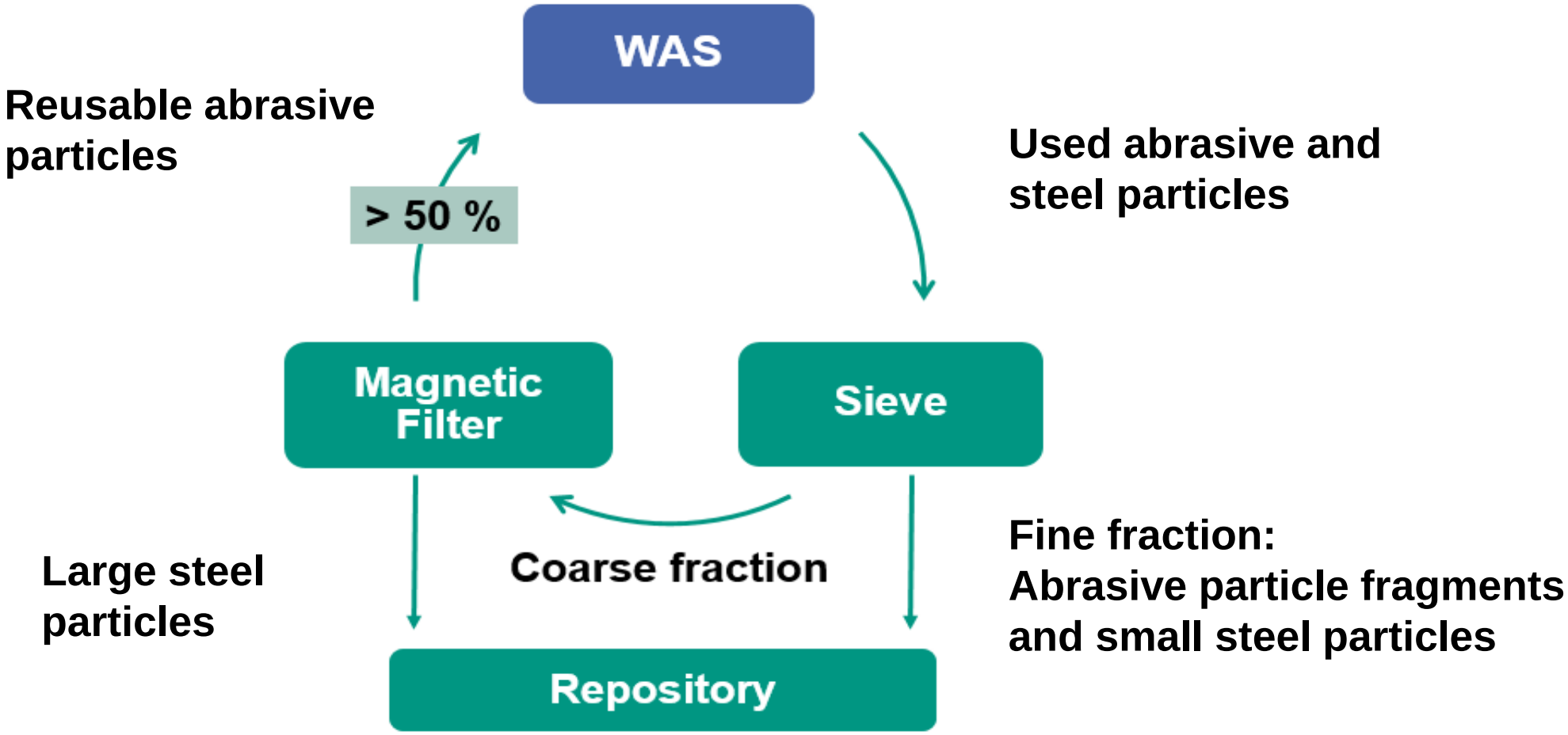
Particle composition [M-%]:





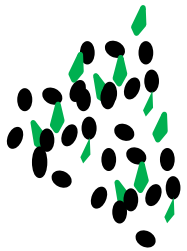
Reference: Dr. Schild, KIT-INE

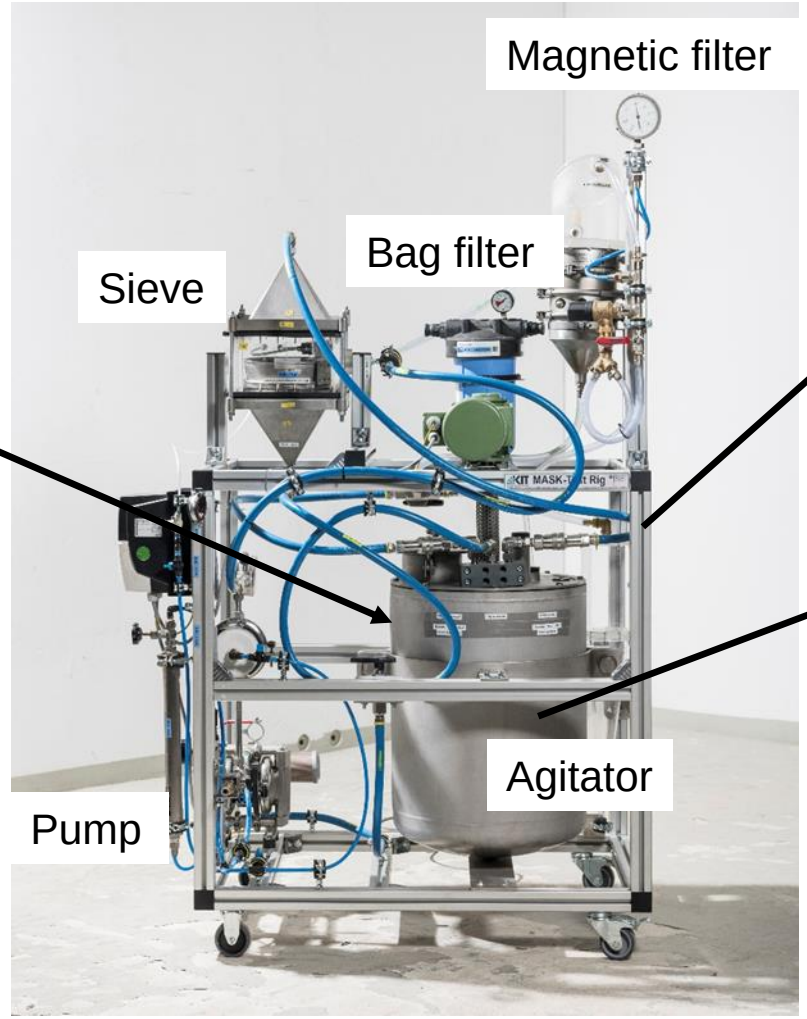
Principle of reuse of abrasive and separation process



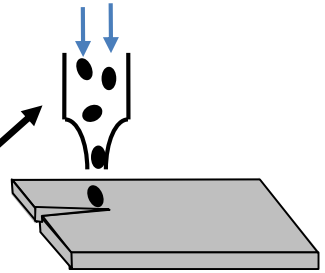
Separation plant in batch operation

Particle-mixture from WAS-cut

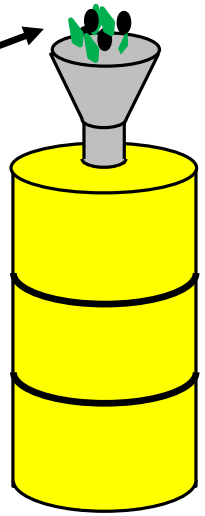




Reuseable abrasive



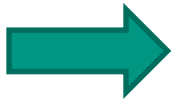
Minimised secondary waste



Possible reduction from 50-75%

Complications in batch operation

- Clogging and deterioration of the switch valves due to the abrasive
- Difficulty in operating the valves
- Interruption of the separation cycles for cleaning of the components
- Low separation rate
- **Rapid overloading of the magnetic filter**



Solution: Transfer to continuous operation

<u>Continuous operation:</u>

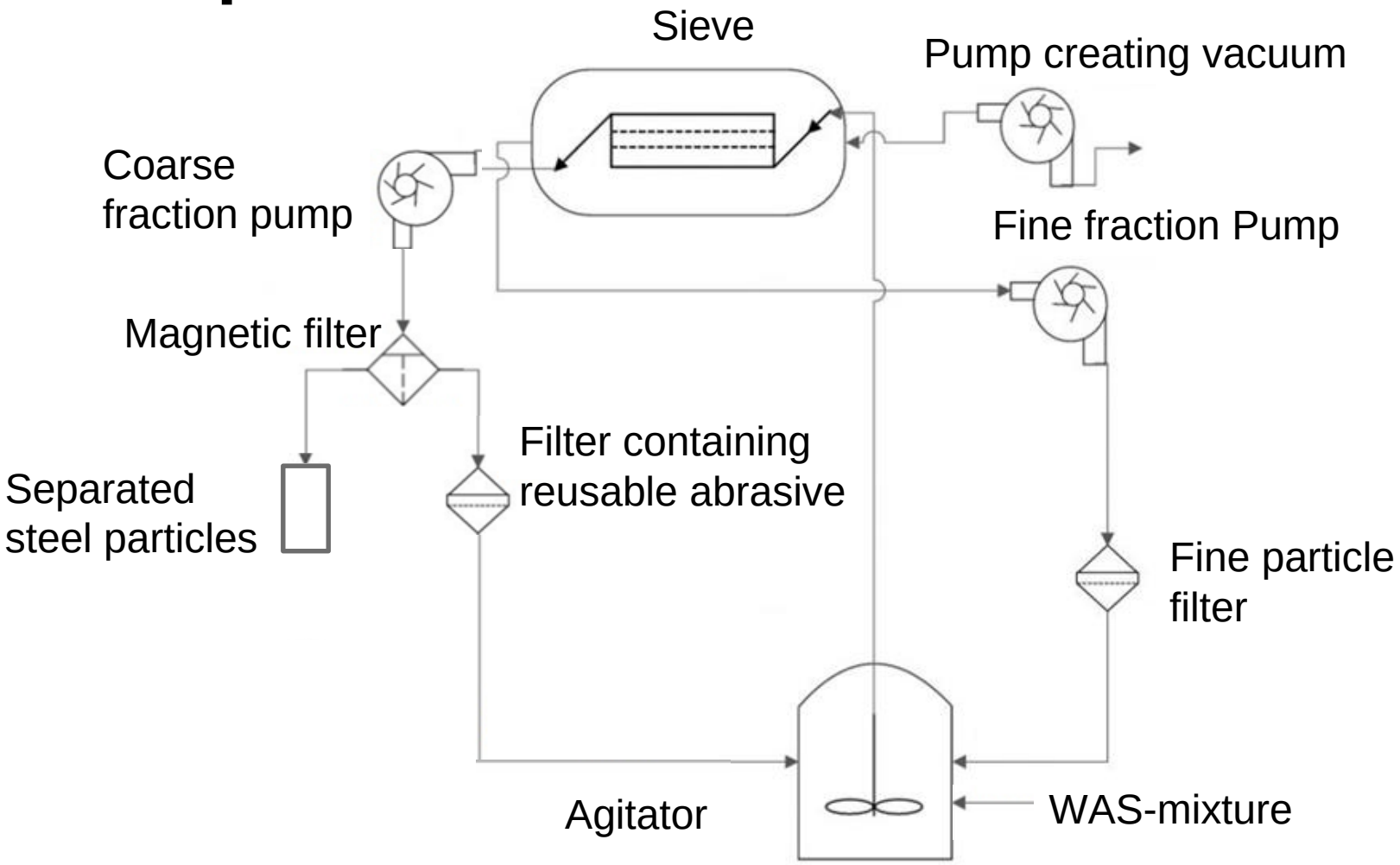
- New operating principle of the plant
- Continuously operated sieve
- Continuously operated magnetic filter

Complications in batch operation

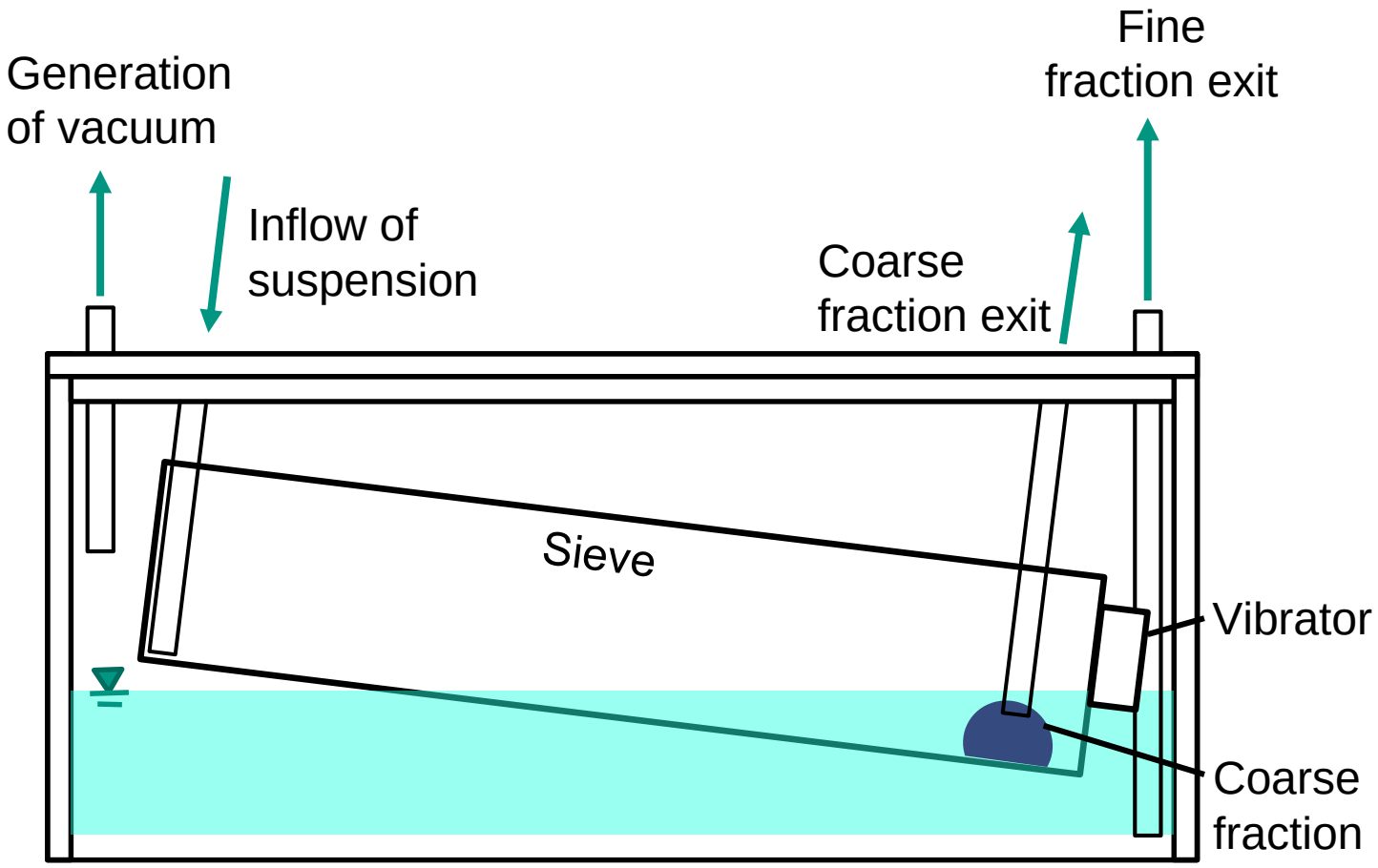
- **Rapid overloading of the magnetic filter**

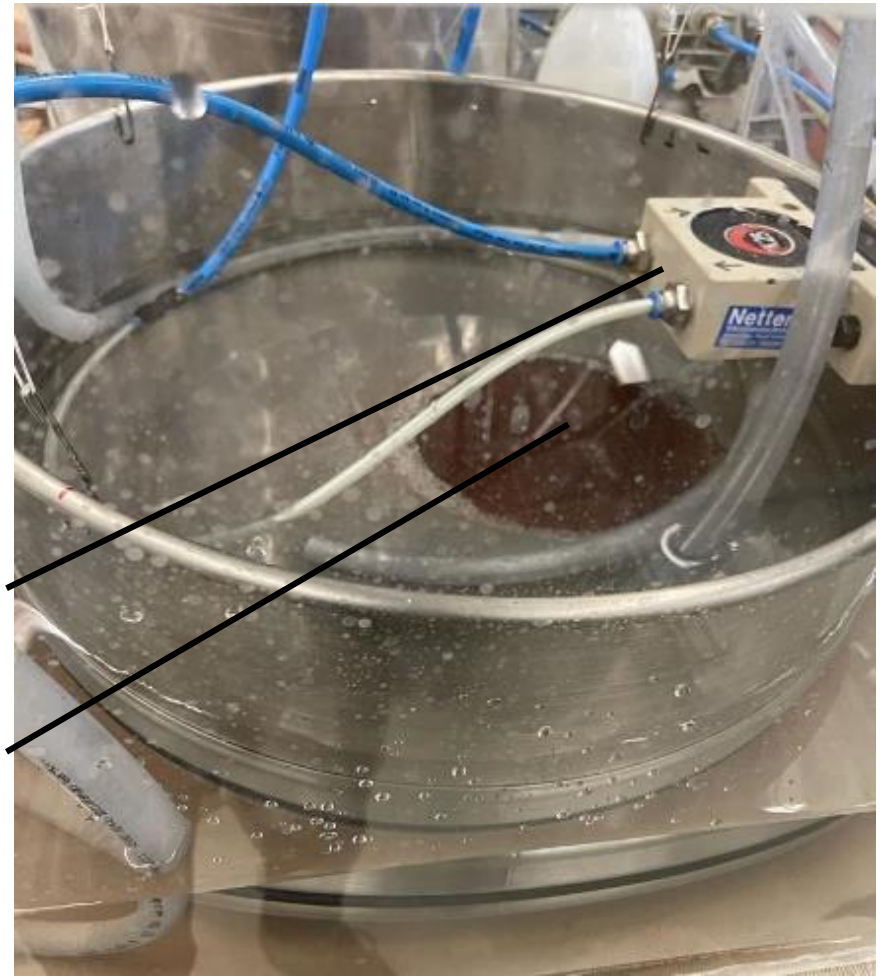
- **Impurities and residual material in the plant**

Continuous operation

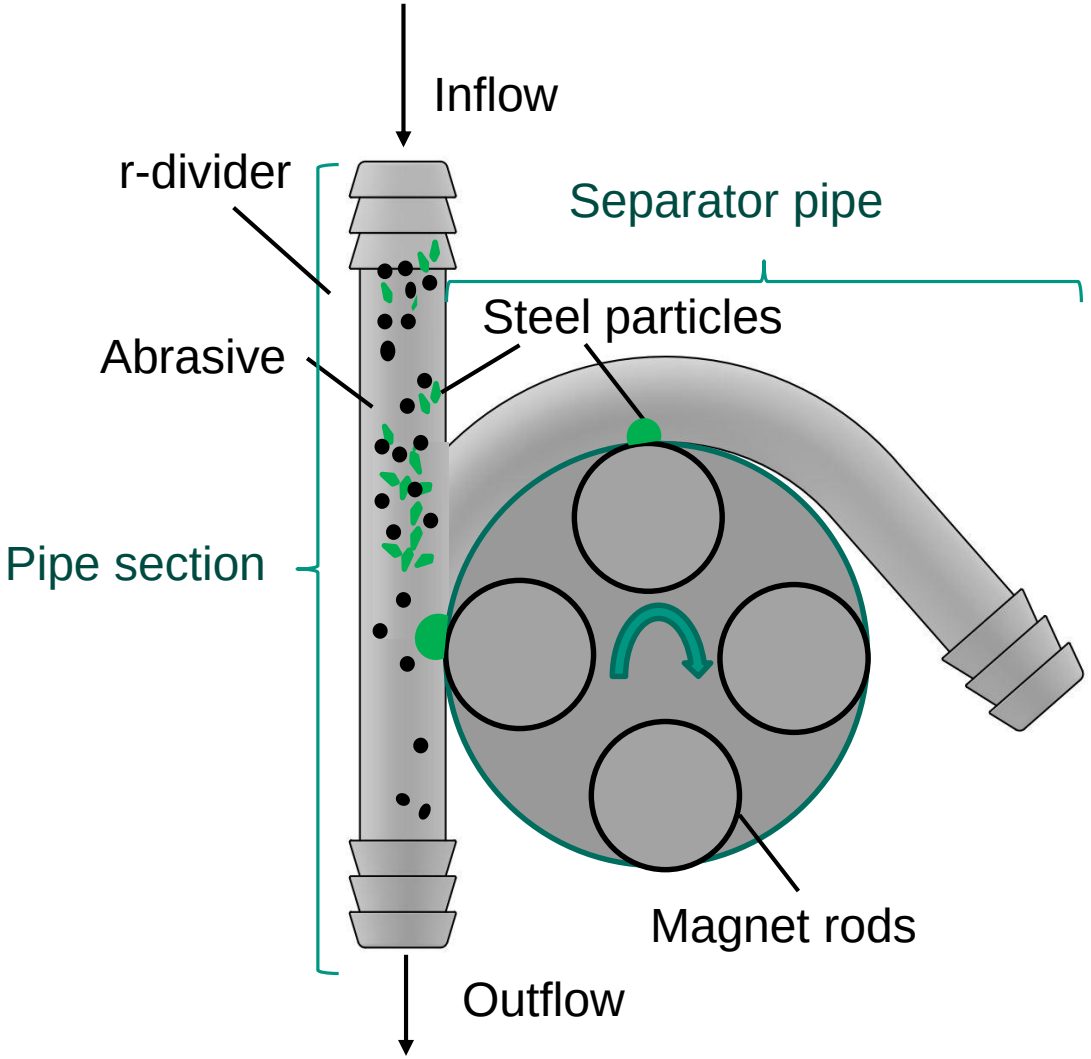


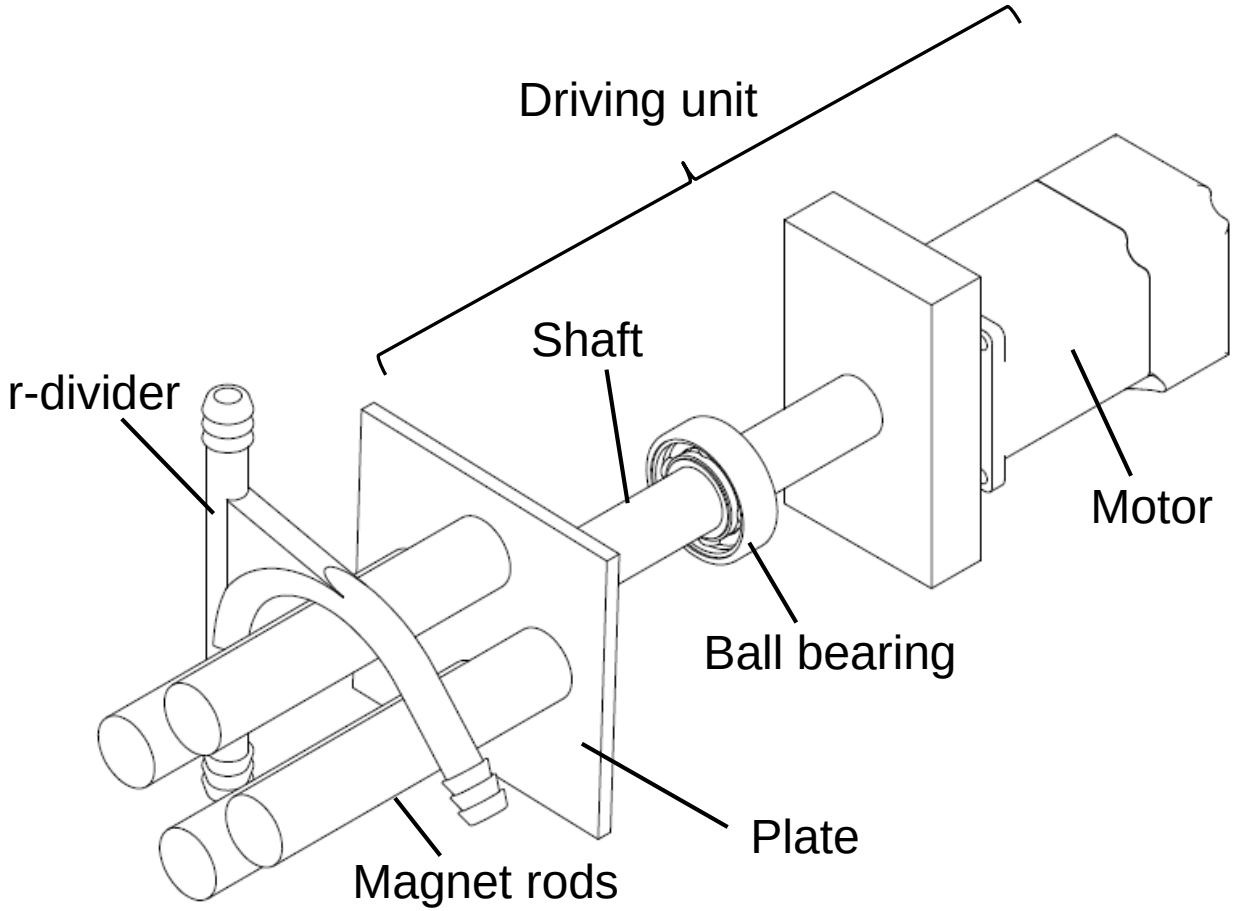
Continuously operated sieve



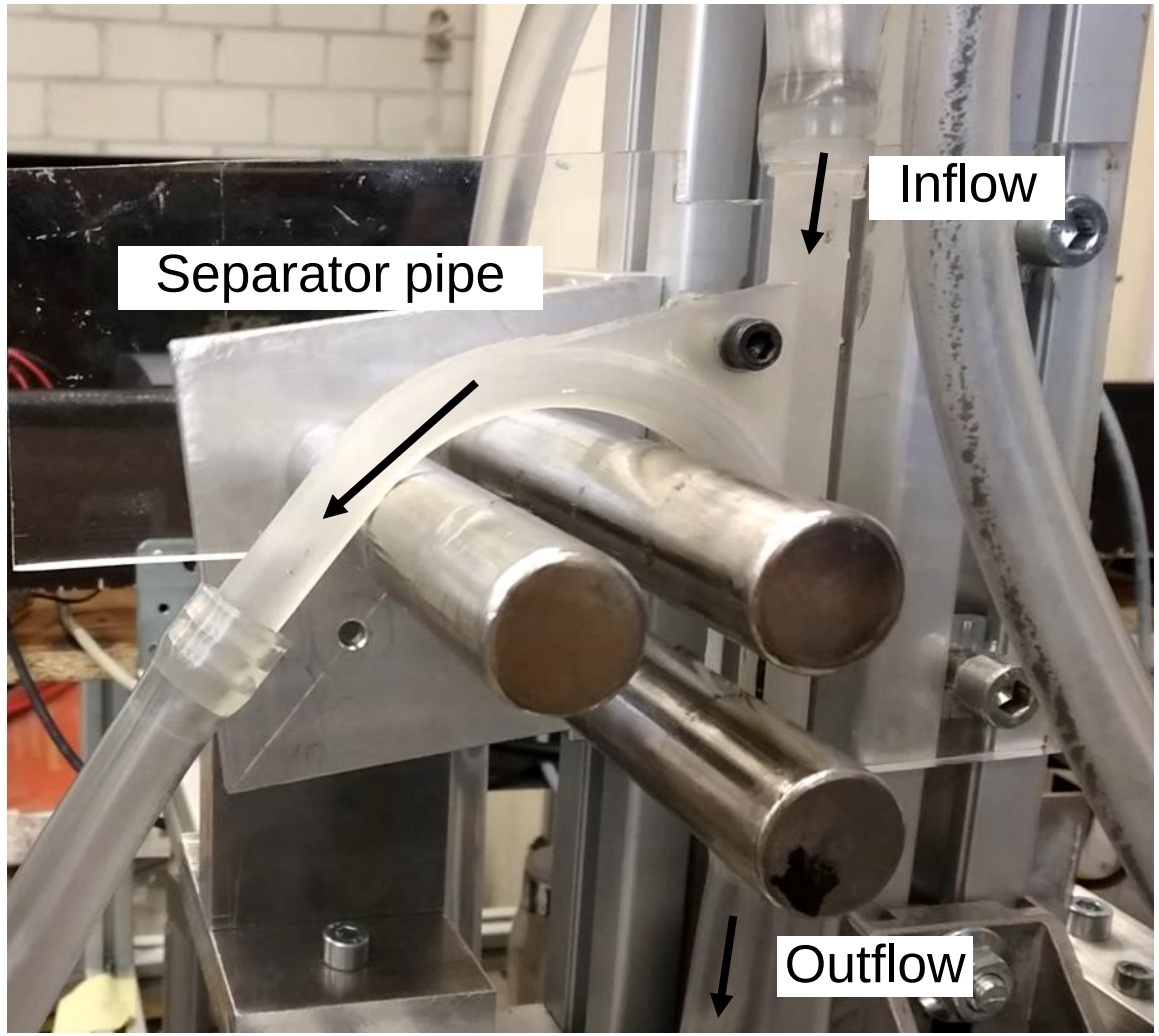


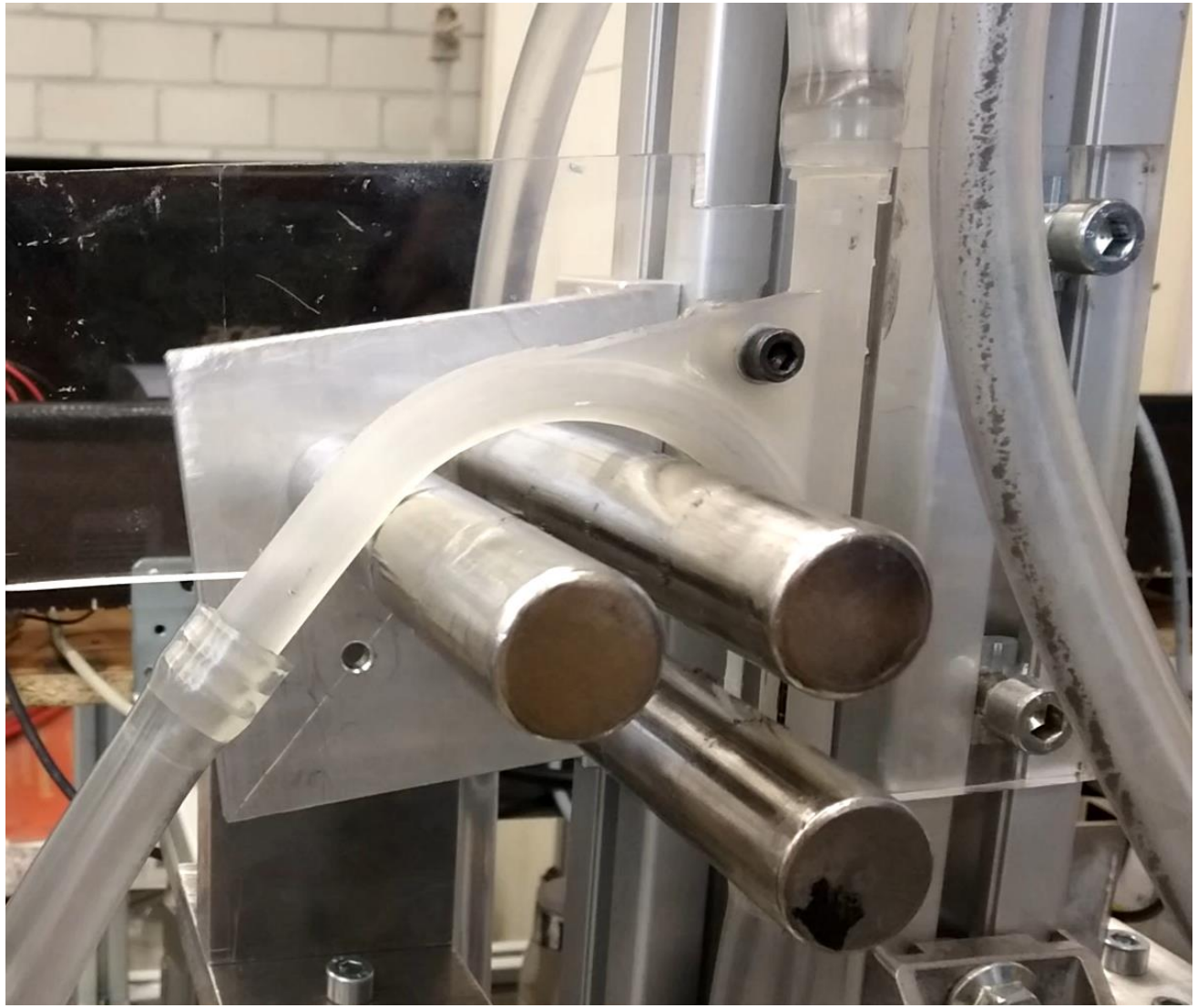
Continuously operated magnetic filter





Continuously operated magnetic filter

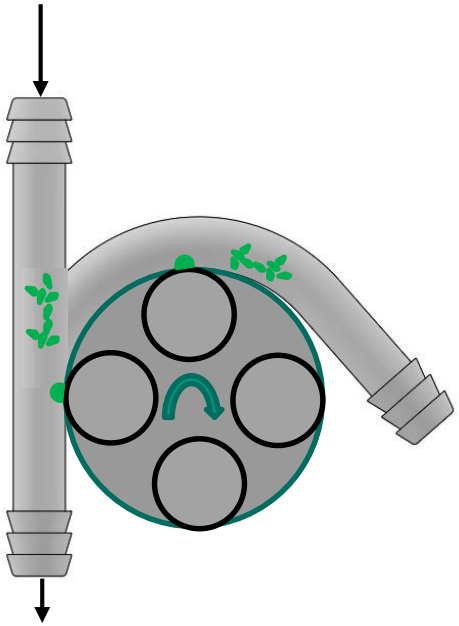


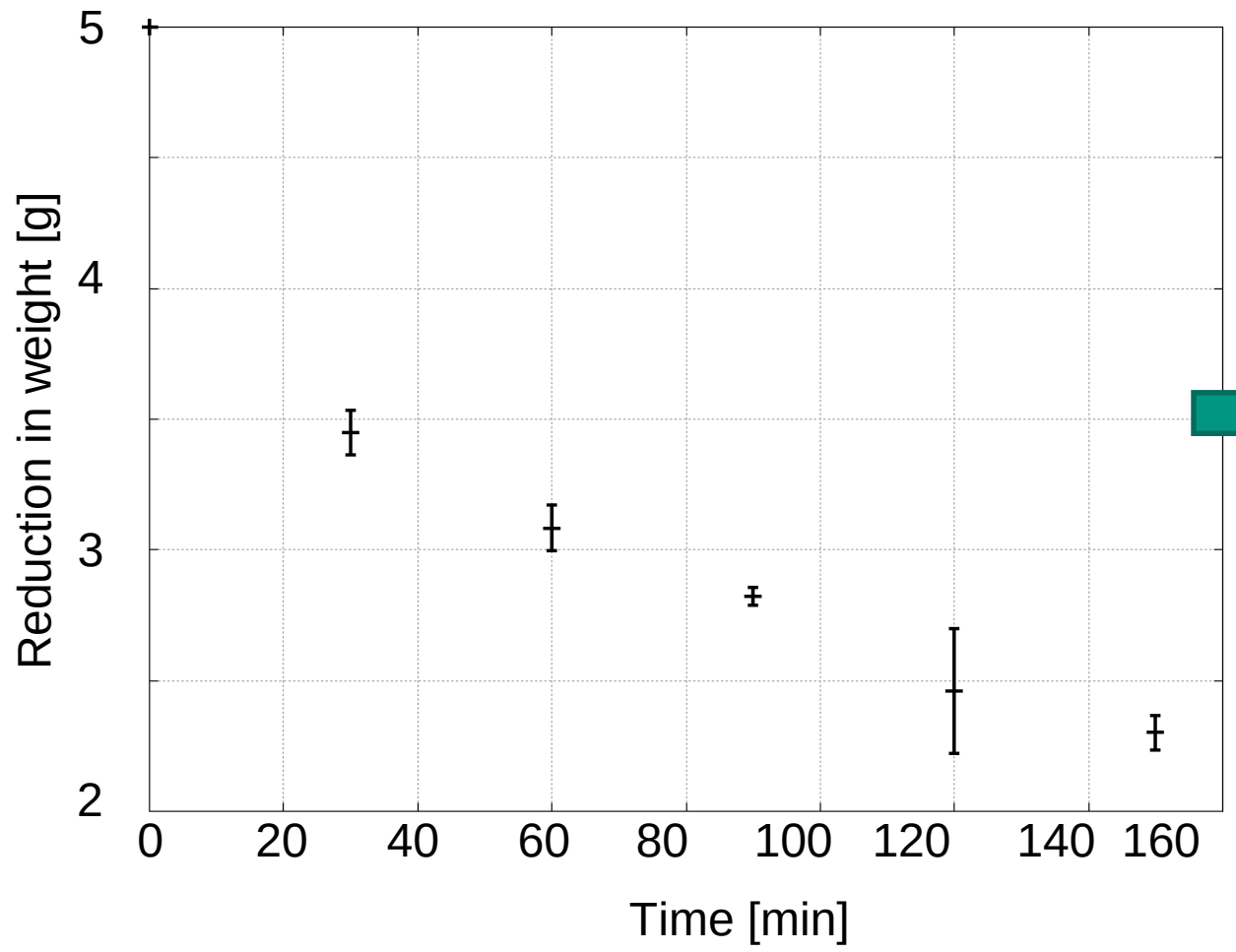


Continuous magnetic filter: Preliminary results

Experiments:

- Only with steel particles
- Batch operation



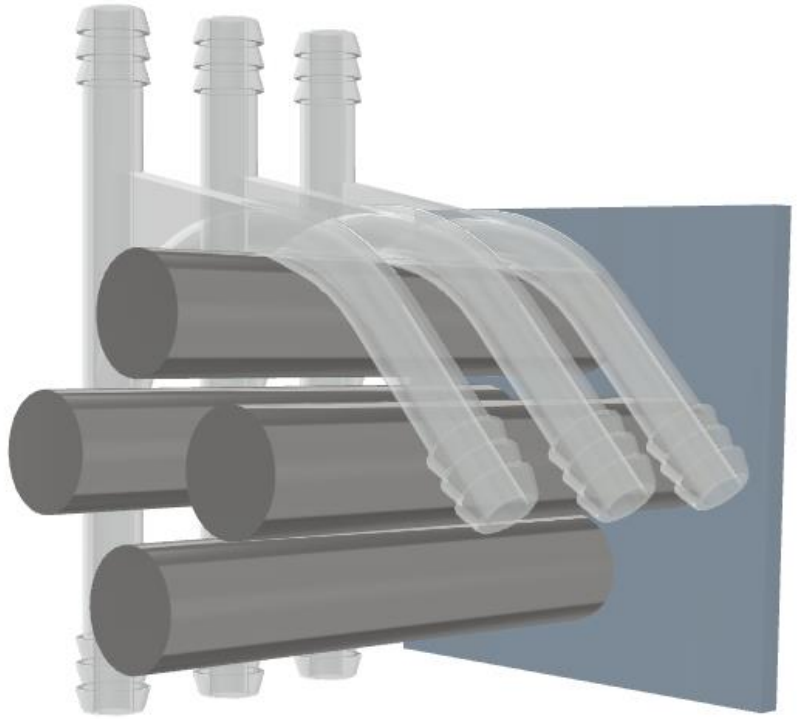


Results:

0.5-1% of the steel particles are separated after passing through r-divider

Outlook

- Combined test of continuous sieve and continuous magnetic filter with abrasive-steel-mixture from WAS-cut
- Improvement of the continuous magnetic filter
  - Geometry of piping
  - Continous flow (i.e. Peristaltic pump)
  - More r-dividers in parallel



Thank you for your attention!

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Muhammad Junaid Chaudhry
+49 721 608 48236
Muhammad.chaudhry@kit.edu