

Using **Perusall** to Enhance Student Learning of Particle Technology at Graz University of Technology

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Introduction

Perusall is a digital platform that allows students to collaboratively annotate textbooks, papers, and other similar classroom reading assignments. In order to help enhance student learning, Perusall was introduced to help teach Particle Technology at Graz University of Technology (TU Graz, Austria). The challenge associated with this course is that (i) students are NOT obliged to attend the lectures (hence participation is usually below 30%), and (ii) that students typically do not read background literature, but focus on exam questions only. Previously, this limited the overall success rate of students in case new exam questions and examples were introduced.

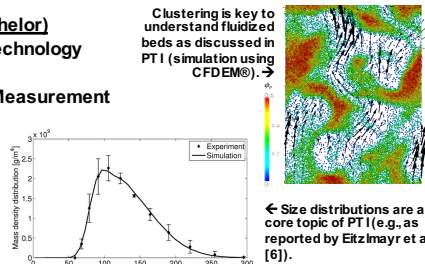
What is **Perusall**?

- Web-based tool for commenting on static content
- Allows students to “crowd source” comments, questions, and answers on text-based course materials
- Asynchronous responses, comments, and questions are recorded (students, timestamps) and shown to class and instructor
- Comments are scored by a machine learning algorithm

Particle Technology Course Content

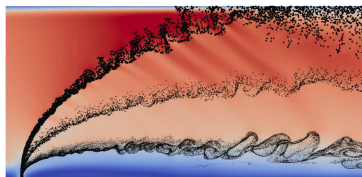
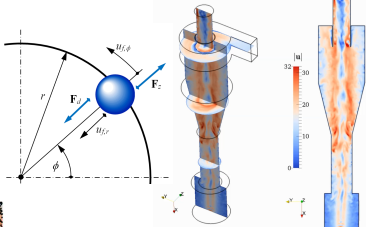
Particle Technology I (PT I, Bachelor)

- Introduction to Particle Technology
- Particle Size Distributions
- Particle Size and Shape Measurement
- Comminution
- Separation Processes
- Sampling
- Mixing
- Granular Rheology
- Fluidized Beds



Particle Technology II (PT II, Master)

- Introduction to Multiphase Flows
- Sedimentation
- Electrostatic Precipitators
- Flotation
- Filtration



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Papers Used in Particle Technology

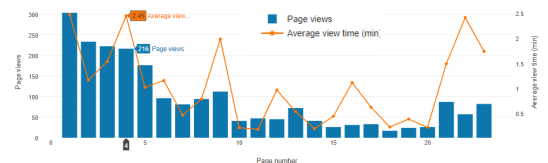
- Acrivos & Herzolzheimer [1]: Used to illustrate the importance of secondary flows in sedimenting suspensions. An eye opener!
- Brunner et al. [2]: Report on the practical application of electrostatic precipitators for small residential heating units. Of immediate importance for daily life, since dust is an issue in Graz.
- Doroodchi et al. [3]: Paper on the size/shape properties of coal and biomass blends that underwent comminution.
- Park et al. [4]: Paper on the particle size distribution of lunar dust, which serves as an initial study into toxicology effects.
- Van Ommen et al. [5]: Paper on introducing fractal injectors into a gas-solid fluidized bed reactor for improved hydrodynamics.

Examples of **Perusall**



Student Participation

- 46% read the text uploaded to Perusall.
- Useful input received from 34% of students.
- Perusall active reading times were between 2 minutes and 5 hrs 30 mins per student.



References

- [1] Acrivos, A., and Herzolzheimer, E., "Enhanced sedimentation in settling tanks with inclined walls," *Journal of Fluid Mechanics*, June 1979, 435-457.
- [2] Brunner, T. et al., "2-Year field operation monitoring of electrostatic precipitators for residential wood heating systems", *Biomass and Bioenergy*, April 2018, 278-287.
- [3] Doroodchi, E., et al., "A Combined Experimental and Theoretical Study on Laboratory-Scale Comminution of Coal and Biomass Blends," *Powder Technology*, 235 (2013) 412-421
- [4] Park, J., et al., "Characterization of Lunar Dust for Toxicological Studies I: Particle Size Distribution," *Journal of Aerospace Engineering*, October 2008, 261-277
- [5] Van Ommen, R., et al., "Reshaping the Structure of Fluidized Beds," *Chemical Engineering Progress*, July 2009, 49-57
- [6] Eitzlmayr et al., "Modeling and simulation of polyacrylic acid/protamine nanoparticle precipitation", *Soft Matter* 7 (2011), 9484-9497.