FLOTSIM

Leveraging Multiphase Flow and Physical Chemistry to Engineer the Next Generation of Flotation Processes

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INTRODUCTION

- Froth flotation: An integral mineral separation process based on differences in hydrophobicities of minerals.
- Extremely complex process with hydrodynamics & surface chemistry involved and not yet fully understood.
- Future flotation cells must be able to respond to resource, energy, and economic challenges.
- *FlotSim* aims to investigate & model the flotation process and the interactions between particles, air bubbles, and turbulent water flows from nano-scale to pilot-scale.
- Particular focus on FLSmidth's nextSTEP flotation cells.
- 5 early stage researchers (ESRs) working together on micro- and macro-processes in flotation.

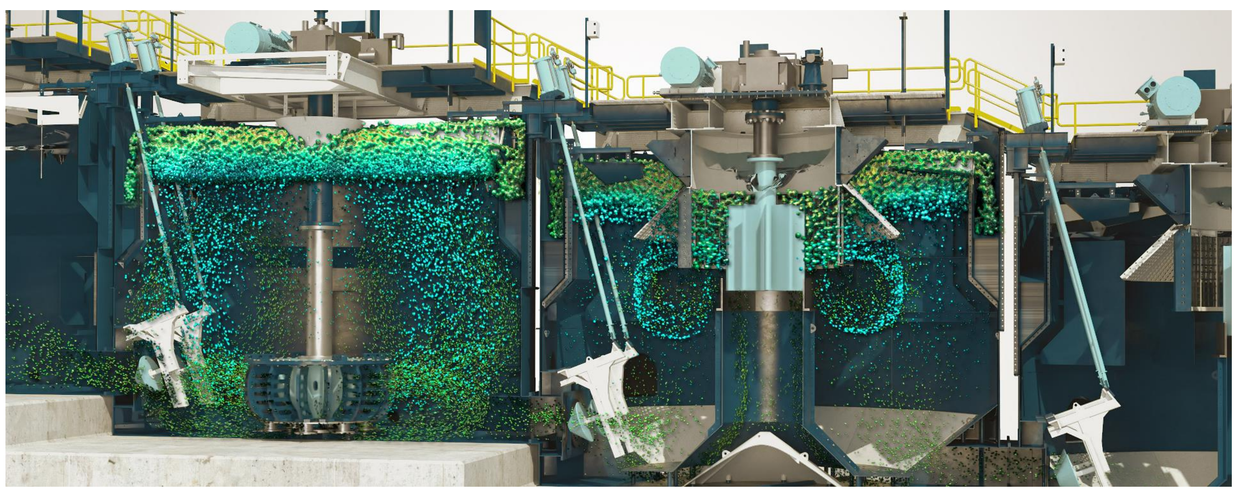
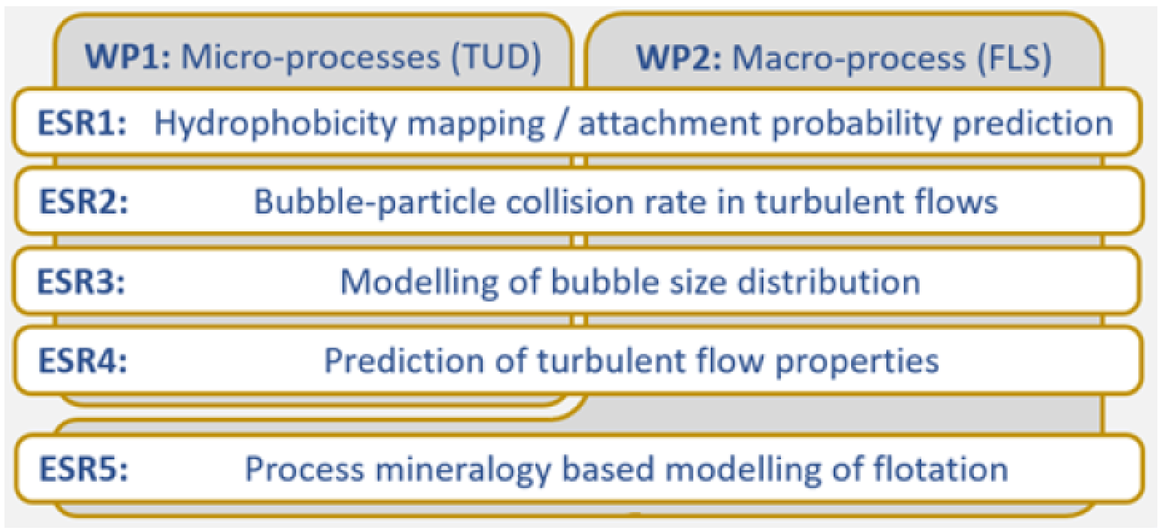


Figure 1: FLSmidth's nextSTEP™ (left) and WEMCO™ (right) flotation cells [1]

WORK PACKAGES



This project has received funding from the European Union's Horizon 2020 research and innovation programme under the Marie Skłodowska-Curie grant agreement No 955805.

READ MORE ABOUT HORIZON 2020

https://www.flsmidth.com/en-gb/flotsim

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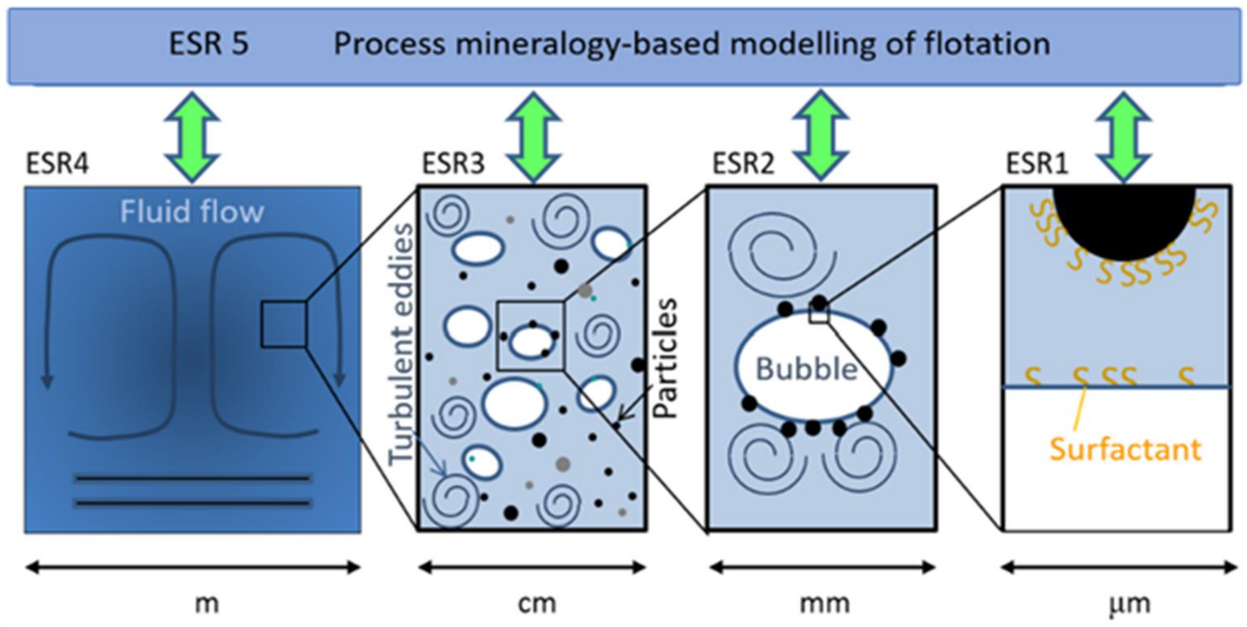

Figure 2: A visual representation of different work packages in FlotSim project from micro-scale to pilot scale [2].

ESRs' DESCRIPTION

ESR 1 – *Gülce Öktem*

- Derivation of particle-bubble interaction parameters, i.e., wettability characterization of individual mineral grains, from atomic force microscopy measurements.
- Implementation of the derived information to enhance flotation models by replacing the simplistic contact angle approach.

ESR 2 – *Benedikt Tiedemann*

- Numerical determination of collision efficiencies and frequencies in flotation processes.
- Based multiphase Direct Numerical Simulations (DNS) for specific parts of the flow field.
- Using large number of resolved particles and bubbles.

ESR 3 – *Hifsa Pervez*

- Experimental study of particle-bubble interactions on a lab-scale setup.
- Measurement of the bubble size distribution under turbulence.
- Validation of the models at a pilot flotation facility.

ESR 4 – *Vikrant Vinayak Kamble*

- Development of expressions for the source terms that account for turbulence modulation due to bubbles and particles in a Reynolds Averaged Navier Stoke (RANS) turbulence model.
- Direct Numerical simulation (DNS) for bubble and particle rise in homogenous isotropic turbulence.
- Development of CFD model for a submerged 3-phase jets.

ESR 5 – *Ali Hassan*

- Apply process mineralogical & particle tracking approach to model flotation tests and formulate predictive models using automated mineralogy.
- Comparison studies on FLSmidth's WEMCO & nextSTEP flotation cells, relating to resource & energy efficiency.
- Experimental validation for CFD models developed by other ESRs.

ACKNOWLEDGEMENTS

- We greatly acknowledge the contributions of colleagues from FLSmidth, TU Dresden, and HZDR. Special thanks to *Jesse Bowden* and *Clay Macomber* from FLSmidth for their support throughtout the project.

REFERENCES

[1] https://www.flsmidth.com/en-gb/flotsim
[2] FlotSim Project Proposal