Laboratory plant freeze concentration

Aim and Scope

- Designing of lab scale freeze concentration process.
- Validation of simulations from literature and experiment.
- Challenges in freeze concentration process.
- Improvements in current model.

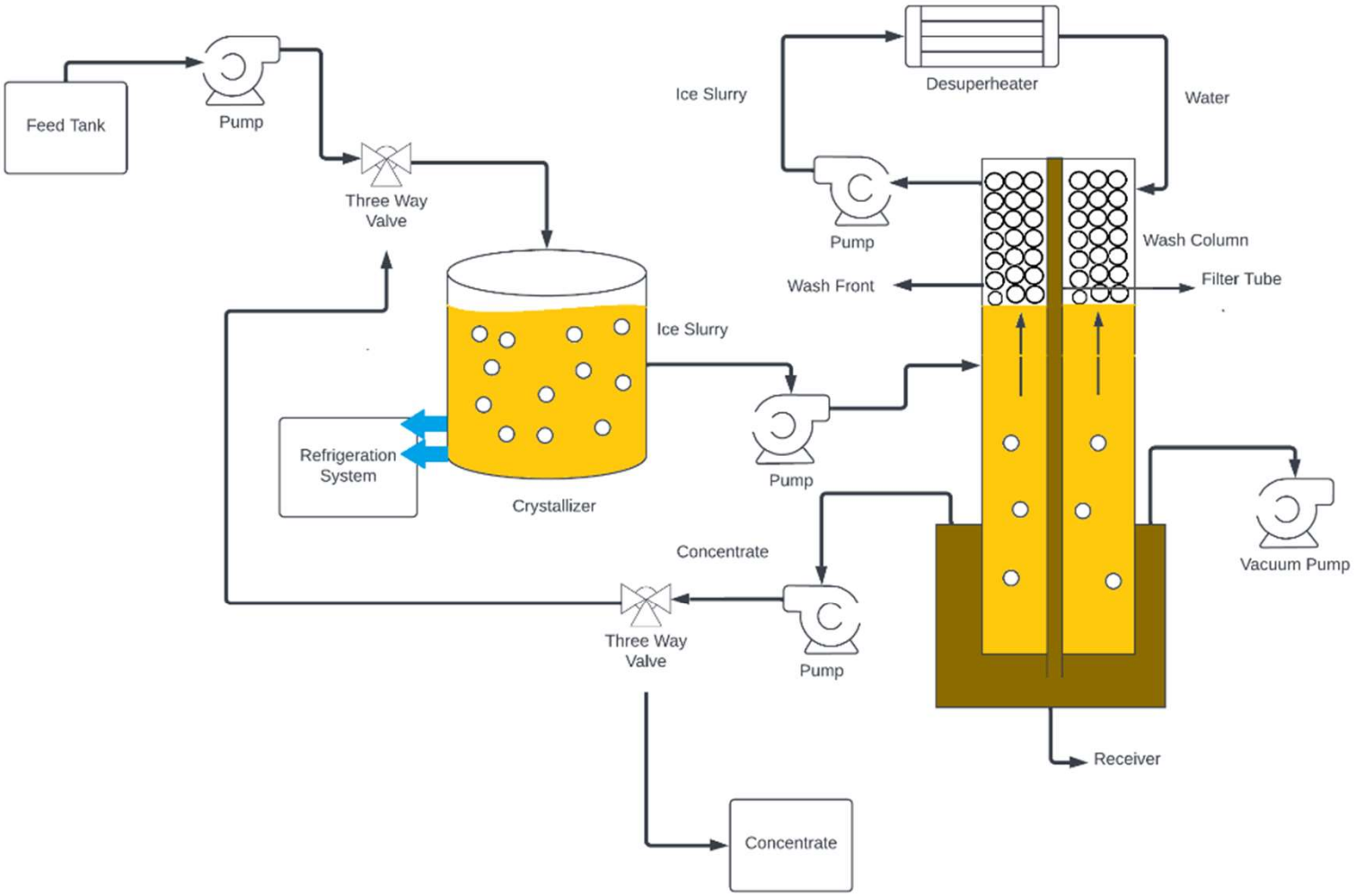
Why to use Freeze Concentration

Energy Efficient

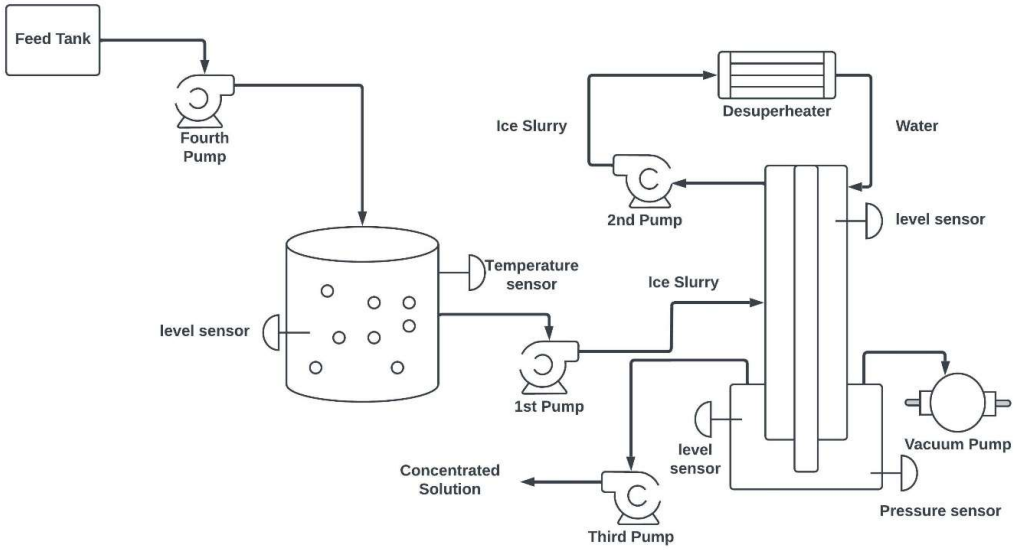
Avoiding thermal damage

Payback in 2 to 4 years

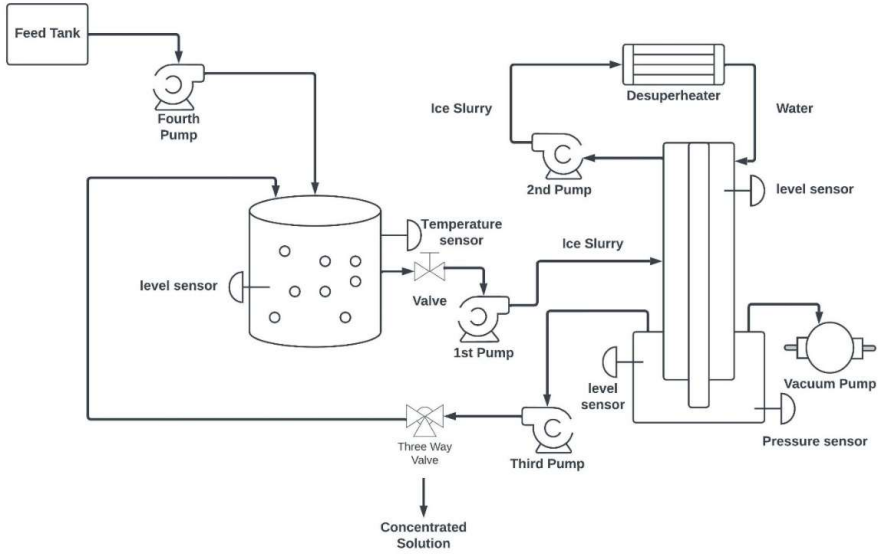
Working Principle



System Sketch



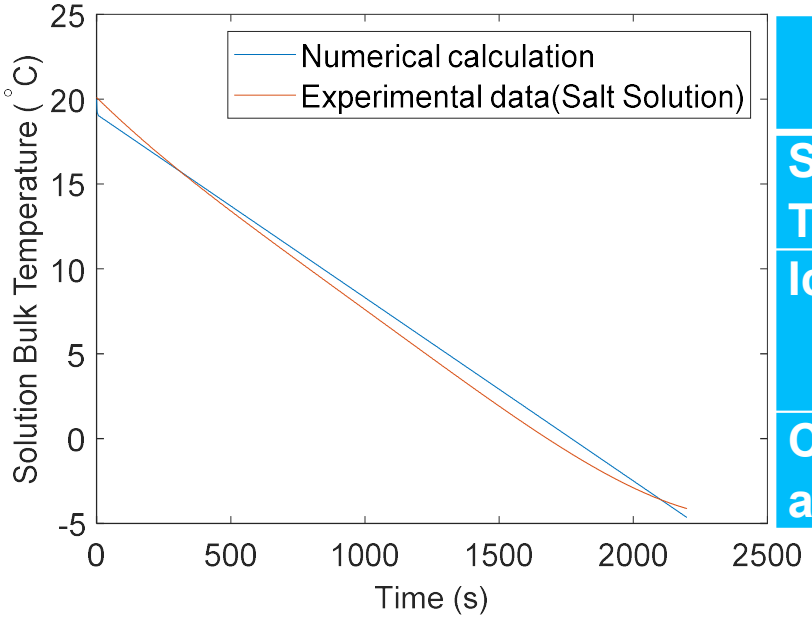
Batch Process



Steady State Process

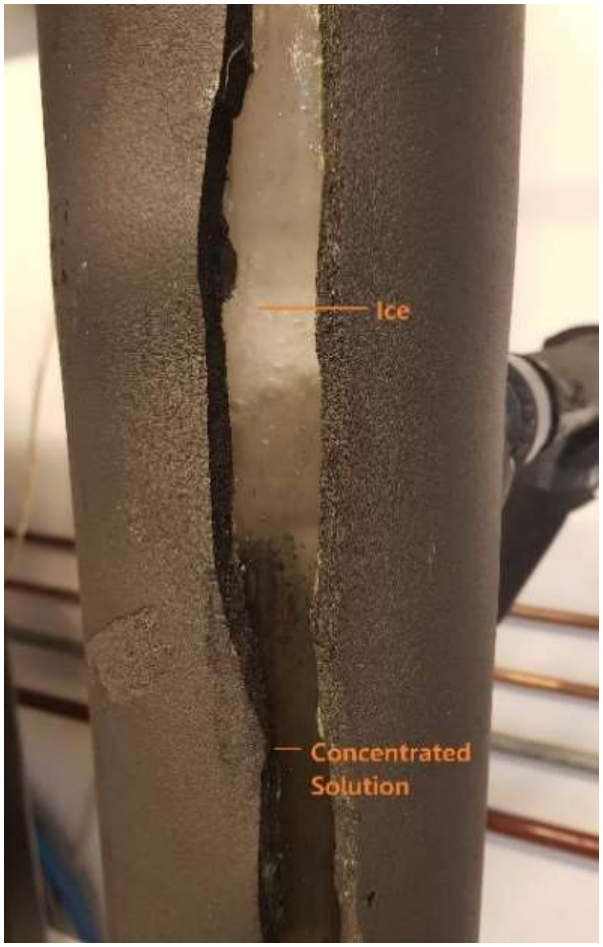
Lab Scale Setup

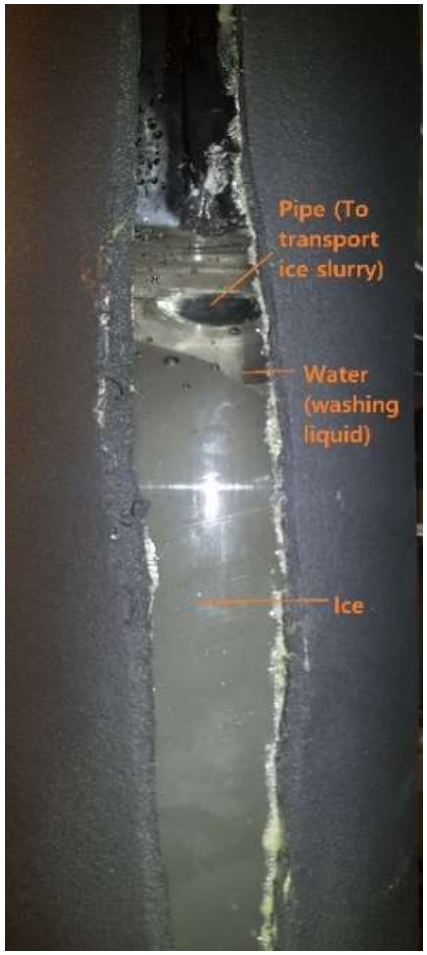
Results for batch scale



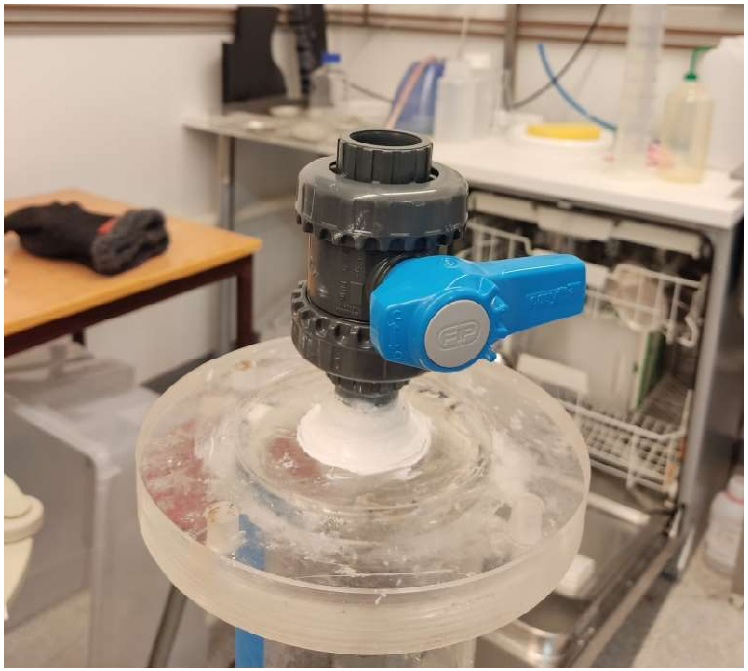
	Experimental Value	Numerical Value	Error
Solution Bulk Temperature	-4.5℃	-4.1 ℃	8.89%
Ice Formation	23%	21%	8.7%
Concentration achieved	8.86%	8.672%	2.12%

Results for batch scale

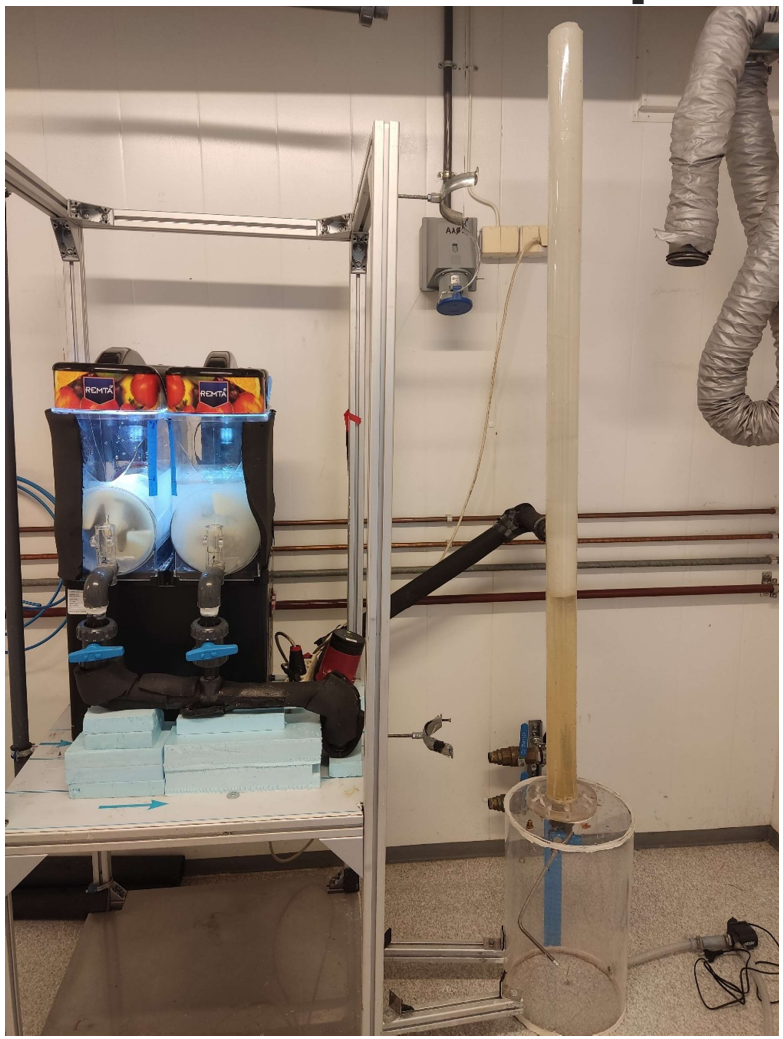


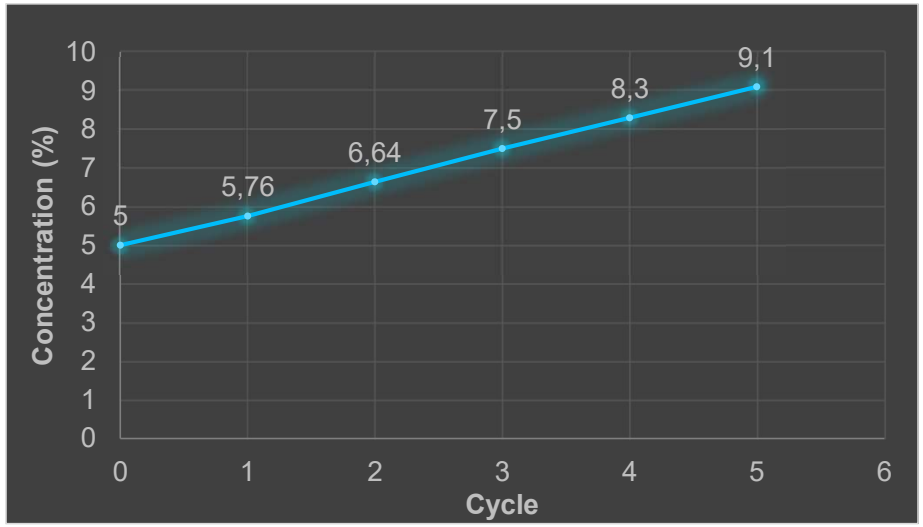


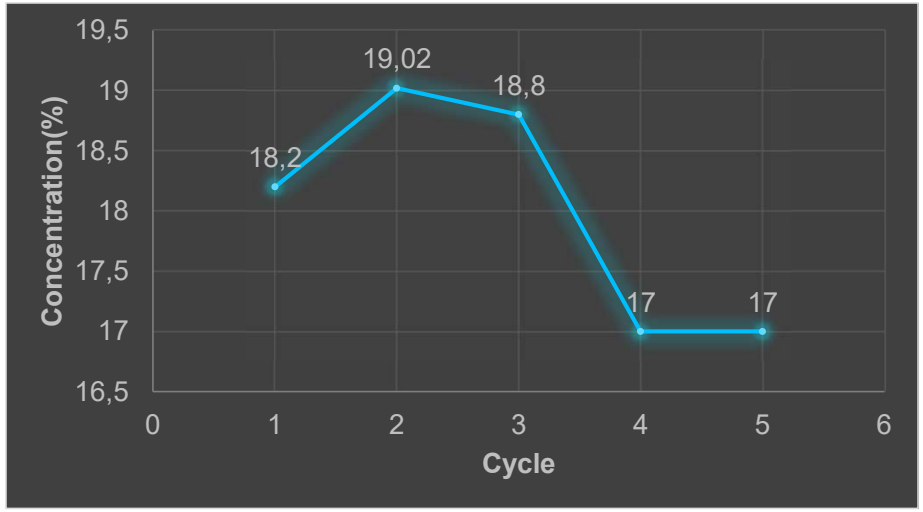
Different Configuration



Improved System

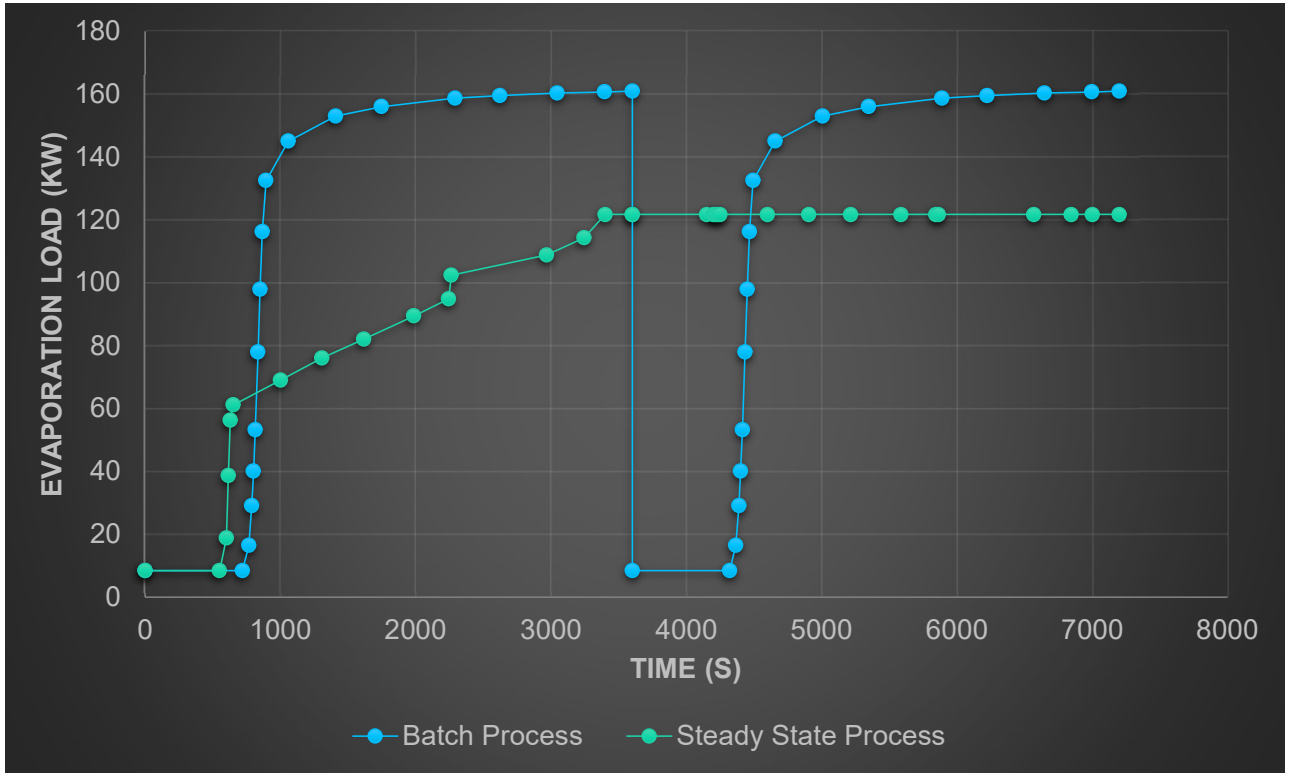






Conclusion

- Batch Process
  - Large Component
  - Pumping problem
  - High cooling demand
- Steady State Process
  - Compact Components
  - Low cooling demand
  - Low pumping power



Thank You!

Questions!

muhamuk@stud.ntnu.no