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Nitrogen depletion on microalgae culture for lipids production – a continuous process facilitated by acoustic settler

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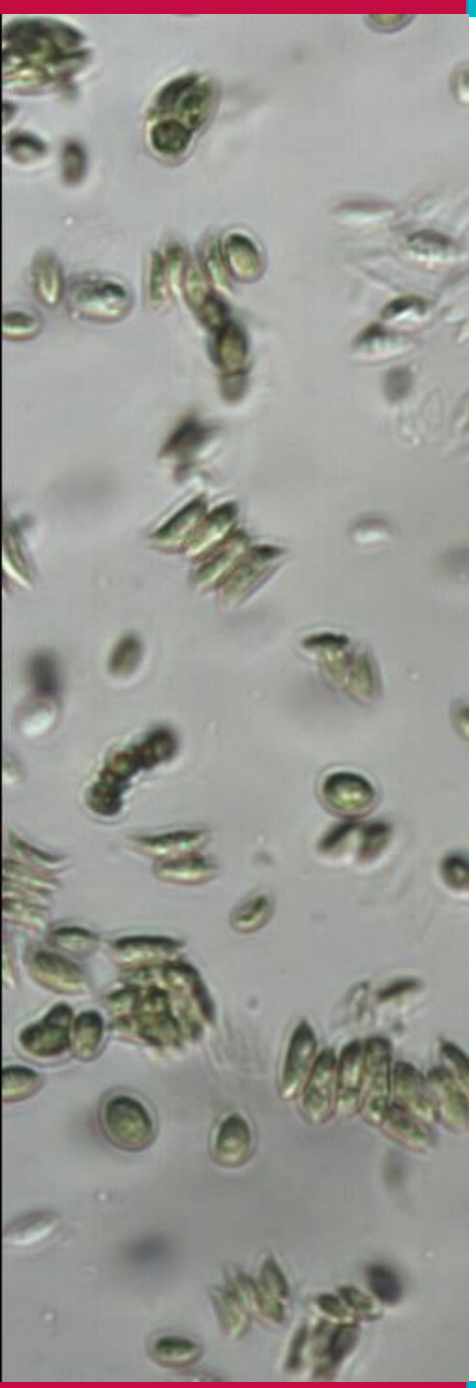
POLYTECH MONS



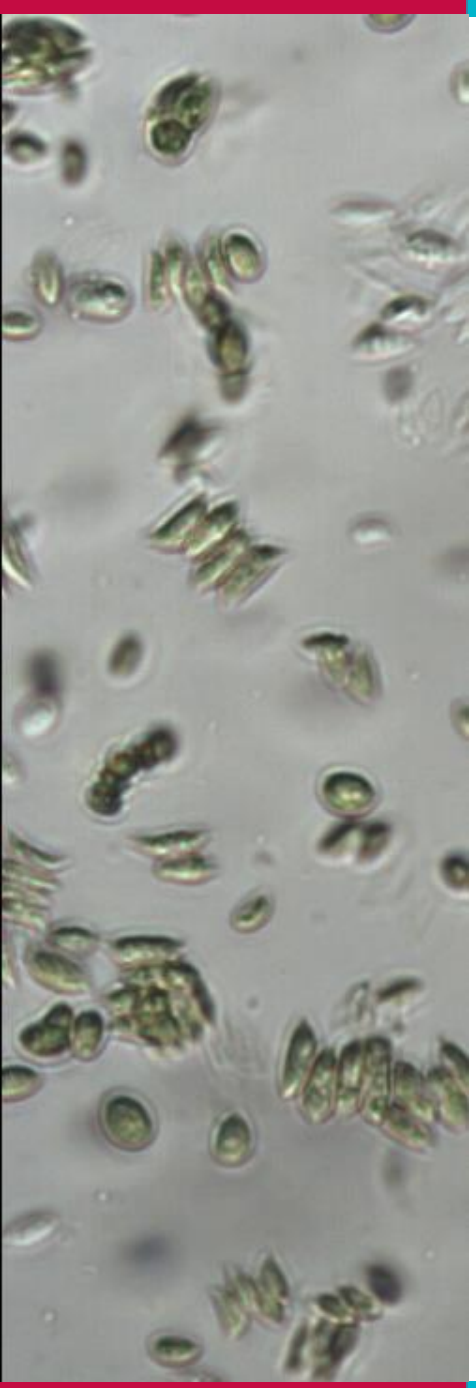
Context

Microalgal-based biorefineries context

- Limitation of the fossil ressources
- Anticipation of CO_2 emission
- Circular economy
- High value-added compounds

Technological limitations

- Maximum concentration relatively low compare to fermentations



The importance of nitrogen-deprivation

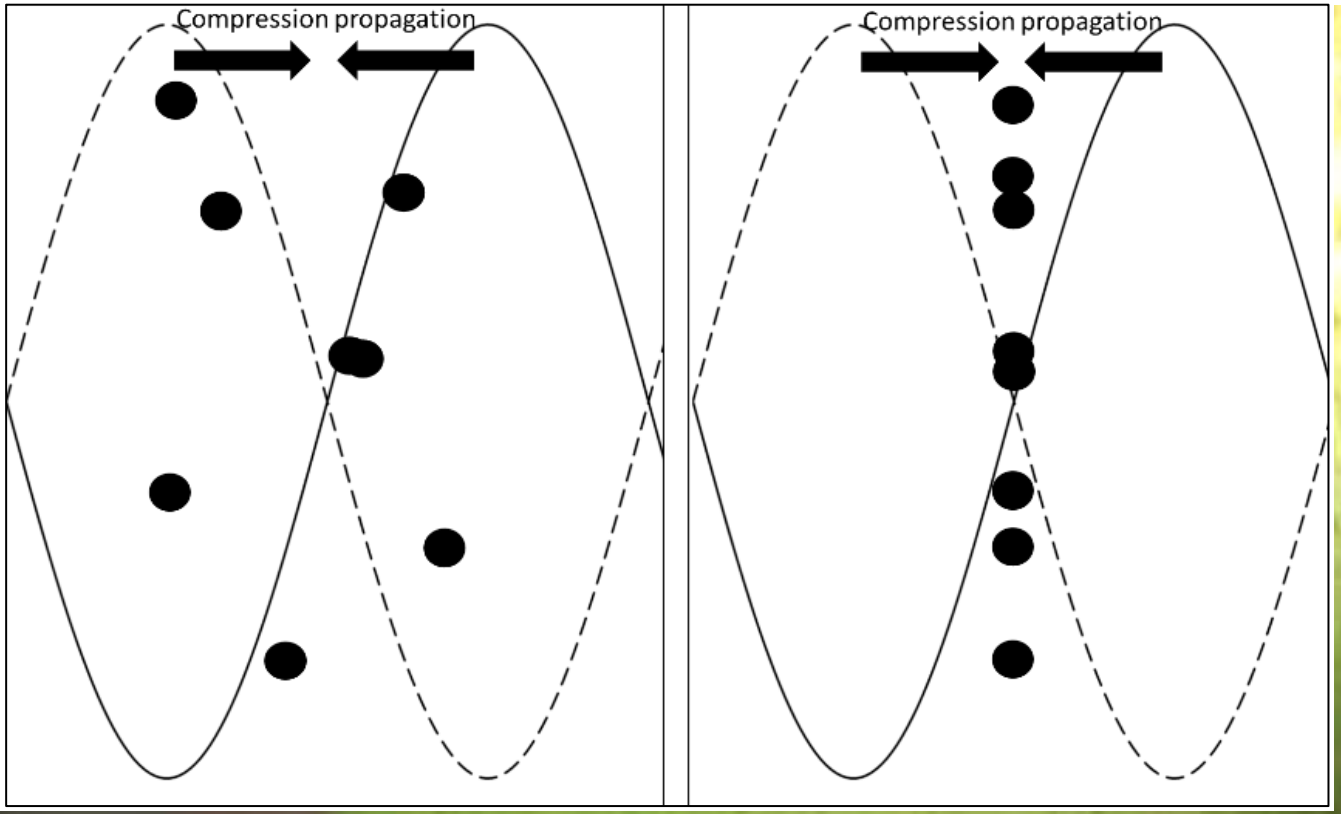
Lipids accumulation

- Up to 5-time higher content in lipids (%)
- Not compatible with optimal growth

Separation Growth/Lipids accumulation

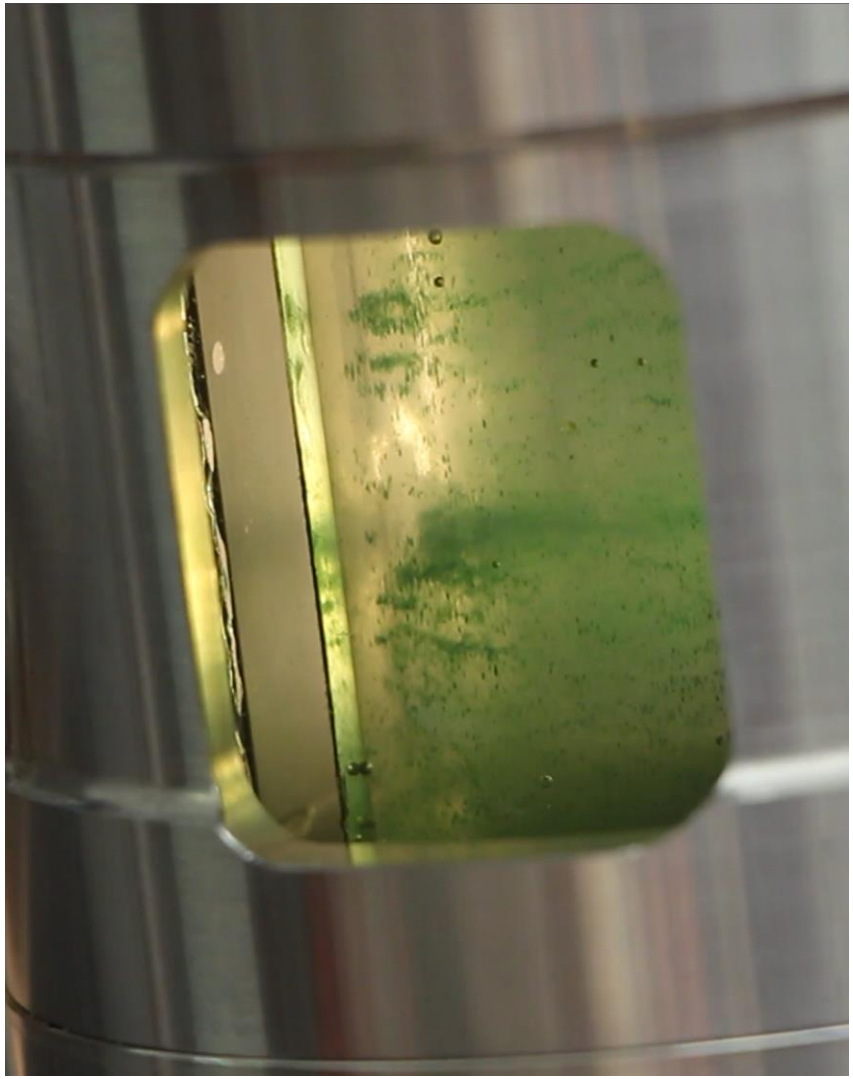
- Least medium transfer

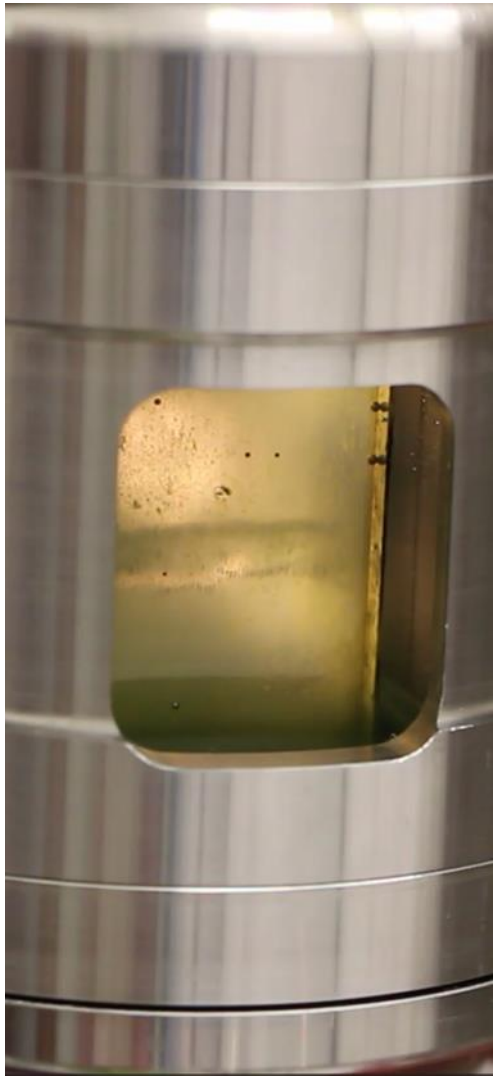
Acoustic settling



Local compression → Local concentration

100-mL acoustic filter chamber





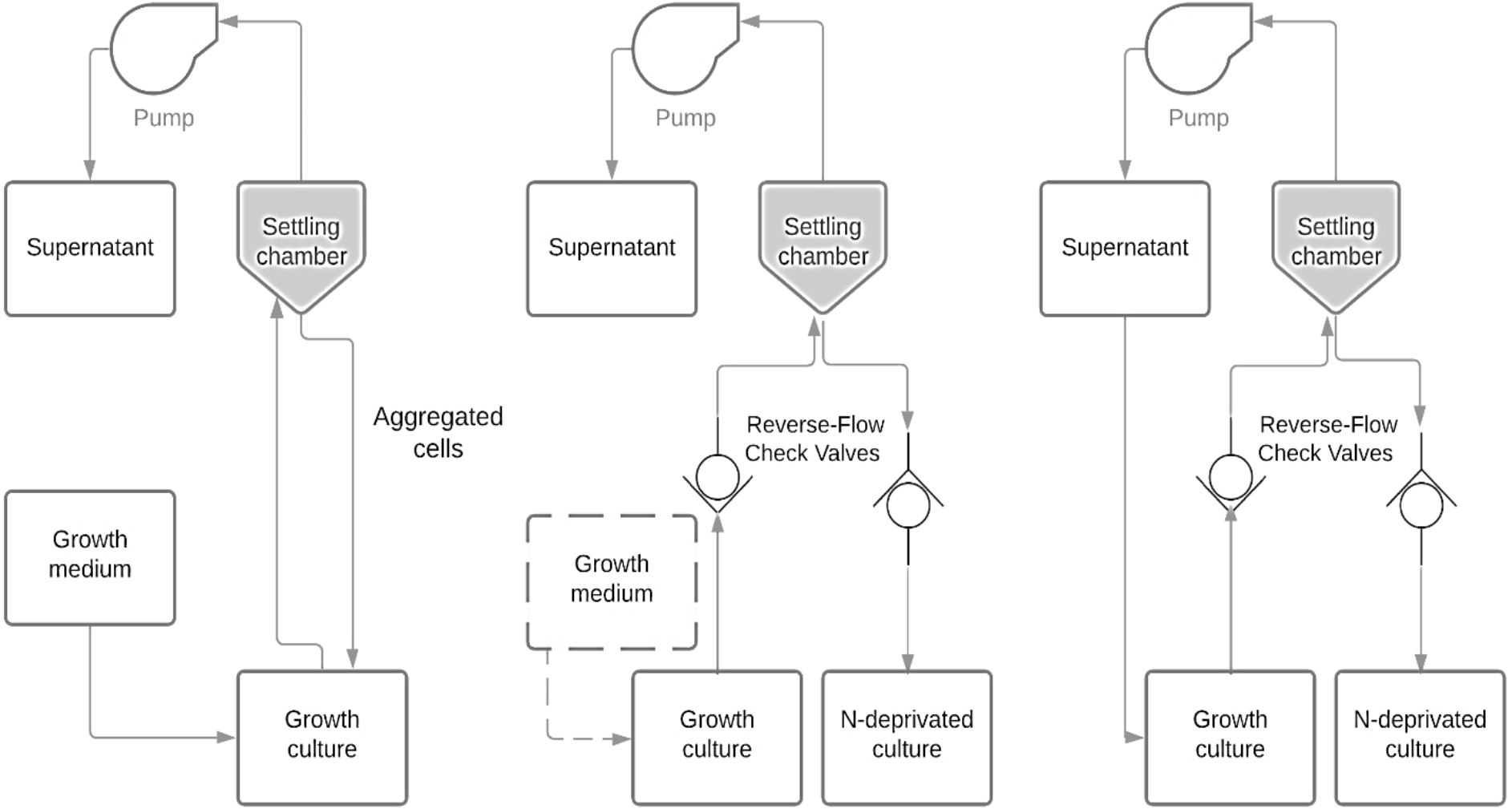
Local concentration → Local sedimentation

LIQUID OUTPUT and AIR INPUT

ACOUSTIC GENERATOR

SETTLING CHAMBER

LIQUID INPUT



Different set-up

Proof of concept : goals

Evaluate:

- Concentration efficiency
- Maximum concentration obtained

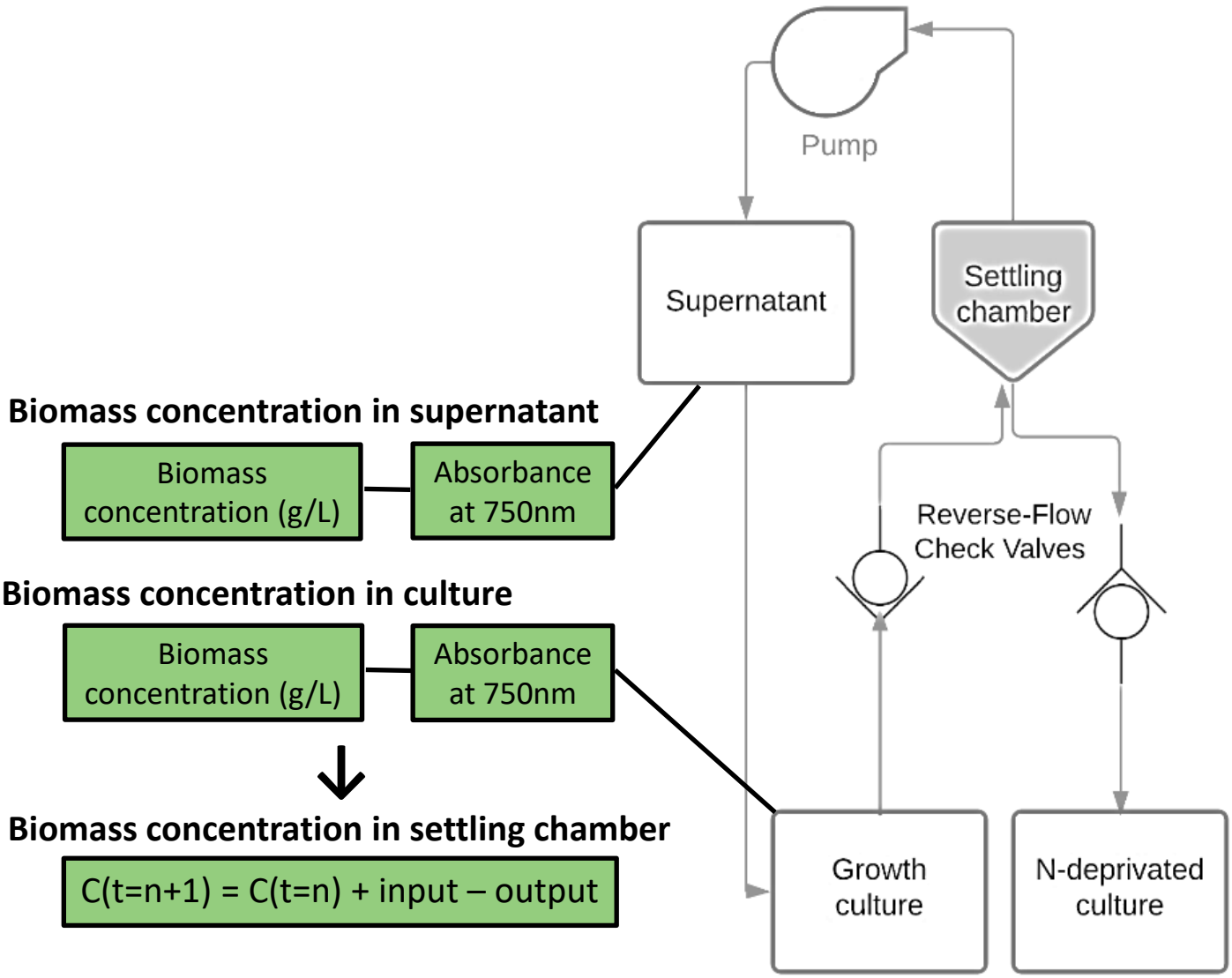
Confirm:

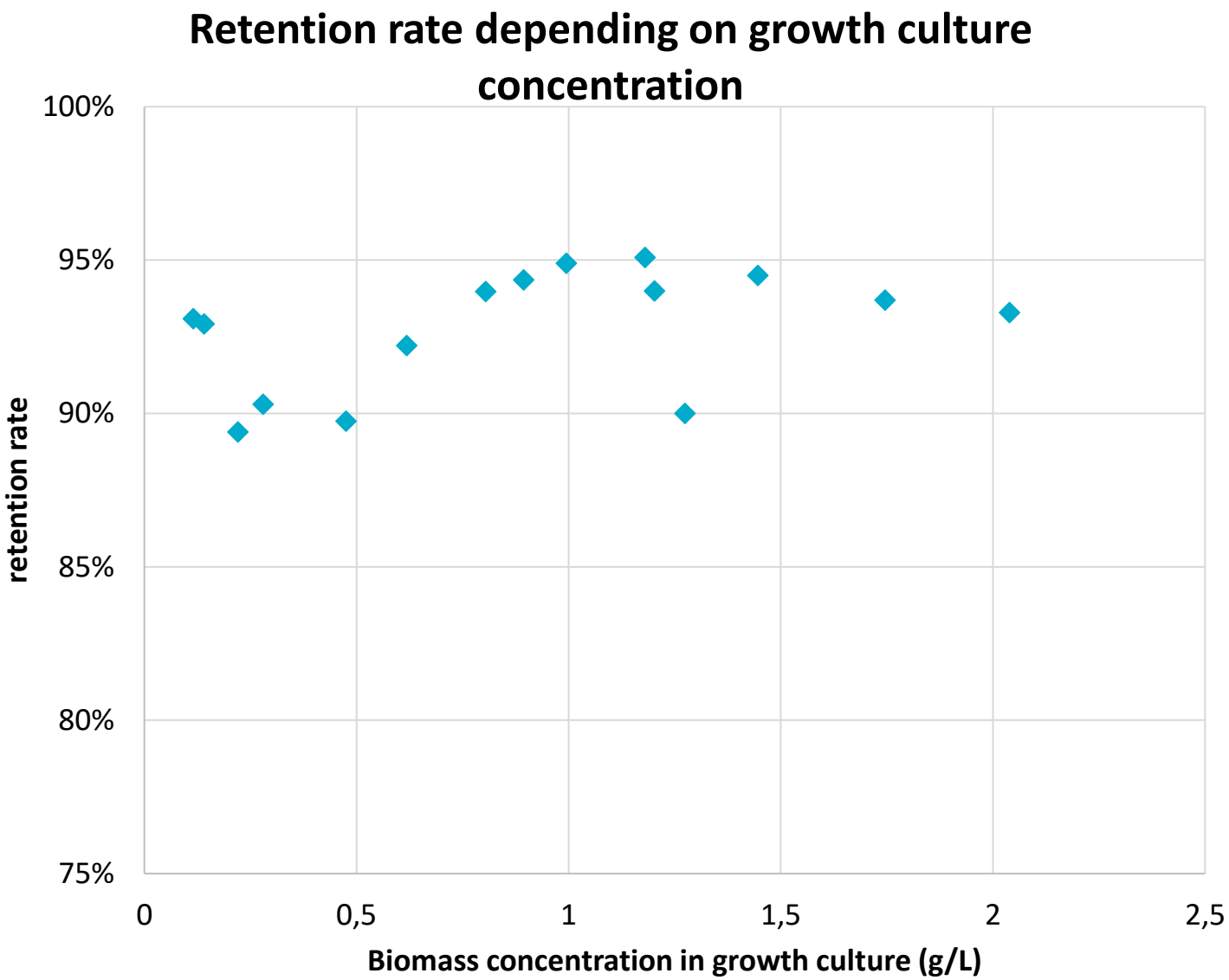
- No biofouling or clogging
- Continuous process

Optimise:

- Volume reinjected
- Length of cycles

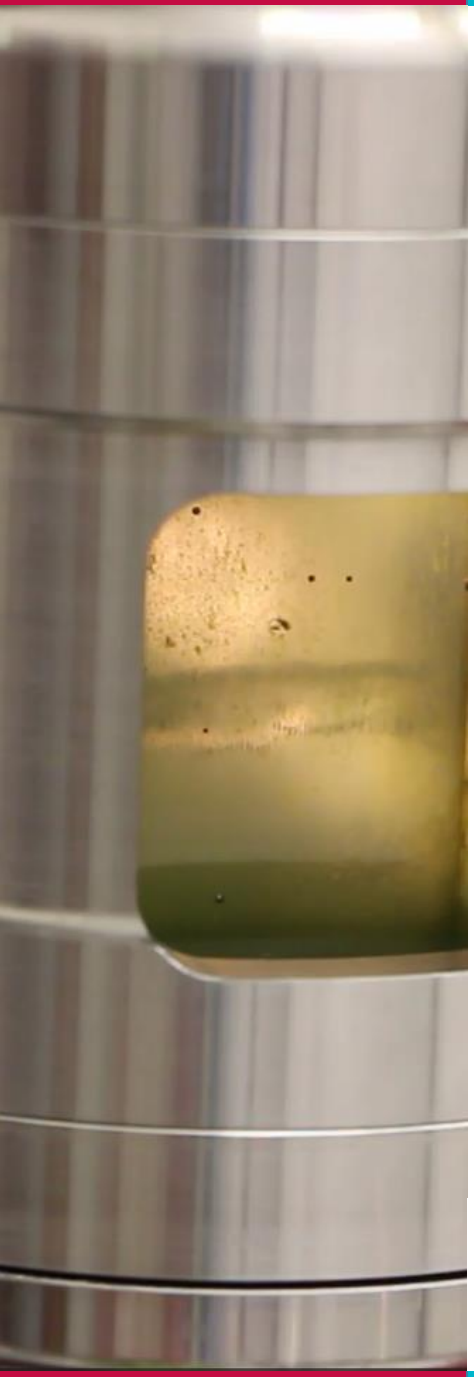
Experimental set-up



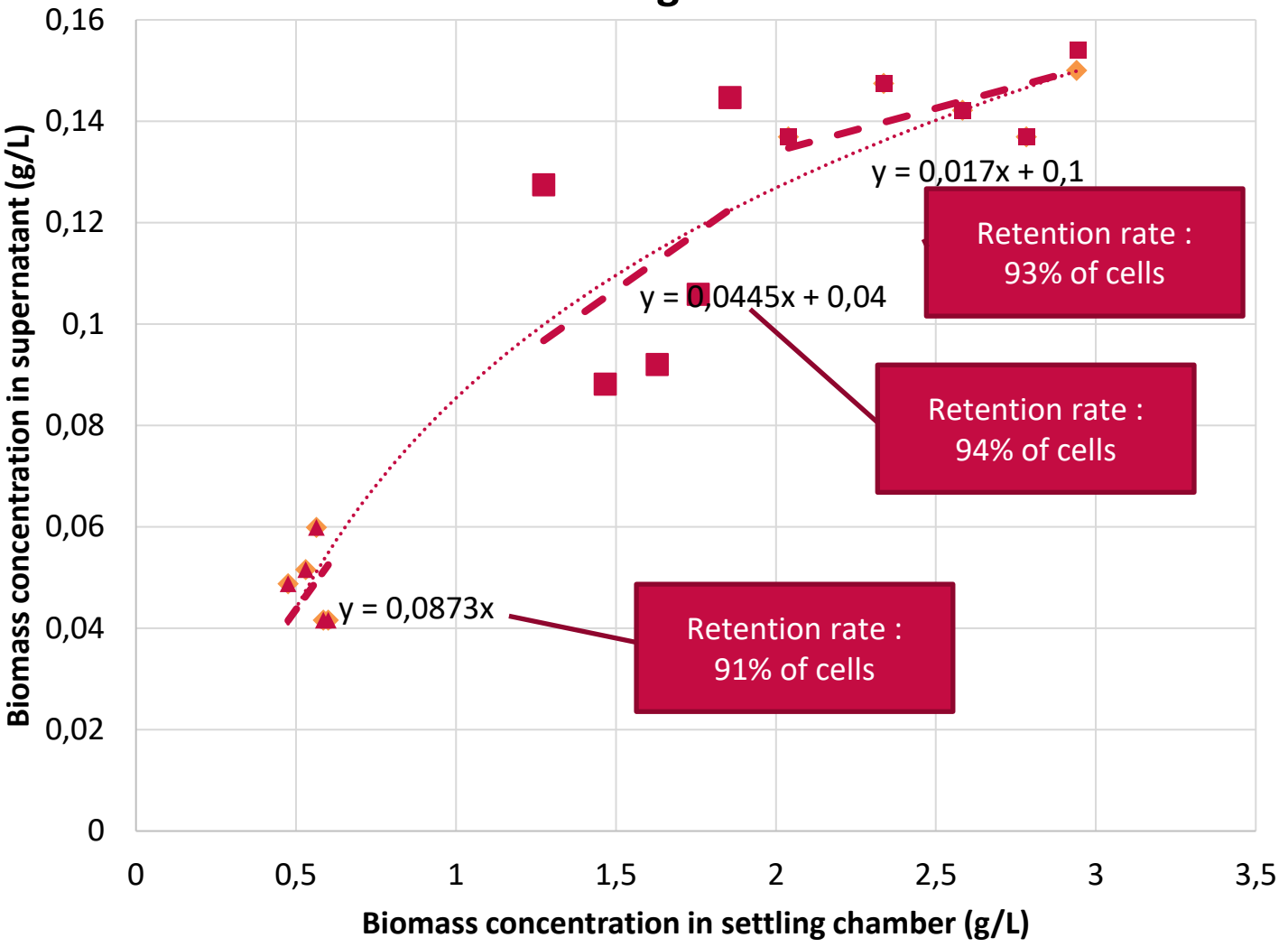


Retention rate between 89% and 95%

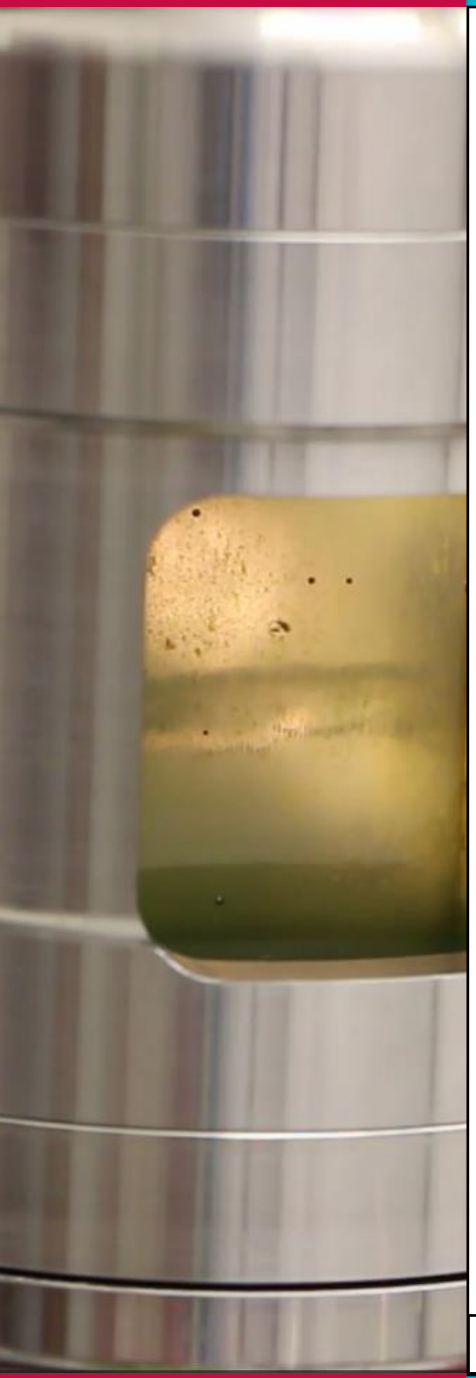
Optimum here at 1,2g/L



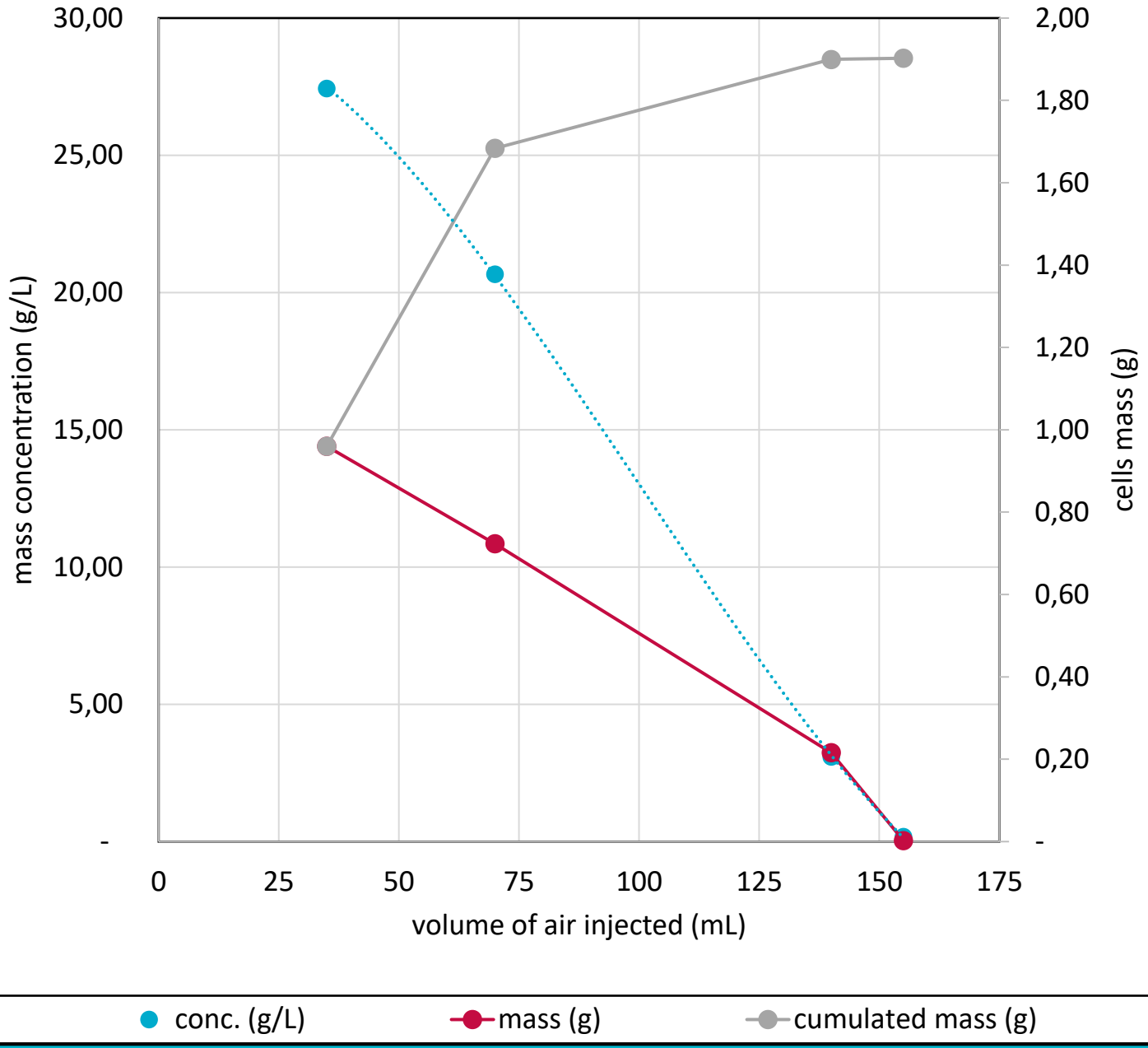
Retention efficiency depending on concentration in settling chamber

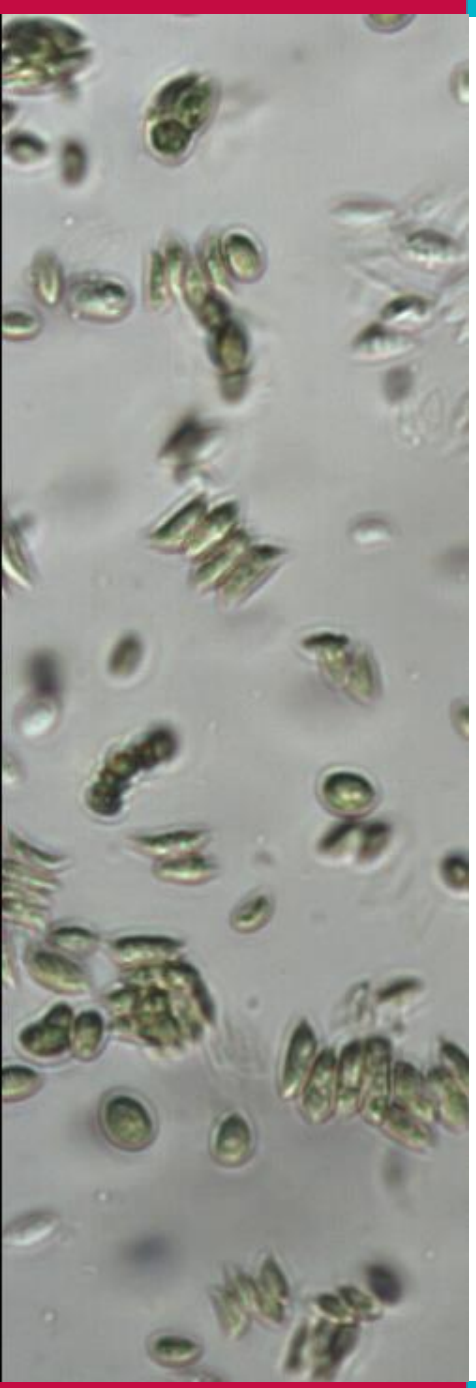


Retention rate stays high



Distribution of biomass in the settling chamber

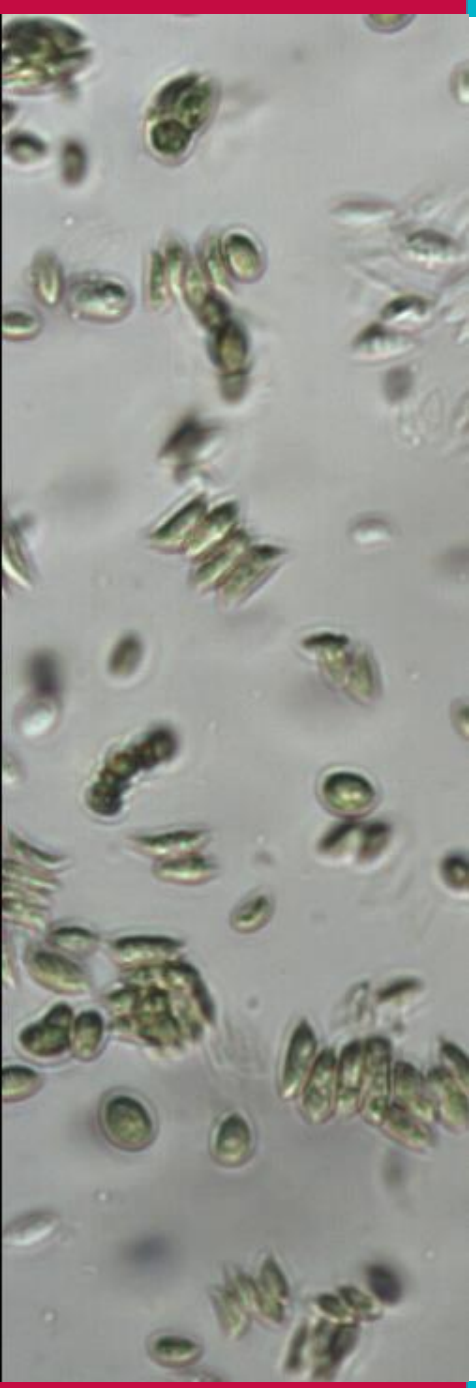




Conclusion (1/2)

Facing customary technological limits:

- ✓High efficiency
- ✓High concentration obtained
- ✓No biofouling or clogging
- ✓Efficient on various microalgae strains and size
- ✓No chemical needed to improve sedimentation



Conclusion (2/2)

Still to be evaluated:

- Continuous process
- Ease to scale and configure on a complete process

Still to be optimized according to the strain

Thank you for your attention

Any question ?

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