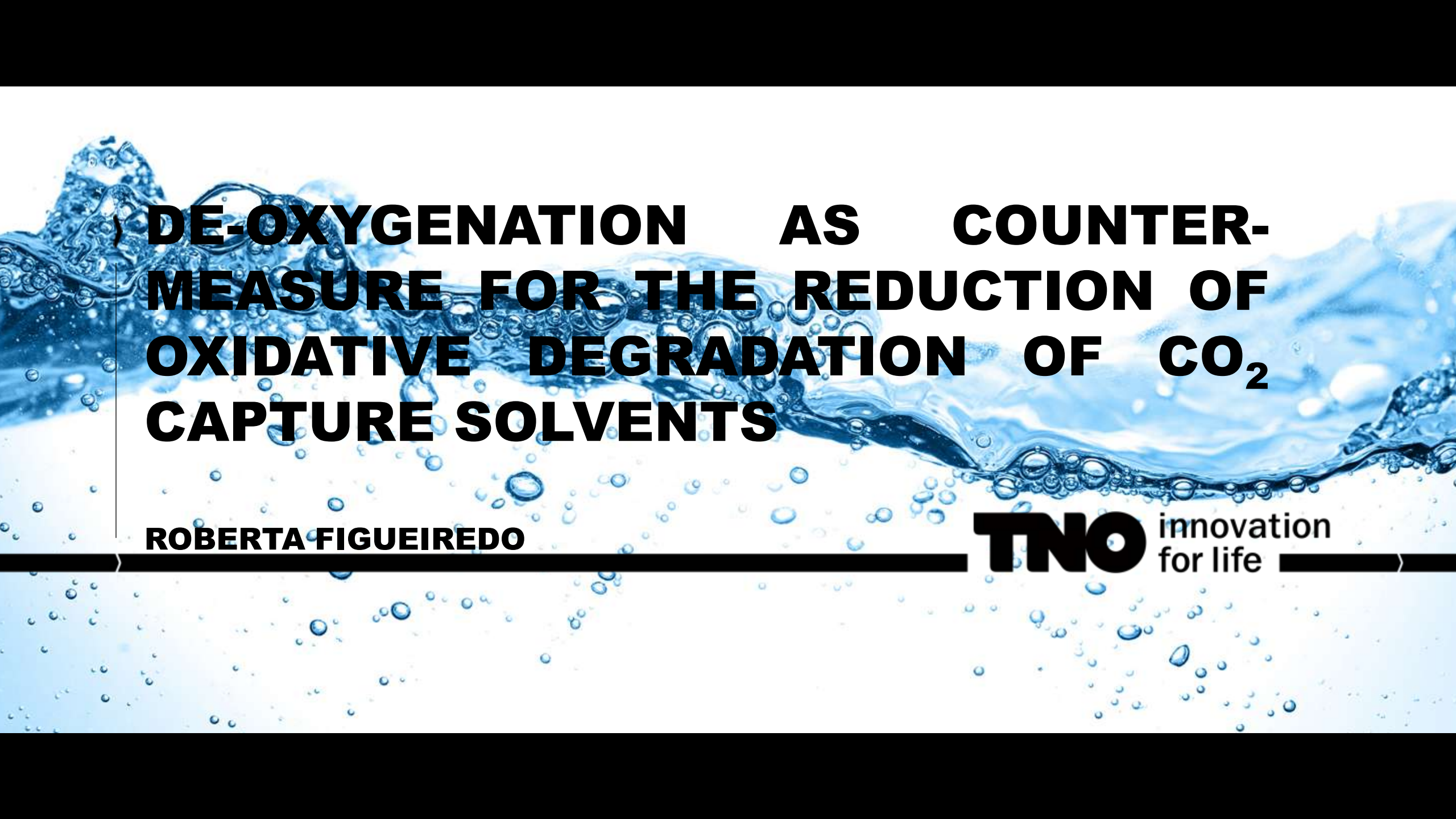


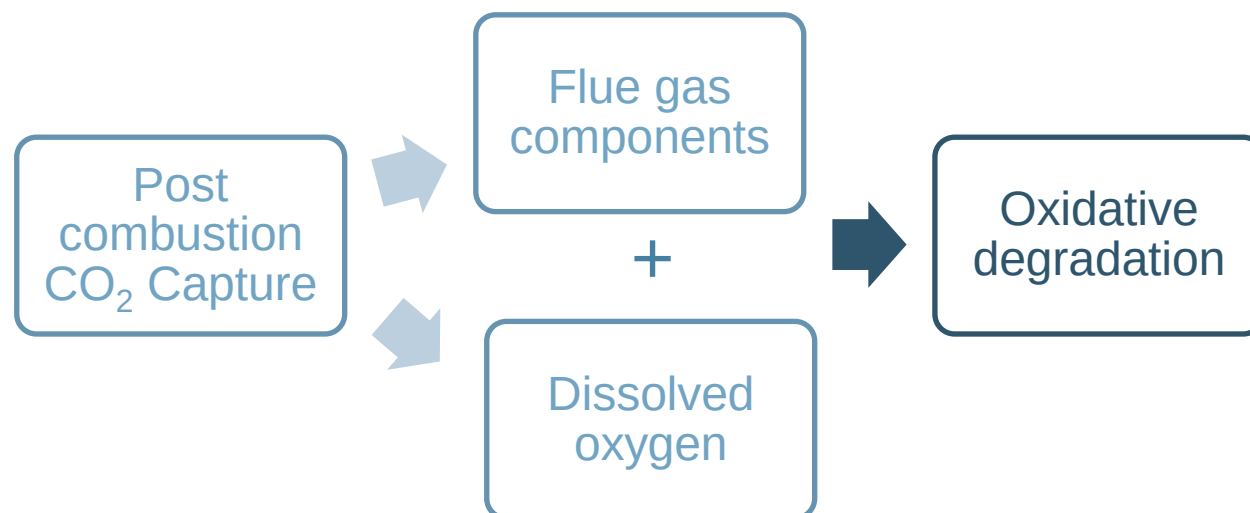


DE-OXYGENATION AS COUNTER- MEASURE FOR THE REDUCTION OF OXIDATIVE DEGRADATION OF CO₂ CAPTURE SOLVENTS

ROBERTA FIGUEIREDO

TNO innovation
for life

OXIDATIVE DEGRADATION



Advantages

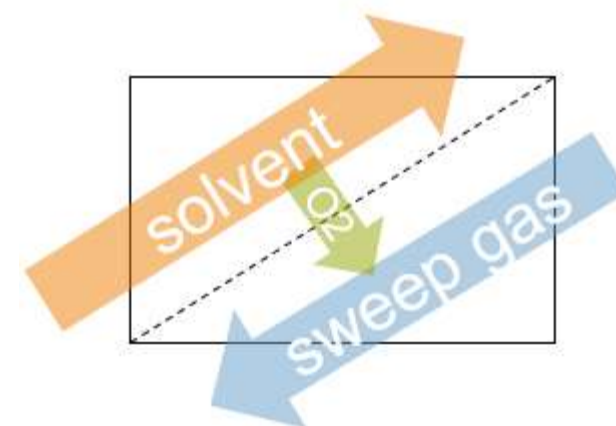
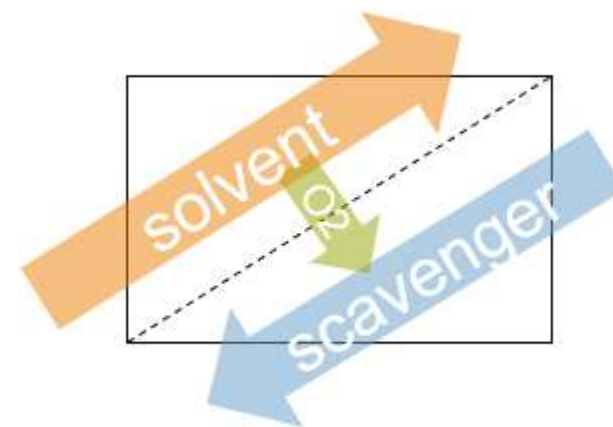
- › Prevents corrosion
- › Decreases energy consumption
- › Simplifies waste management and disposal

DORA – DISSOLVED OXYGEN REMOVAL APPARATUS

› Liqui-Cell X40 membrane



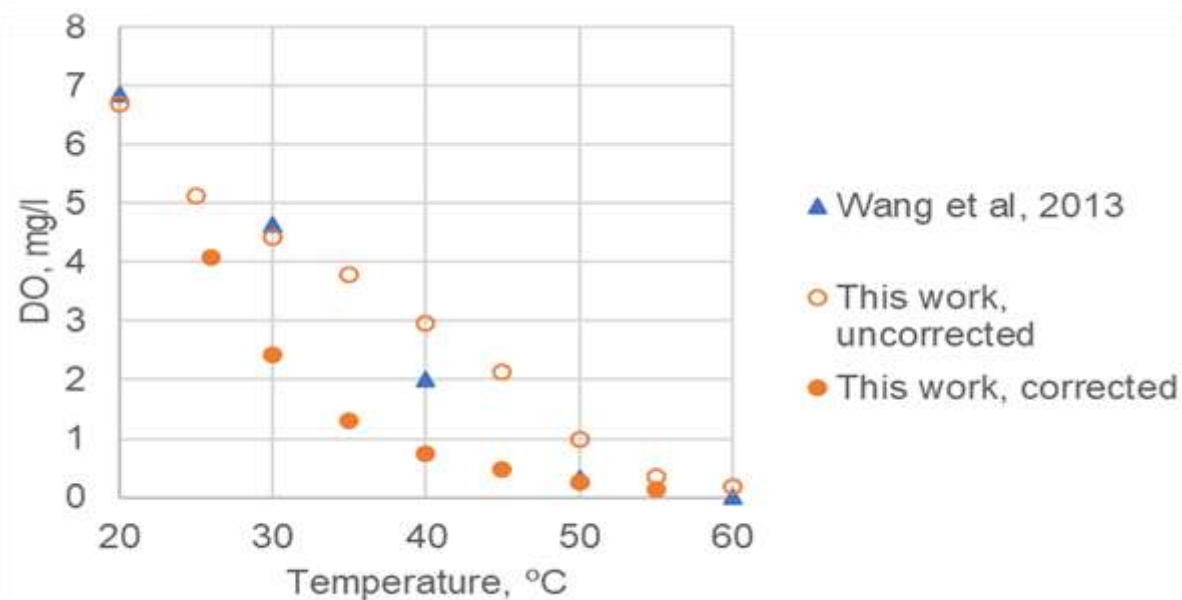
Operation modes



DISSOLVED OXYGEN MEASUREMENTS

› Memosens COS81D Optical sensor

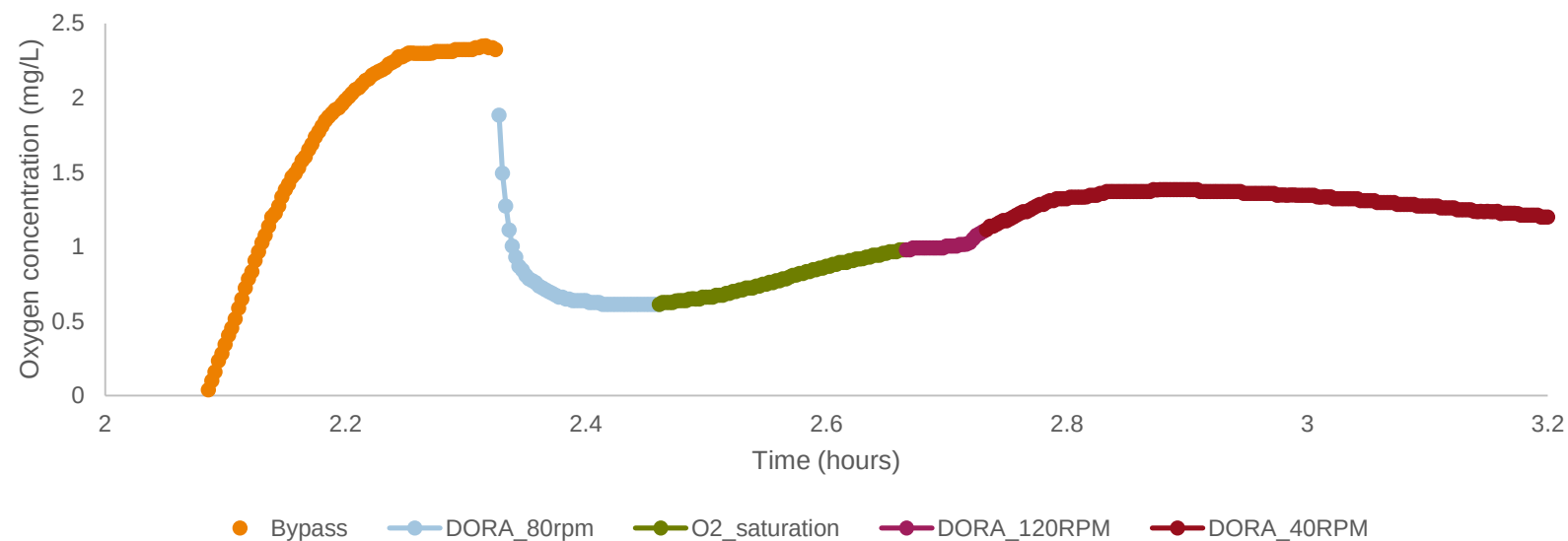
30% MEA, loading = 0,4 mol/mol





) MICROPLANT OPERATION - SCAVENGER

PARAMETER OPTIMIZATION



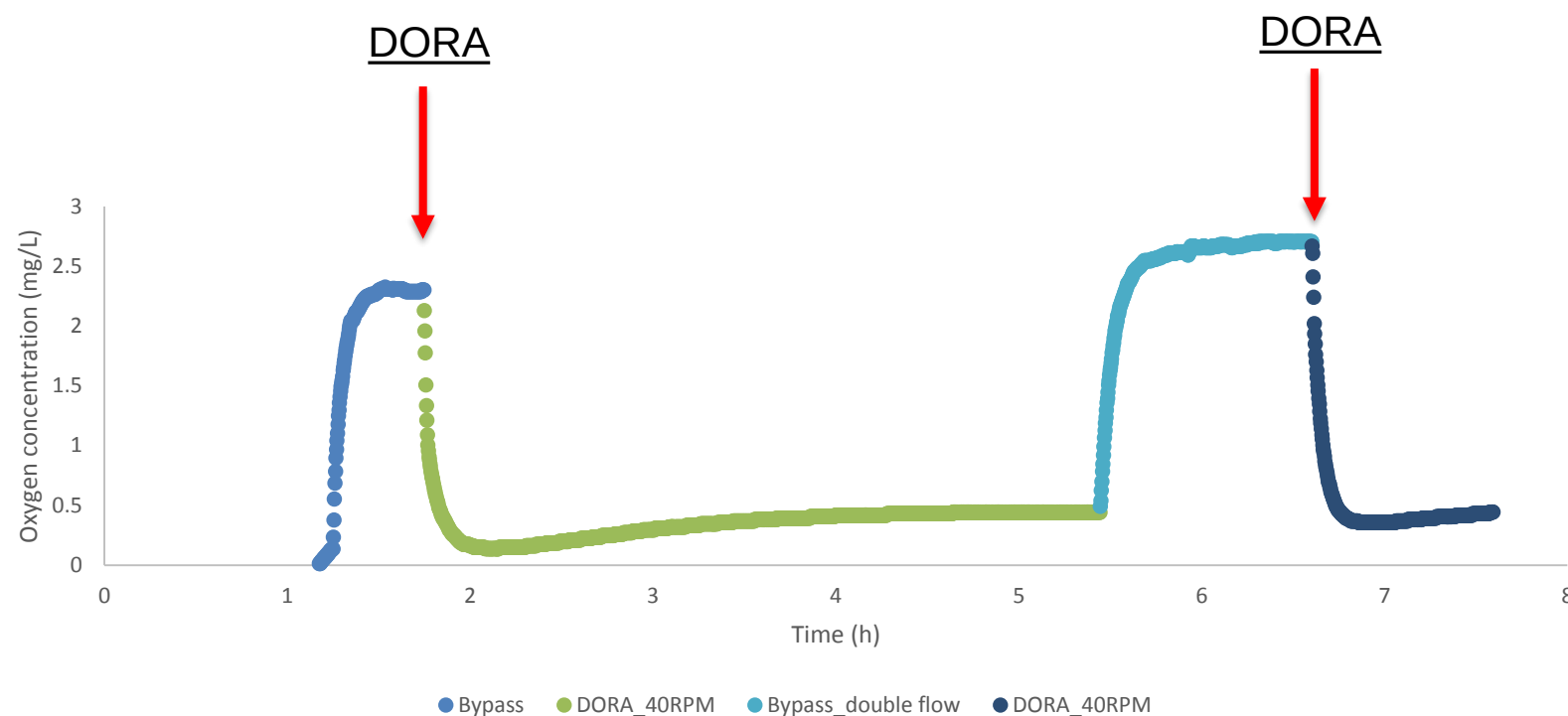
Observation:

O₂ removal observed
Low flows can be used

Removal:

40RPM → 48,7%

OXYGEN REMOVAL BY SCAVENGER



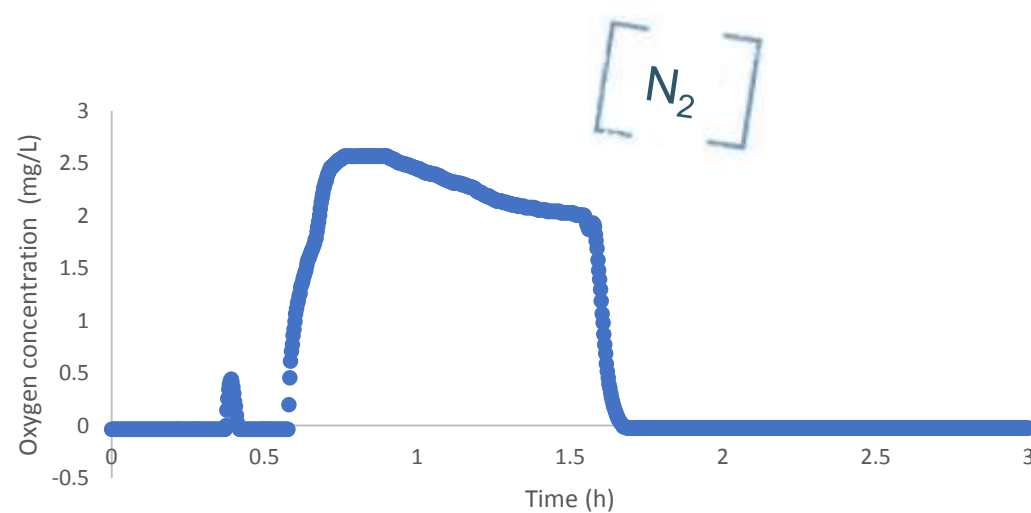
Observation:
O₂ removal observed

Removal:
First case → 78,7%
Second case → 83,5%

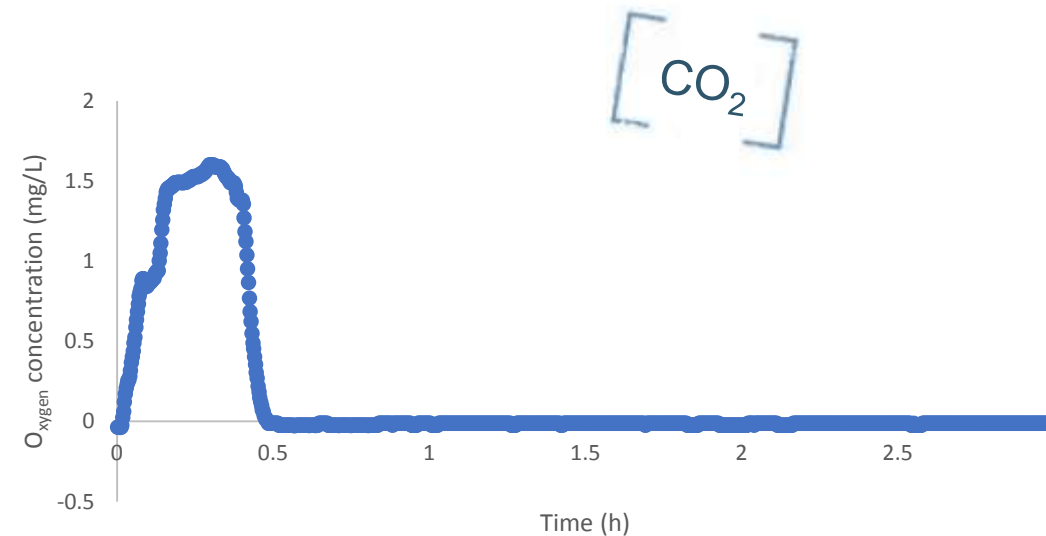


) MICROPLANT OPERATION – SWEEPING GAS

OXYGEN REMOVAL BY NITROGEN



● 314 <Conc oxygen> (MGL)



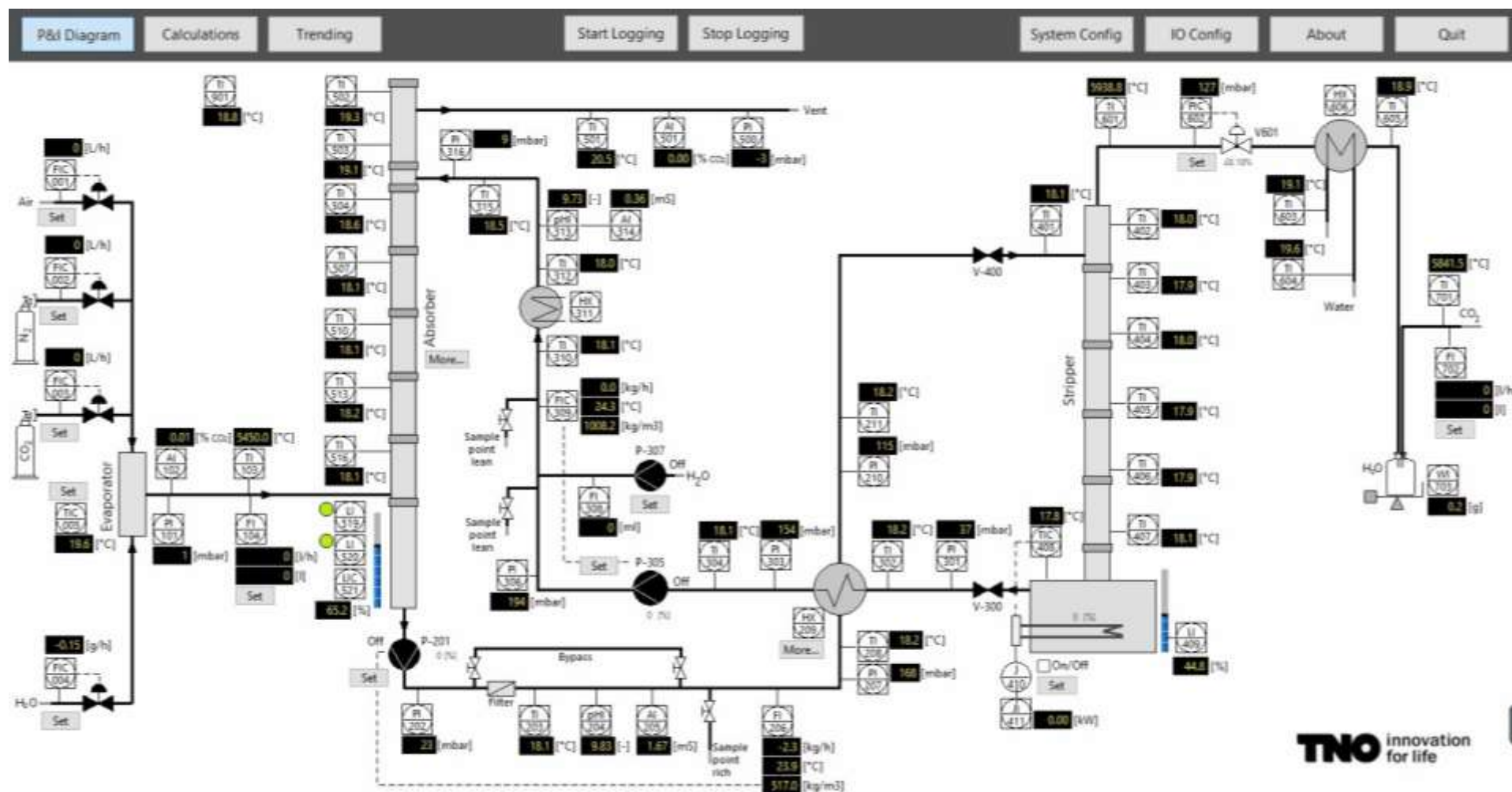
● 314 <Conc oxygen> (MGL)

➤ **100% Removal in both cases!**

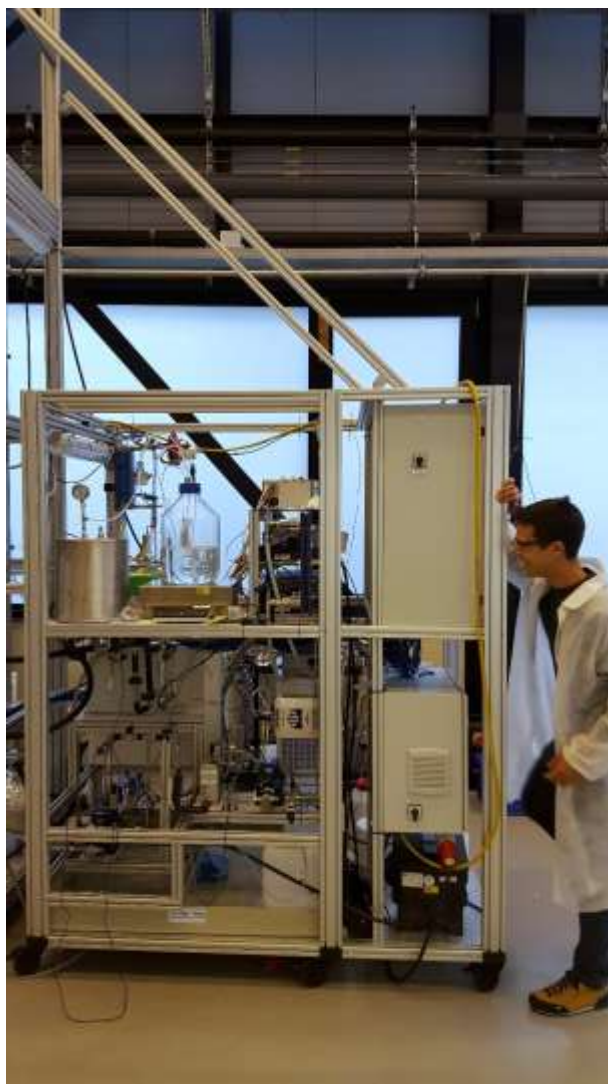


) MINIPLANT OPERATION

MINIPLANT



MINIPLANT



ACCELERATED SOLVENT DEGRADATION

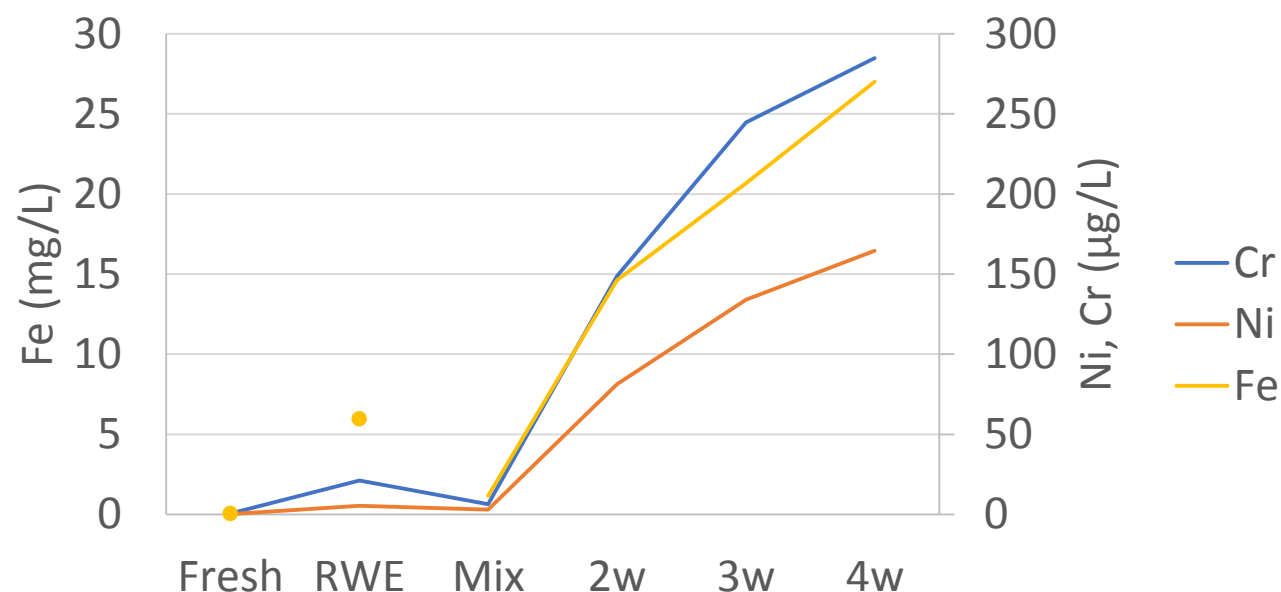


ACCELERATED SOLVENT DEGRADATION



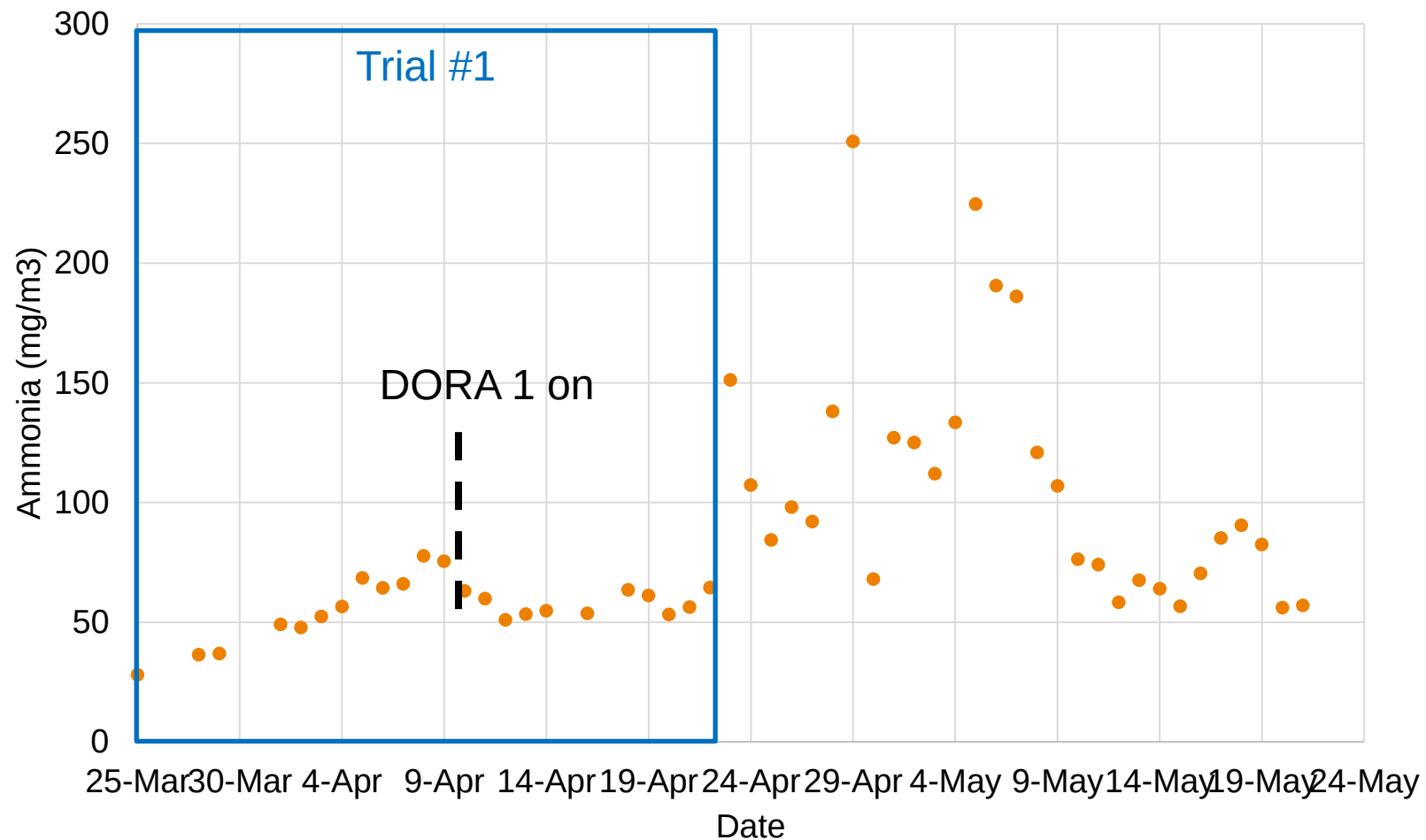
ANALYSIS OF METALS

Sample	Fe (mg/L)
MEA outside	0,47
RWE	60
Lean 01/02	11
Rich 01/02	146
Rich 13/02	207
Rich 20/02	270

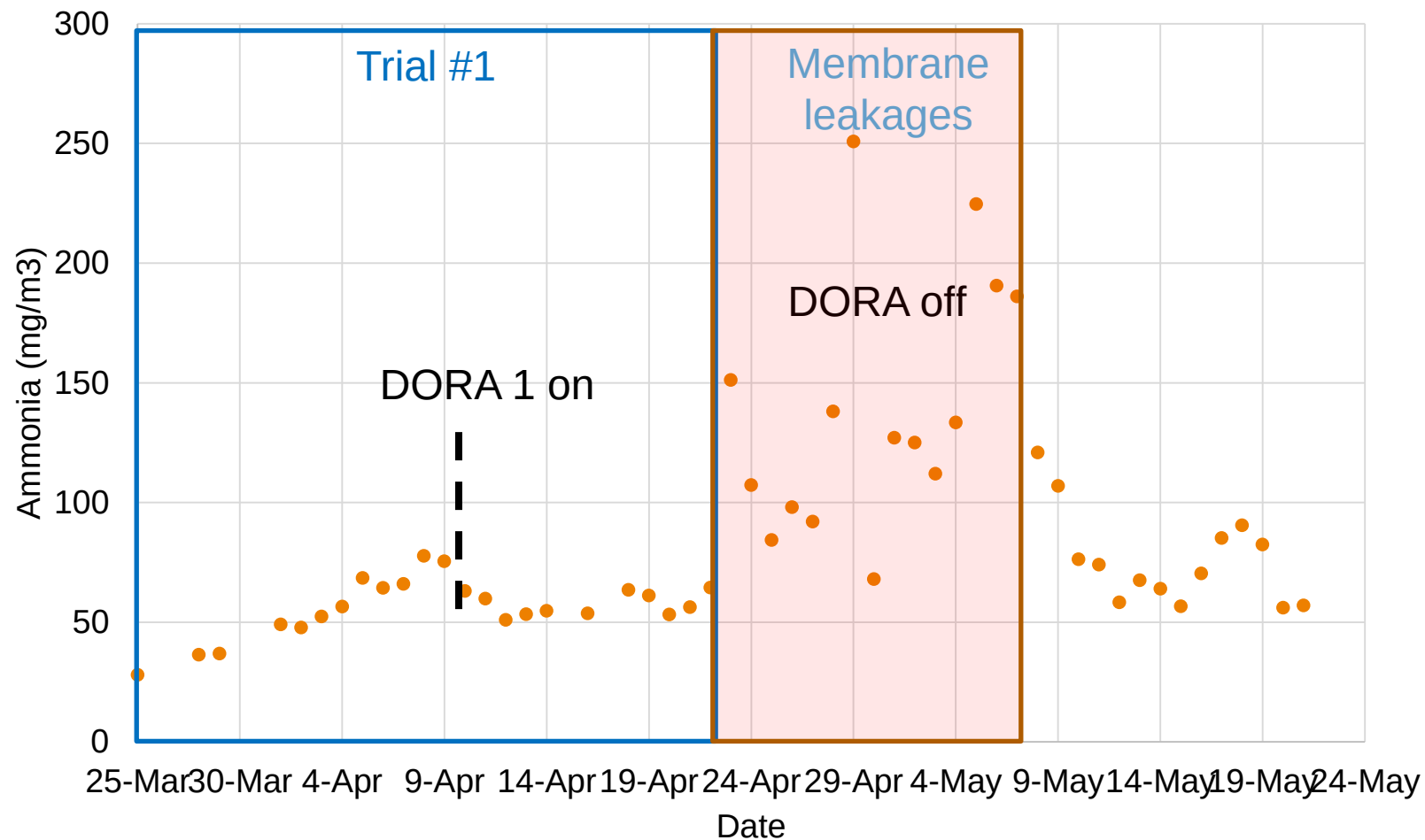


FRESH SOLVENT

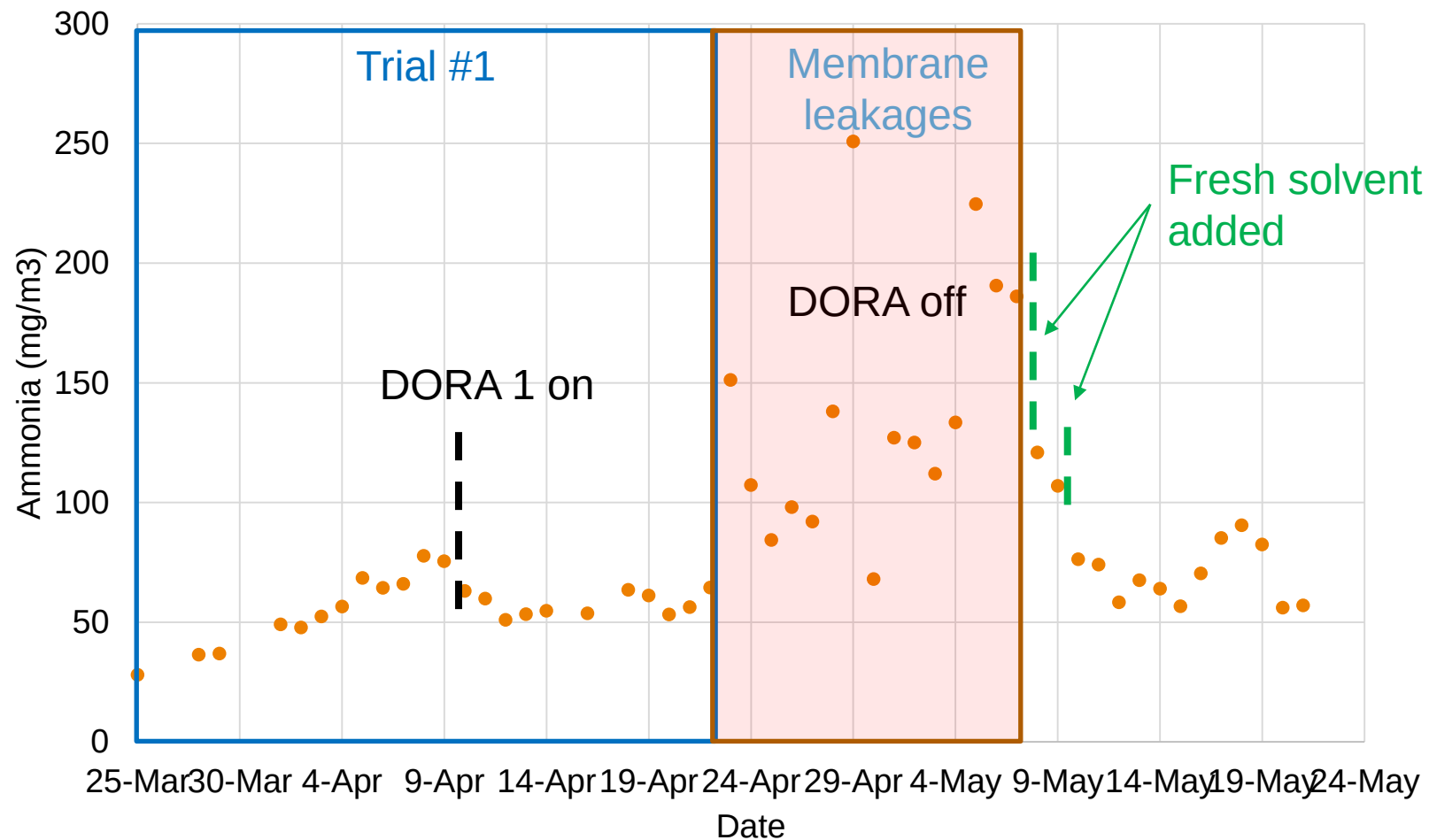
DORA CAMPAIGN



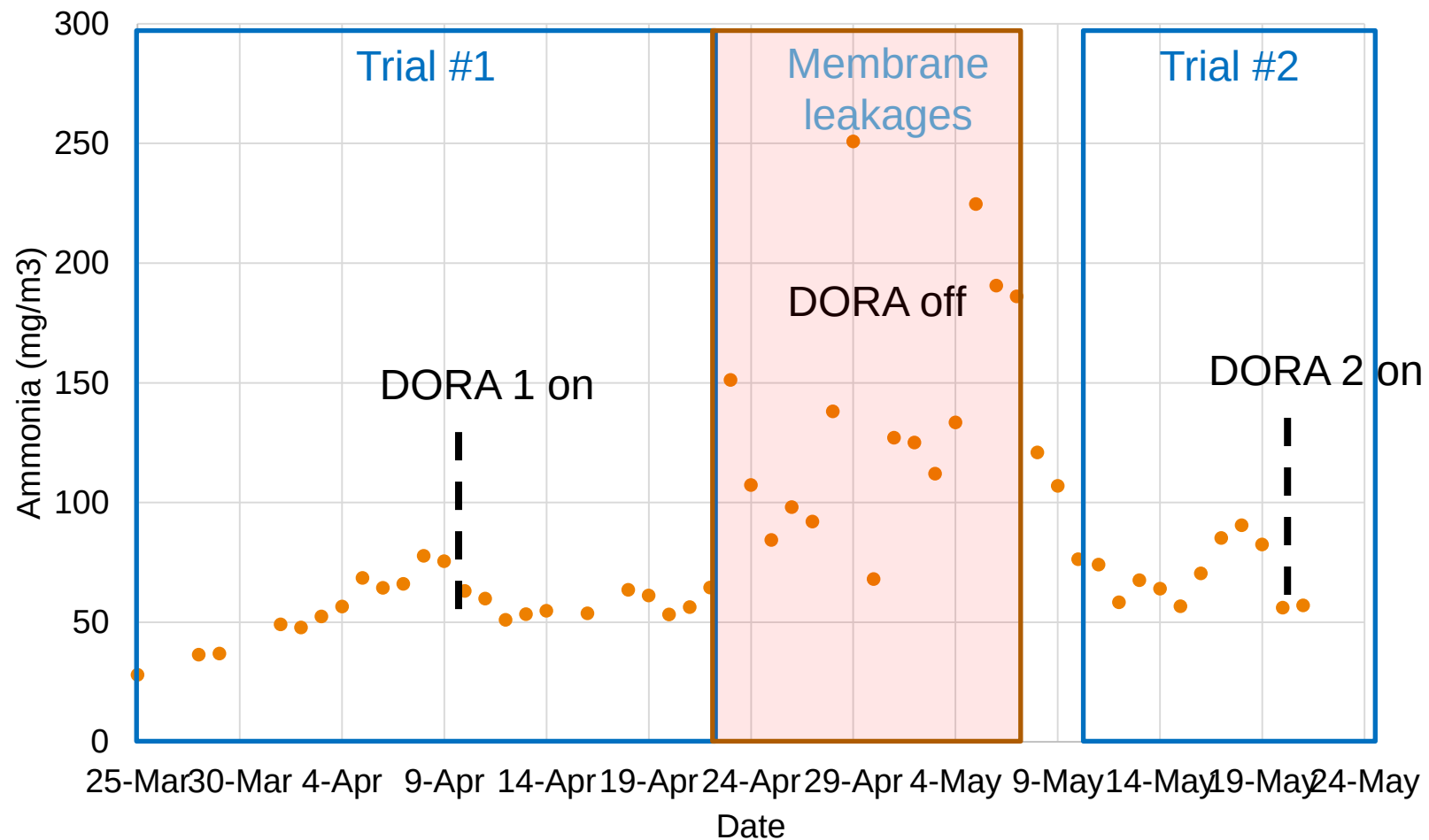
DORA CAMPAIGN



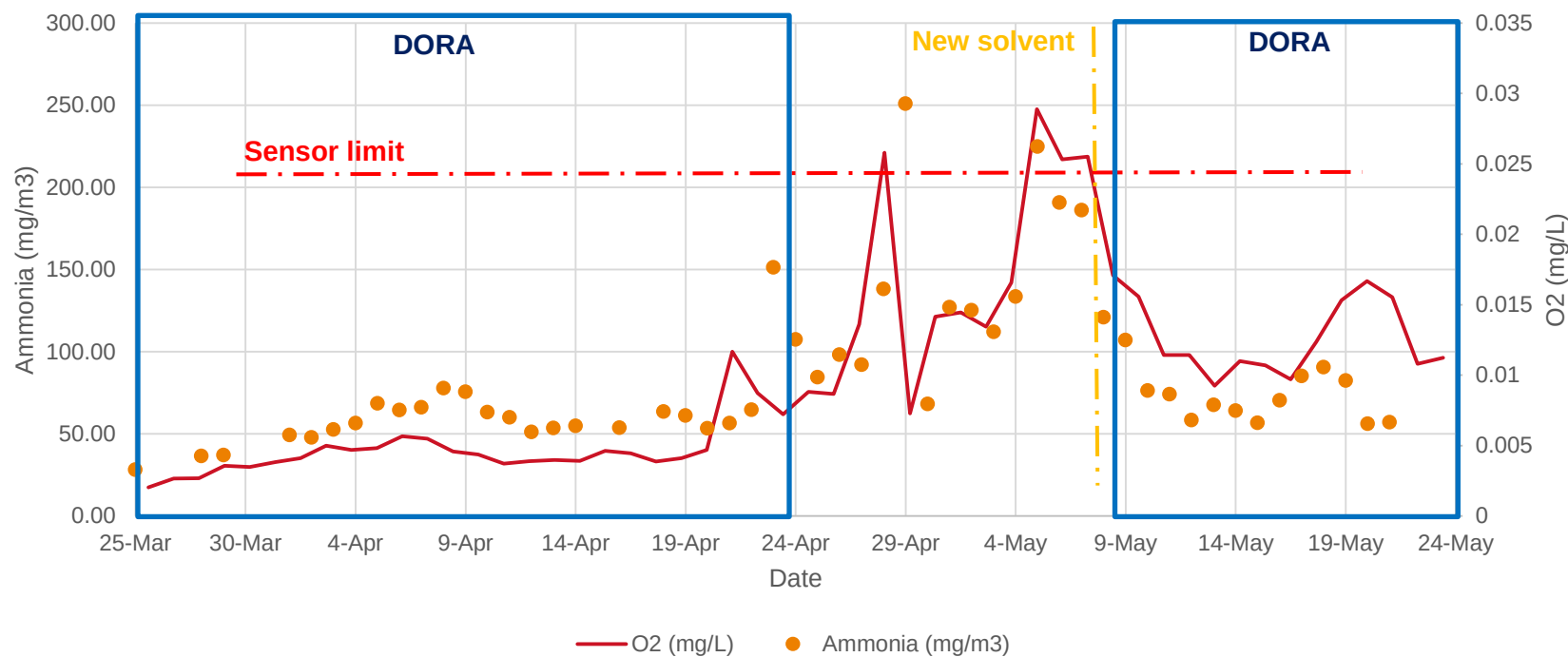
DORA CAMPAIGN



DORA CAMPAIGN

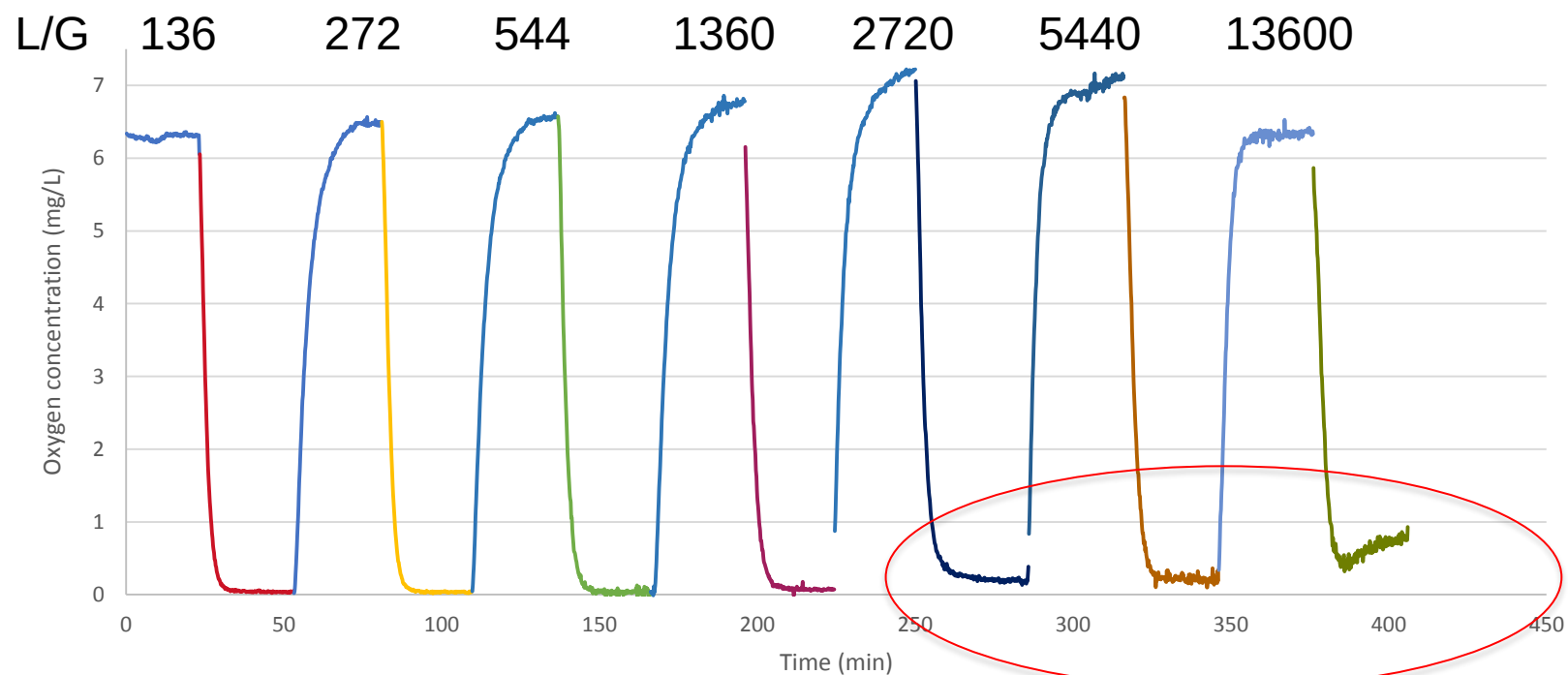


ABSORBER EXHAUST LINE



Assuming: $\text{MEA} + \text{O}_2 \rightarrow \text{NH}_3 + (\text{other degradation products})$

SENSITIVITY ANALYSIS

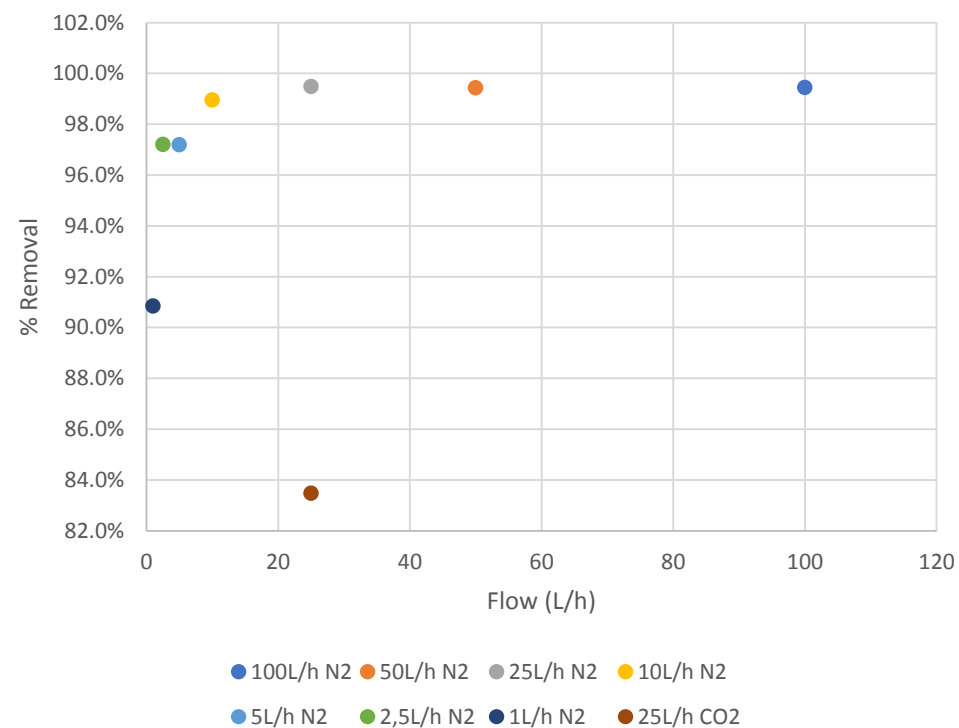


Oxygen levels did not reach 0

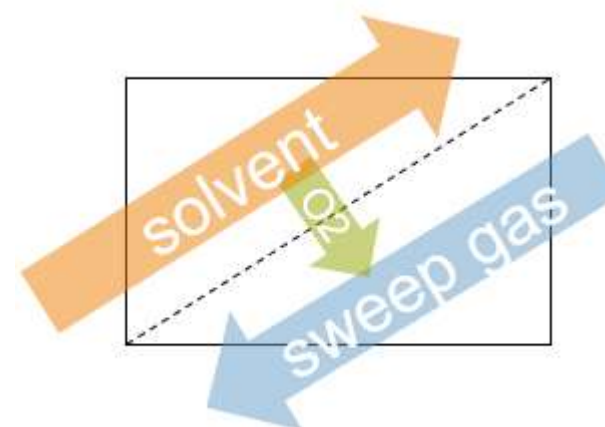


- Nitrogen used as sweeping gas

SENSITIVITY ANALYSIS



Almost 100% removal with
100 – 25L/h Nitrogen



NEXT STEPS

Miniplant to Plant 1

- TRL 6
- Campaign without DORA
- Campaign with DORA

New membranes

- Tests in the lab
- Tests at Plant 1 (depending on lab results)

ACKNOWLEDGEMENTS

› ACT ALIGN CCUS Project No 271501

This project has received funding from RVO (NL), FZJ/PtJ(DE), Gassnova(NO), UEFISCDI (RO), BEIS (UK) and is cofunded by the European Commission under the Horizon 2020 programme ACT, Grant Agreement No 691712

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› This publication has been produced with support from the NCCS Centre, performed under the Norwegian research program Centres for Environment-friendly Energy Research (FME). The authors acknowledge the following partners for their contributions: Aker Solutions, ANSALDO Energia, CoorsTek Membrane Sciences, Equinor, Gassco, KROHNE, Larvik Shipping, Norcem, Norwegian Oil and Gas, Quad Geometrics, Shell, TOTAL, and the Research Council of Norway (257579/E20).

A dynamic splash of blue water with numerous bubbles, set against a white background. The water is captured in mid-motion, creating a sense of energy and freshness.

THANK YOU!

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