

Simulation, Optimization and Control of Submerged Membrane Bioreactors(MBR) using Advanced Approaches

Context

- MBR is a mature technology for wastewater treatment due to **smaller foot print, superior and constant quality of effluent** compared to activated sludge process (ASP).
- MBR is still struggling with limitations of mass transfer and loss of permeability due to fouling and results in **higher maintenance and operational costs**.
- MBR functions under different conditions compared to ASP (longer Sludge Retention Time, higher solid concentration...) and needs different information (Transmembrane Pressure...), it requires **different approaches for modelling**.
- Knowledge-based models integrating biological and filtration behaviour already validated on pilots (Zarragoitia-Gonzalez et al. 2008), have not been tested on **large MBR plants (>100,000m³/day)**
- Adaptation of an integrated model to a large MBR plant and development of related control strategies would help to optimize the operational cost of the plant.

Aims

- To collect and validate the data from a large MBR plant
- To develop of an **integrated model**, capable to simulate the behaviour for this sMBR plant;
- To adapt **advanced control suitable** for the MBR processes to save **energy and chemicals**.

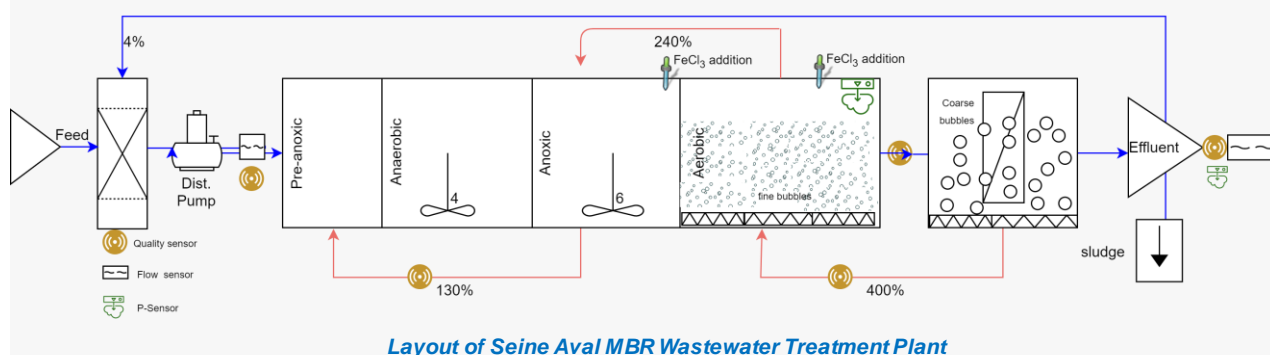


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Fouling

Large Membrane Bioreator

Knowledge-based Modelling

Optimisation & Control

Aeration

Materials and methods

- Large MBR Plant: ~300,000 m³/day, 460,00m² Zeeweed D-500D ZENON (PVDF 0.4µm) membrane surface
- ✓ Data collection, cleaning and analysis through basic and advanced checks using R-studio and Origin Pro software
- ✓ Dedicated experimental campaign for the missing data sets
- ✓ Development of simulator, calibration and validation of the model with the Seine Aval plant data
- ✓ Improvement of the model to adapt to missing phenomena
- ✓ Optimization of functioning conditions
- ✓ Development of advanced process control system

References

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