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Fouling Monitoring and Control in Membrane Bioreactor

Introduction

Fouling is still a major issue in membrane filtration technologies that critically declines the filtration performance in the long term. There are many ways to control fouling, but their effectiveness depends on fouling characteristics. Therefore, monitoring systems are developed and coupled with appropriate fouling control for a better fouling management.

Objective

- Investigate fouling characteristics under different operating conditions.
- Analyse the significance and dependency of fouling parameters identified by fluid dynamic gauge in representing various characteristics of biofilm.
- Setup and demonstrate the reliability of fluid dynamic gauge as an online monitoring system.

Methodology

Biofilm Thickness

Obtaining thickness data through tracking change in vertical position of the gauge at constant clearance between fouling surface and gauge head.

Cohesive and Adhesive Strength

Utilising destructive testing which allow removal of each biofilm layer by fluid shear stress to discern strength of each layer.

Results

- Correlation of pressure difference (dP) between station 1 and 4 and clearance (h) from biofilm surface.
- Removal is indicated by sudden drop of dP value due to increase of h from remaining biofilm layer.
- Obtaining dP value at each pressure drop to compute fluid shear stress that determine strength of each biofilm layer.
- Establishing the relationship of identified fouling parameters under different time frame.
- Evaluating data accuracy by comparing the results with confocal microscopy.

Conclusion

Fluid dynamic gauge (FDG) is unique for its ability to measure biofilm’s strength and thickness. The understanding of these fouling parameters will allow further study in developing biofouling control and management. Currently, this project progresses in investigating the impact of operating conditions on fouling characteristics.

Reference

Fluid Dynamic Gauging, Training materials – Pressure mode, Will Lewis, Visit to Singapore – August 2015