

# Electrical Impedance Spectroscopy (EIS) for Fouling Detection in Reverse Osmosis (RO) Process

Dr. HO Jia Shin E-mail: [jiashin.ho@ntu.edu.sg](mailto:jiashin.ho@ntu.edu.sg)

## 'Canary Cell' for Fouling Monitoring

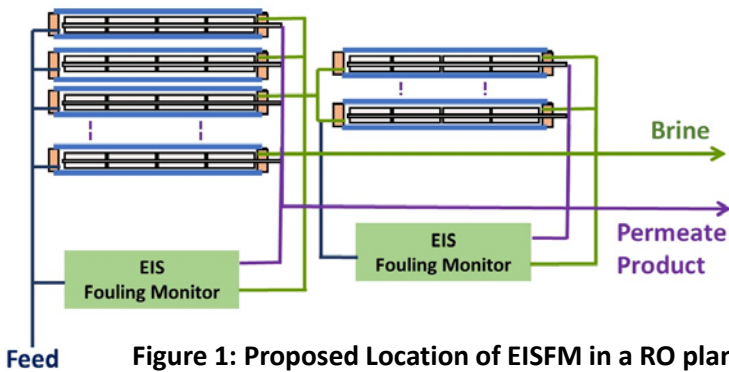


Figure 1: Proposed Location of EISFM in a RO plant

- EIS fouling monitor (EISFM) is installed on side streams of RO spiral wound modules (SWMs).
- Mimicking the hydrodynamic of SWMs to give the same fouling state
- Detect onset of incipient fouling in RO *in-situ* and in real time

## Fouling Detection using EIS

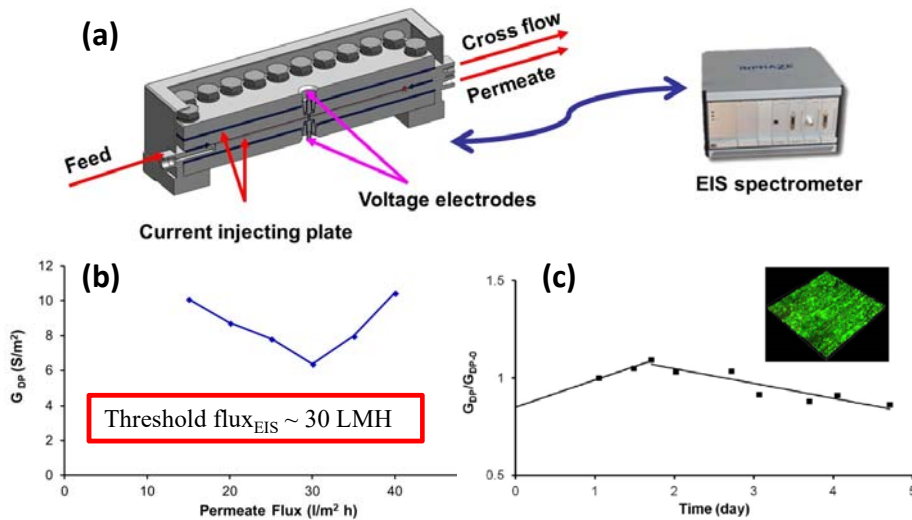


Figure 2: (a) Canary cell fitted with electrodes and EIS; (b) Determination of threshold flux and (c) Biofouling detection using EIS, Patent: WO2016/171628A1.

- Provides indication on the transition from (1) polarization layer to cake formation; (2) bacteria deposition to mature biofilm formation.

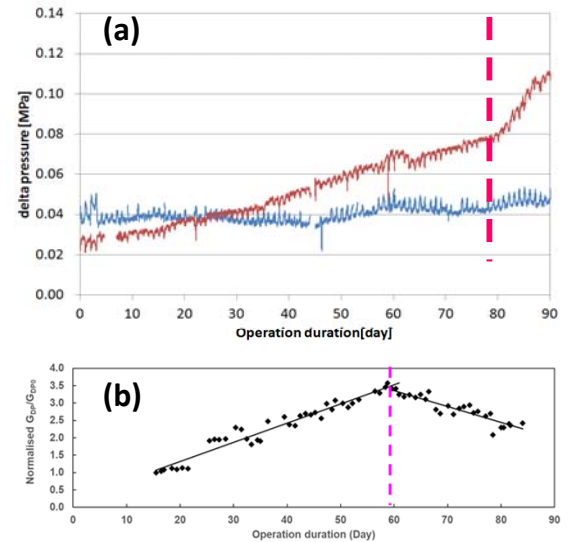


Fig. 3: (a) Channel pressure drop,  $\Delta P$ , for RO trains; (b) Normalized  $G_{DP}$  obtained from EISFM

- EISFM pre-empts the  $\Delta P$  increase of the SWRO system.

Team Members: Chong Tzyy Haur, Sim Lee Nuang, Hans Coster, A.G. Fane

This project was supported by the Singapore National Research Foundation (NRF) under its Environment and Water Research Program and administered by PUB. The collaborations with Kurita R&D Asia and CMS Innovations are greatly acknowledged.