

Supplementary Materials: Pretreatment Techniques for Produced Water with Subsequent Forward Osmosis Remediation

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Supplemental Information

Equation S1 for Standardized Fouling Index (SFI):

$$\text{Standardized fouling index(\%)} = \left(1 - \left(\frac{\text{baseline flux after washing}}{\text{initail baseline flux}} \right) \right) \times 100$$

Table S1. Analytical parameters measured for the 100 mL of treated PW.

Component	TOC (mg/L)	pH	Turbidity (NTU)
Centrifuge	16.9 ± 0.4	7.00	24 ± 2
Activated Carbon	1.6 ± 0.4	7.28	17.4 ± 0.4
Filtration	17.1 ± 0.6	7.46	85 ± 7
FeCl ₃	10.4 ± 0.2	1.68	530 ± 70
UltraPAC 261	16.3 ± 0.4	5.19	67 ± 17
UltraPAC 2346	15.4 ± 0.5	6.79	56 ± 4
UltraPAC 1145	14.9 ± 0.2	3.95	74 ± 3
UltraPAC 560 CV	25 ± 1	7.06	40± 10
UltraPAC 261 & UltraPAC560CV	18.5 ± 0.7	7.11	24.9 ± 0.6

Table S2. The reported flux and reverse solute flux (RSF) from the manufacturer with using FS of DI water and 3.5% NaCl DS. The initial baseline flux, the average flux during the first hour of the 7 h trial, as well as the % decrease over the trial. Finally, for comparison purposes the baseline after FO trials, and baseline after washing module for 1 hr with DI water is recorded along with the module performance and standard fouling index is also provided for FO trial using pretreated PW as the FS.

Component	Manufacture Reported		Baseline Flux (LMH)	Initial Flux Average over 1st h	% Flux Decrease over 7 h Trial	Baseline Flux after FO Trial (LMH)	Baseline Flux after Washing (LMH)	Module Performance After FO Trial	Standardized Fouling Index (SFI) *
	Flux	RSF							
Centrifuge	15.16	3.33	11.6	9.7	12%	13.3	11	115%	5%
Activated Carbon	14.44	2.20	12.0	11.9	14%	13.7	12.6	114%	-5%
Filtration	14.73	1.878	14.6	13.1	79%	-2.4	15.4	-16%	-5%
UltraPAC 2346	14.88	2.86	12.2	10.8	2%	2.2	9.2	18%	25%
UltraPAC 261 & UltraPAC 560CV	15.15	1.86	13.3	11.9	4%	1.2	9.2	9%	31%

* Negative SFI indicates an improvement in module performance.