

# Fouling Factor and Salt Passage Recommendations for Membrane Performance Projection

Aquaporin's projection tool, Cliir, is an online calculation tool that allows users to simulate the performance of the Aquaporin Inside® industrial RO elements in a system. It can be used to estimate not only the initial performance – when the membranes are newly installed – but also how the membranes may age over time.

As RO membranes are run in a system over a long period of time, their performance will decline due to a combination of factors that may vary throughout the years of operation. The quality of the feedwater, the system recovery rate, and the operating conditions may all affect the long-term performance of the membranes.

Cliir utilizes user-designated input values for Fouling Factor (FF) and Salt Passage (SP) to estimate the long-term performance of Aquaporin RO elements. The FF is a value used to simulate the decrease in permeate flow rate considering the effects of aging due to temperature, pressure, and operating time, while the SP is a value used to simulate the increased salt passage through the membrane due to the same reasons.

This document outlines the suggested FF and SP values to be used in Cliir for the purpose of estimating the long-term performance of the Aquaporin Inside® industrial RO elements. The guide covers a membrane age of 0 to 5 years, and the most common RO system feedwaters.

## Notes:

SDI – Salt Density Index

Calculations for seawater feed is still under development

Raw Water Source/Intake	NF / RO Permeate	Municipal (Tap Water)	Well Water	(Brackish) Surface Water		Wastewater	
Pretreatment	NF / RO	MF / UF / Conventional	MF / UF / Conventional	MF / UF	Conventional	MF/UF	Conventional
RO Feed SDI @ 15 min.	< 1	< 3	< 5	< 3	< 5	< 3	< 5
“Silt Density Index (SDI)” in cliir Projection Tool	1-5	1-3	1-5	1-3	4-5	1-3	4-5
Flux Decline per Year	5%	7%	7%	7%	10%	12%	15%
Salt Passage Increase per Year	5%	7%	7%	7%	10%	12%	15%

Year	Fouling Factor (FF)						
0	1,00	1,00	1,00	1,00	1,00	1,00	1,00
1	0,95	0,93	0,93	0,93	0,90	0,88	0,85
2	0,90	0,86	0,86	0,86	0,81	0,77	0,72
3	0,86	0,80	0,80	0,80	0,73	0,68	0,61
4	0,81	0,75	0,75	0,75	0,66	0,60	0,52
5	0,77	0,70	0,70	0,70	0,59	0,53	0,44

Year	Salt Passage Increase						
0	0%	0%	0%	0%	0%	0%	0%
1	5%	7%	7%	7%	10%	12%	15%
2	10%	14%	14%	14%	21%	25%	32%
3	16%	23%	23%	23%	33%	40%	52%
4	22%	31%	31%	31%	46%	57%	75%
5	28%	40%	40%	40%	61%	76%	101%

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