Concentrate Recirculation

Project name			
Calculated by		Permeate flow/train	4.00 m3/h
HP Pump flow	8.23 m3/h	Raw water flow/train	5.33 m3/h
Feed pressure	15.3 bar	Permeate recovery	48.60 %
Feed temperature	12.0 °C(53.6°F)	Total system recovery	75.00 %
Concentrate recirculation	2.90 m3/h	Element age	2.0 years
Feed water pH	8.30	Flux decline %, per year	5.0
Chem dose, mg/l, 100 %	55.1 NaOH	Fouling factor	0.90
Specific energy	1.09 kwh/m3	SP increase, per year	7.0 %
Pass NDP	14.1 bar	Inter-stage pipe loss	0.207 bar
Average flux rate	26.9 lmh		
		Feed type	Brackish Well Non-Fouling

Pass - Stage	Perm. Flow m3/h	Flow / Vessel Feed m3/h	Flow / Vessel Conc m3/h	Flux lmh	DP bar	Flux Max lmh	Beta	Stagewise Pressure Perm. bar	Boost bar	Conc bar	Perm. TDS mg/l	Element Type	Element Quantity	PV# x Elem #
1-1	2.1	8.2	6.2	27.7	0.3	27.8	1.15	0	0	15	4.2	CPA7-LD	2	1 x 2M
1-2	1.9	6.2	4.2	26.1	0.2	26.5	1.2	0	0	14.7	6.8	CPA7-LD	2	1 x 2M

Ion (mg/l)	Raw Water	Feed Water	Permeate Water	Concentrate 1	Concentrate 2
Hardness, as CaCO3	0.23	0.48	0.000	0.6	0.9
Ca	0.06	0.12	0.000	0.2	0.2
Mg	0.02	0.04	0.000	0.1	0.1
Na	122.50	316.47	1.522	421.3	614.4
K	0.00	0.00	0.000	0.0	0.0
NH4	0.10	0.17	0.001	0.2	0.3
Ba	0.000	0.000	0.000	0.0	0.0
Sr	0.000	0.000	0.000	0.0	0.0
H	0.00	0.00	0.000	0.0	0.0
CO3	0.04	17.28	0.000	20.0	44.9
HCO3	165.00	502.37	3.222	663.5	958.3
SO4	98.00	201.78	0.150	268.8	392.5
Cl	12.00	24.65	0.073	32.8	47.9
F	0.00	0.00	0.000	0.0	0.0
NO3	16.00	32.43	0.499	43.1	62.6
PO4	0.00	0.00	0.000	0.0	0.0
OH	0.00	0.02	0.000	0.0	0.0
SiO2	0.00	0.00	0.000	0.0	0.0
B	0.00	0.00	0.000	0.0	0.0
CO2	61.18	2.28	2.28	2.28	2.28
NH3	0.00	0.01	0.01	0.01	0.01
TDS	**413.72**	**1095.32**	**5.47**	**1450.12**	**2121.23**
pH	**6.70**	**8.60**	**6.45**	**8.71**	**8.86**

Saturations	**Raw Water**	**Feed Water**	**Concentrate**	**Limits**
CaSO4 / ksp * 100, %	0	0	0	400
SrSO4 / ksp * 100, %	0	0	0	1200
BaSO4 / ksp * 100, %	0	0	0	10000
SiO2 saturation, %	0	0	0	140
CaF2 / ksp * 100, %	0	0	0	50000
Ca3(PO4)2 saturation index	0.0	0.0	0.0	2.4
CCPP, mg/l	-90.88	26.75	81.95	850
Langelier saturation index	-4.20	-1.54	-0.74	2.8
Ionic strength	0.01	0.02	0.03	
Osmotic pressure, bar	0.2	0.6	1.2	

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Pass NDP	14.1 bar	Inter-stage pipe loss	0.207 bar
Average flux rate	26.9 lmh		

Feed type: Brackish Well Non-Fouling

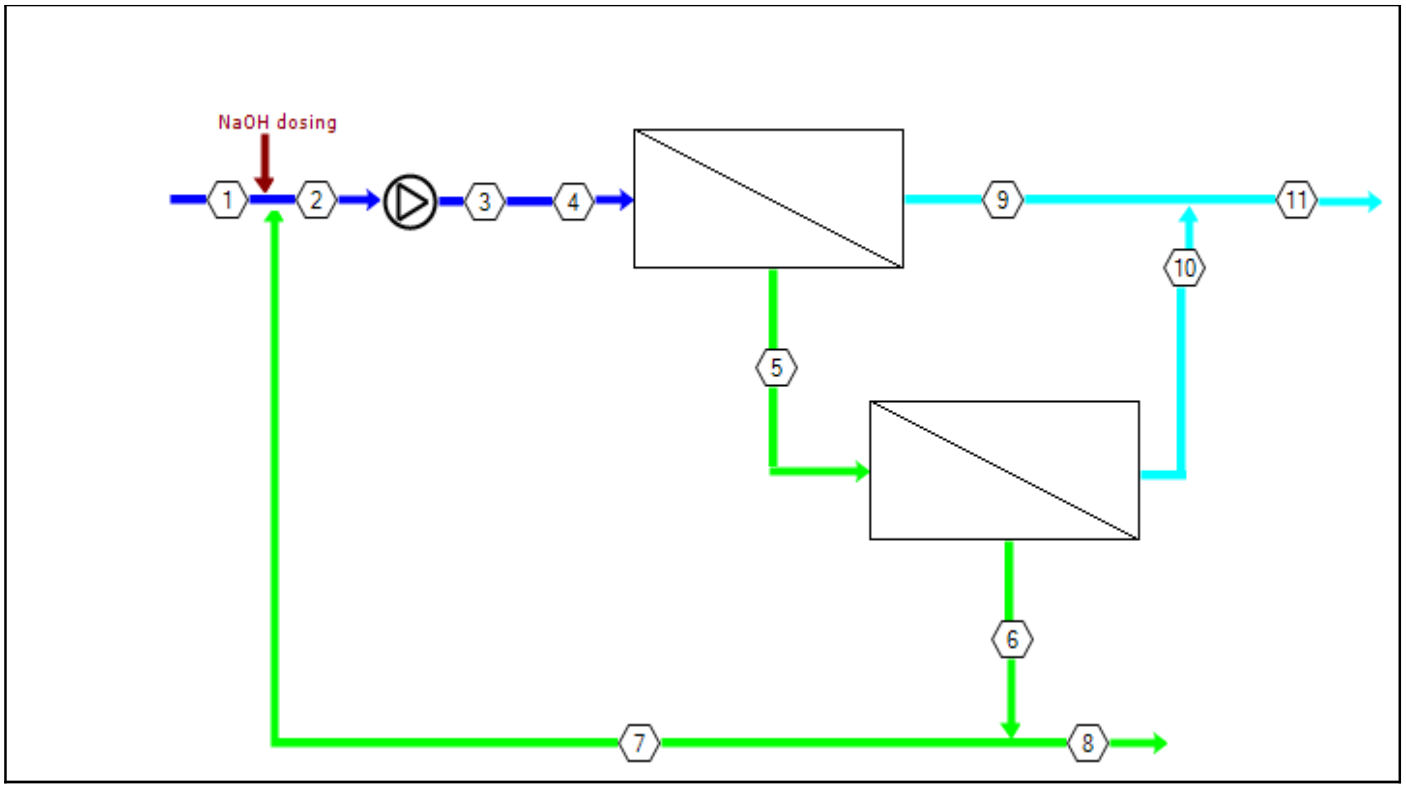
Pass - Stage	Perm. Flow m3/h	Flow / Vessel Feed m3/h	Flow / Vessel Conc m3/h	Flux lmh	DP bar	Flux Max lmh	Beta	Stagewise Pressure Perm. bar	Stagewise Pressure Boost bar	Stagewise Pressure Conc bar	Perm. TDS mg/l	Element Type	Element Quantity	PV# x Elem #
1-1	2.1	8.2	6.2	27.7	0.3	27.8	1.15	0	0	15	4.2	CPA7-LD	2	1 x 2M
1-2	1.9	6.2	4.2	26.1	0.2	26.5	1.2	0	0	14.7	6.8	CPA7-LD	2	1 x 2M

Pass - Stage	Element no.	Feed Pressure bar	Pressure Drop bar	Conc Osmo. bar	NDP bar	Permeate Water Flow m3/h	Permeate Water Flux lmh	Beta	Permeate (Stagewise cumulative) TDS	Ca	Mg	Na	Cl
1-1	1	15.3	0.14	0.7	14.6	1	27.8	1.13	3.7	0	0	1.041	0.05
1-1	2	15.2	0.12	0.8	14.3	1	27.3	1.15	4.2	0	0	1.158	0.056
1-2	1	14.8	0.09	1	13.9	1	26.5	1.17	5.9	0	0	1.643	0.079
1-2	2	14.7	0.07	1.2	13.6	1	26	1.2	6.8	0	0	1.904	0.092

Concentrate Recirculation

Temperature : 12.0 °C

Element age, P1 : 2.0 years



Stream No.	Flow (m3/h)	Pressure (bar)	TDS (mg/l)	pH	Econd (µs/cm)
1	5.33	0	414	6.70	596
2	8.23	0	1095	8.60	1521
3	8.23	15.3	1095	8.60	1521
4	8.23	15.3	1095	8.60	1521
5	6.18	15.0	1450	8.71	1943
6	4.23	14.7	2121	8.86	2734
7	2.90	0	2121	8.86	2734
8	1.33	0	2121	8.86	2734
9	2.05	0	4.16	6.33	5.30
10	1.95	0	6.84	6.55	8.50
11	4.00	0	5.47	6.45	6.80