

Permeate Throttling (Variable), Concentrate Recirculation

Project name		Cray Barn		Page : 1/3	
Calculated by	Stefan Massingham	Permeate flow/train	0.40	m3/h	
HP Pump flow	3.07 m3/h	Raw water flow/train	0.57	m3/h	
Feed pressure	5.5 bar	Permeate recovery	13.03	%	
Feed temperature	25.0 °C(77.0°F)	Total system recovery	70.00	%	
Concentrate recirculation	2.50 m3/h	Element age	0.0	years	
Feed water pH	8.40	Flux decline %, per year	5.0		
Chem dose, mg/l, -	H2SO4	Fouling factor	1.00		
Specific energy	1.47 kwh/m3	SP increase, per year	7.0	%	
Pass NDP	2.3 bar				
Average flux rate	17.9 lmh				

Feed type

Brackish Well Non-Fouling

Pass - Stage	Perm. Flow m3/h	Flow / Vessel		Flux lmh	DP bar	Flux Max lmh	Beta	Stagewise Pressure			Perm. TDS mg/l	Element Type	Element Quantity	PV# x Elem #
		Feed m3/h	Conc m3/h					Perm. bar	Boost bar	Conc bar				
1-1	0.4	1	0.9	18	0.1	18	1.13	1	0	5.4	120.1	ESPA4-LD-4040	3	3 x 1M

Ion (mg/l)	Raw Water	Feed Water	Permeate Water	Concentrate 1
Hardness, as CaCO3	0.00	0.00	0.000	0.0
Ca	0.00	0.00	0.000	0.0
Mg	0.00	0.00	0.000	0.0
Na	380.00	1018.82	46.386	1164.5
K	0.00	0.00	0.000	0.0
NH4	0.70	1.08	0.079	1.2
Ba	0.000	0.000	0.000	0.0
Sr	0.000	0.000	0.000	0.0
H	0.00	0.00	0.000	0.0
CO3	0.00	0.02	0.000	0.0
HCO3	0.10	0.26	0.012	0.3
SO4	2.00	5.78	0.026	6.6
Cl	585.45	1571.37	71.619	1796.1
F	0.00	0.00	0.000	0.0
NO3	0.00	0.00	0.000	0.0
PO4	0.00	0.00	0.000	0.0
OH	0.04	0.10	0.005	0.1
SiO2	6.70	18.69	0.444	21.4
B	1.58	1.58	1.581	1.6
CO2	0.00	0.00	0.00	0.00
NH3	0.10	0.36	0.36	0.36
TDS	976.53	2617.59	120.15	2991.78
pH	8.40	8.78	7.50	8.83

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, %	4	10	11	140
CaF2 / ksp * 100, %	0	0	0	50000
Ca3(PO4)2 saturation index	0.0	0.0	0.0	2.4
CCPP, mg/l	0.00	0.00	0.00	850
Langelier saturation index	0.00	0.00	0.00	2.8
Ionic strength	0.02	0.04	0.05	
Osmotic pressure, bar	0.8	2.1	2.3	

Product performance calculations are based on nominal element performance when operated on a feed water of acceptable quality. The results shown on the printouts produced by this program are estimates of product performance. No guarantee of product or system performance is expressed or implied unless provided in a separate warranty statement signed by an authorized Hydranautics representative. Calculations for chemical consumption are provided for convenience and are based on various assumptions concerning water quality and composition. As the actual amount of chemical needed for pH adjustment is feedwater dependent and not membrane dependent, Hydranautics does not warrant chemical consumption. If a product or system warranty is required, please contact your Hydranautics representative. Non-standard or extended warranties may result in different pricing than previously quoted. Version : 2.231.90 %

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Chem dose, mg/l, -	H2SO4		Fouling factor	1.00
Specific energy	1.47 kwh/m3		SP increase, per year	7.0 %
Pass NDP	2.3 bar			
Average flux rate	17.9 l/mh			

Pass - Stage	Perm. Flow m3/h	Flow / Vessel		Flux lmh	DP bar	Flux Max lmh	Beta	Feed type			Perm. TDS mg/l	Brackish Well Non-Fouling		
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1-1	0.4	1	0.9	18	0.1	18	1.13	1	0	5.4	120.1	ESPA4-LD-4040	3	3 x 1M
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	TDS	Permeate (Stagewise cumulative)				
										Ca	Mg	Na	Cl	
1-1	1	5.5	0.08	2.3	2.3	0.1	18	1.13	120.1	0	0	46.361	71.58	

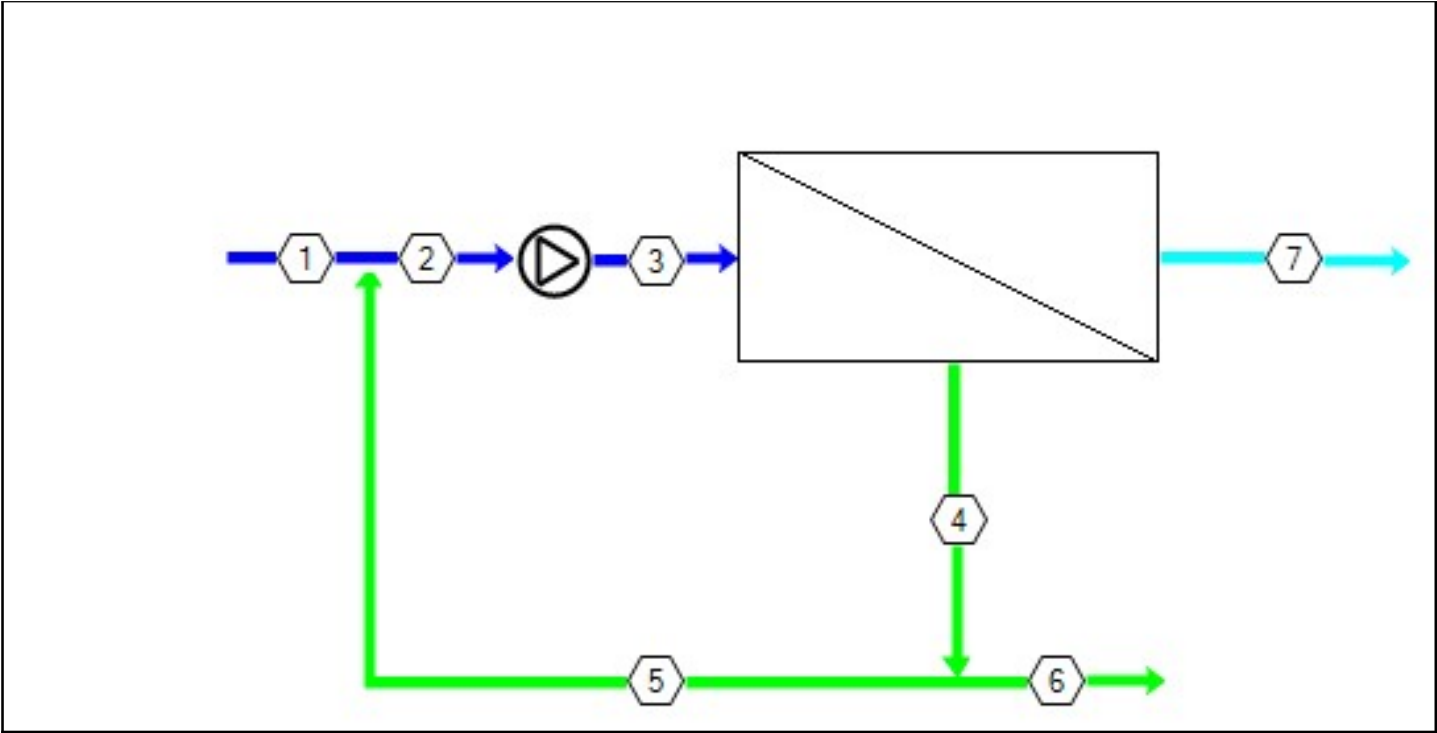
Permeate Throttling (Variable), Concentrate Recirculation

Project name
Temperature :

Cray Barn
25.0 °C

Element age, P1 :

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0.0 years



Stream No.	Flow (m3/h)	Pressure (bar)	TDS (mg/l)	pH	Econd (µs/cm)
1	0.570	0	977	8.40	2010
2	3.07	0	2618	8.78	4842
3	3.07	5.47	2618	8.78	4842
4	2.67	5.40	2992	8.83	5465
5	2.50	0	2992	8.83	5465
6	0.170	0	2992	8.83	5465
7	0.400	1.00	120	7.50	257

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