DOW Water and Process Solutions

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CALCULATION OF A DEMINERALISATION PLANT
WITH ROHM AND HAAS ION EXCHANGE RESINS

Client	SCI	Date of project	24 aug 2012
Project name	SCI case 1 no degas SACSBA	Date of printout	30 aug 2012 13:13:25
Project code [ID]	SCI_case_1_SACSBA [383]	IXCalc user	M. Slagt

1. GENERAL REMARKS

1.9.1

Strong acid & strong base resin data relate to resins in Na & Cl form respectively.

2. ORIGIN AND PRE-TREATMENT OF THE WATER

Origin   river
Pre-treatment   UF

3. WATER ANALYSIS [meq/L]

Ca :	0,700	Cl :	1,100	)			
Mg + Fe :	0,300	SO_4 :	0,200	) EMA :	1,300		
Na :	1,000	NO_3 :	0,000	)			
K :	0,000	HCO_3 :	0,700	CO_2 :	0,715	(after cation exchanger)	
NH_4 :	0,000			SiO_2 :	0,2500		

Total Cations	2,000	Total Anions	2,000		2,265	(after cation exchanger)
		Free CO_2 :	0,015			

Temperature 5 °C   Approximate pH   8,3 @ 25°C
Organics   20 mg/L as $KMnO_4$ Approx. conductivity 216 µS/cm @ 25°C

4. OPERATION DATA

Flow rate per line	400,0 m^3/h net	306,8 m^3/h gross	($\times$ 2)

Flow rate per line   300,0 m^3/h net   306,8 m^3/h gross   ($\times$ 2)
Running time   13,0 hours   3 900 m^3 net run
Regenerants   32 % HCl   50 % NaOH

5. LAYOUT OF THE PLANT (Without Degasifier)
[3] SAC - SBA
Amberjet 1000 H - Amberlite IRA458RF Cl

6. CALCULATION OF THE EXCHANGERS

	Amberjet 1000 H	Amberlite IRA458RF Cl
Resin choice		
Resin volume [litres]	7950	18700
Reference ionic form for calculation	Na	Cl
Volume to purchase [L]	**8750**	
Running time [h]	13,0	13,0
Gross throughput [m^3]	3988	3988
Ionic load [eq]	7976	9033
Organic load [g/L R as KMnO$_4$]		4
Operating capacity [eq/l R]	1,00	0,48
Flow-rate [BV/h]	38,6	16,4
Regenerant mode	Amberpack	Amberpack
Leakage (overrun) [%]		
Regenerant type	HCl	NaOH (5°C)
Concentration [%]	5,0	3,2
Regenerant ratio [% theory]	150	207
Regenerant Level [g/L R]	55	40
Total regen. [kg 100%]	437	748
Consumption [g/m^3 treated water]	112,1	191,8
Excess of regenerant [eq]	4004	9667
Dilution water [m^3]	7,4	21,9
Regen. displacement [m^3]	11,9	46,7
Fast rinse [m^3] (Total recycle rinse)	0,0	0,0
Backwash water [m^3]	0,0	0,0
Total waste water [m^3]	90,1	
TDS of waste [meq/L]	296	
Safety factors	*0,95*	*0,95*
Leakage	**< 0,8 µS/cm**	**< 0,04 mg/L SiO$_2$**

Sizing and pressure drop

	Amberjet 1000 H	Amberlite IRA458RF Cl
External diameter [mm]	2900	3500
Filter area [m^2]	6,49	9,48
Linear velocity [m/h]	47	32
Bed depth shrunk form [mm]	1225	1973
Bed depth swollen form [mm]	1318	2227
Bed depth end of run [mm]	1259	2086
Pressure drop [kPa]	102	96