

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	cambridge case 1 no degas weak strong	Date of printout	30 aug 2012 12:59:48
Project code [ID]	SCI_WS_WS_nodegas [380]	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
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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 KMnO₄ Approx. conductivity 216 µS/cm @ 25°C

4. OPERATION DATA

Flow rate per line	300,0 m ³ /h net	307,7 m ³ /h gross	(× 2)
Running time	13,0 hours	3 900 m ³ net run	
Regenerants	32 % HCl	50 % NaOH	

5. LAYOUT OF THE PLANT (Without Degasifier)

[6] WAC - SAC - WBA - SBA

Amberlite IRC86RF - Amberjet 1000 H - Amberlite IRA67RF - Amberlite IRA458RF Cl

6. CALCULATION OF THE EXCHANGERS

Resin choice	Amberlite IRC86RF	Amberjet 1000 H	Amberlite IRA67RF	Amberlite IRA458RF CI
Resin volume [litres]	7750	7685	7550	7700
Reference ionic form for calculation	H	Na	Free base	Cl
Volume to purchase [L]		8450		
Running time [h]	13,0	13,0	13,0	13,0
Gross throughput [m ³]	4001	4001	4001	4001
Ionic load [eq]	2716	5285	7820	1242
Organic load [g/L R as KMnO ₄]			11	4
Operating capacity [eq/l R]	0,35	0,69	1,04	0,16
Flow-rate [BV/h]	39,7	40,0	40,8	40,0
Regenerant mode	Amberpack	Amberpack	Amberpack	Amberpack
Leakage (overrun) [%]	3		3	
Regenerant type		HCl		NaOH (5°C)
Concentration [%]		5,0		3,2
Regenerant ratio [% theory]	110	157	151	1048
Regenerant Level [g/L R]		39		68
Total regen. [kg 100%]		302		521
Consumption [g/m ³ treated water]		77,4		133,5
Excess of regenerant [eq]		272		3954
Dilution water [m ³]		5,1		15,2
Regen. displacement [m ³]		23,2		57,2
Fast rinse [m ³]	0,0	0,0	0,0	0,0
(Total recycle rinse)				
Backwash water [m ³]	0,0	0,0	0,0	0,0
Total waste water [m ³]	102,2			
TDS of waste [meq/L]	206			
<i>Safety factors</i>	<i>0,85</i>	<i>0,72</i>	<i>0,92</i>	<i>0,37</i>
Leakage		< 0,8 µS/cm		< 0,09 mg/L SiO₂
Sizing and pressure drop				
External diameter [mm]	2900	2900	2900	2900
Filter area [m ²]	6,49	6,49	6,49	6,49
Linear velocity [m/h]	47	47	47	47
Bed depth shrunk form [mm]	1195	1185	1164	1187
Bed depth swollen form [mm]	1220	1265	1273	1318
Bed depth end of run [mm]	1220	1226	1273	1289
Pressure drop [kPa]	112	99	89	92

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