

# DOW Water and Process Solutions

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<http://www.amberlite.com>

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

<b>Client</b>	SCI	<b>Date of project</b>	24 aug 2012
<b>Project name</b>	cambridge case 1 with degas	<b>Date of printout</b>	30 aug 2012 13:08:21
<b>Project code</b> [ID]	SCI_case_1_SACSBAdg [382]	<b>IXCalc user</b>	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 <sub>4</sub> :	0,200	)	EMA : 1,300
Na :	1,000	NO <sub>3</sub> :	0,000	)	
K :	0,000	HCO <sub>3</sub> :	0,700		CO <sub>2</sub> : 0,250 (after degasser)
NH <sub>4</sub> :	0,000				SiO <sub>2</sub> : 0,2500
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Total Cations	2,000	Total Anions	2,000		1,800 (after degasser)
		Free CO <sub>2</sub> :	0,015		

Temperature 5 °C                      Approximate pH      8,3 @ 25°C  
Organics      20 mg/L as KMnO<sub>4</sub>      Approx. conductivity 216 µS/cm @ 25°C

### 4. OPERATION DATA

Flow rate per line	300,0 m <sup>3</sup> /h net	306,1 m <sup>3</sup> /h gross	(× 2)
Running time	13,0 hours	3 900 m <sup>3</sup> net run	
Regenerants	32 % HCl	50 % NaOH	

### 5. LAYOUT OF THE PLANT (With Degasifier)

[3] SAC - (DEG) - SBA  
Amberjet 1000 H - Degasifier - Amberlite IRA458RF Cl

## 6. CALCULATION OF THE EXCHANGERS

Resin choice	<b>Amberjet 1000 H</b>	<b>Amberlite IRA458RF Cl</b>
Resin volume [litres]	7950	15900
Reference ionic form for calculation	Na	Cl
Volume to purchase [L]	<b>8750</b>	
Running time [h]	13,0	13,0
Gross throughput [m <sup>3</sup> ]	3980	3980
Ionic load [eq]	7959	7163
Organic load [g/L R as KMnO <sub>4</sub> ]		5
Operating capacity [eq/l R]	1,00	0,45
Flow-rate [BV/h]	38,5	19,3
Regenerant mode	Amberpack	Amberpack
Leakage (overrun) [%]		
Regenerant type	HCl	NaOH (5°C)
Concentration [%]	5,0	2,9
Regenerant ratio [% theory]	151	222
Regenerant Level [g/L R]	55	40
Total regen. [kg 100%]	437	636
Consumption [g/m <sup>3</sup> treated water]	112,1	163,1
Excess of regenerant [eq]	4020	8737
Dilution water [m <sup>3</sup> ]	7,4	20,7
Regen. displacement [m <sup>3</sup> ]	11,9	39,7
Fast rinse [m <sup>3</sup> ]	0,0	0,0
(Total recycle rinse)		
Backwash water [m <sup>3</sup> ]	0,0	0,0
Total waste water [m <sup>3</sup> ]	81,7	
TDS of waste [meq/L]	292	
<i>Safety factors</i>	<i>0,95</i>	<i>0,95</i>
<b>Leakage</b>	<b>&lt; 0,8 µS/cm</b>	<b>&lt; 0,05 mg/L SiO<sub>2</sub></b>
<b>Sizing and pressure drop</b>		
External diameter [mm]	2900	3300
Filter area [m <sup>2</sup> ]	6,49	8,42
Linear velocity [m/h]	47	36
Bed depth shrunk form [mm]	1225	1889
Bed depth swollen form [mm]	1318	2114
Bed depth end of run [mm]	1259	1988
Pressure drop [kPa]	102	106

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