ION EXCHANGE RESINS

DUOLITE A 161

ENGINEERING DATA SHEET
CO-CURRENT REGENERATION

Auchtel

Duolite A 161 is a type 1 Macroporous strong base Anion Exchange Resin. The data provides information to calculate the silica leakage and operating capacity of Duolite A 161 used with Co-Current regeneration. The properties of Duolite A 161 are described in the Product Data Sheet.

SILICA LEAKAGE

The average silica leakage is obtained by multiplying the basic leakage value from Table 1 by the correction factors A,B and C from Tables 2 to 4

$$Leak = Leak_0 \times A \times B \times C$$

TABLE 1 : Basic Silica Leakage versus NaOH regenerant level

NaOH g / L	Leakage ppm SiO_2 ($Leak_0$)
50	0.079
60	0.064
70	0.051
80	0.037
100	0.028
120	0.021
150	0.016

TABLE 2 : Leakage Correction Factor A versus Silica to Total Anions Ratio.

SiO_2 %	Factor A
1	0.1
5	0.5
10	1.0
25	2.5
50	5.0
75	7.5
90	9.0

TABLE 3 : Leakage Correction Factor B versus water Temperature

Water ^{0}C	Factor B
5	0.7
10	0.8
15	1.0
25	1.5
35	2.3
45	3.3

TABLE 4 : Leakage Correction Factor C versus Regenerant Temperature

NaOH ^{0}C	Factor C
10	1.65
15	1.37
25	1.00
35	0.76
45	0.58
50	0.50

TABLE 5 : Suggested Operating Conditions

Maximum operating temperature.	60^0C (OH^-), 100^0C (Cl^-)
Minimum bed depth	700 mm
Service flow rate	5 to 40 BV */ h
Maximum linear velocity	50 m / h
Regenerant	NaOH
Level	50 to 150 g/L
Flow rate	2 to 8 BV/ h (minimum contact time : 30 minutes)
Concentration	3 % to 5 %
Slow rinse	Minimum 2 BV at regeneration flow rate
Fast rinse	Same as service flow rate.
Influent Limitations	
Free chlorine	Nil
Turbidity	< 2 NTU
Iron & heavy metal	< 0.1 PPM

* 1 BV (Bed Volume) = 1 m^3 solution per m^3 resin

OPERATING CAPACITY

The operating capacity of Duolite A 161 is obtained by multiplying the basic capacity value from Table 6 by the correction factors **D** to **G** from Tables 7 to 10.

$$Cap = Cap_0 \times D \times E \times F \times G$$

TABLE 6 : Basic capacity versus NaOH regenerant level (co-current regeneraion)

NaOH g / L	Capacity eq / L (Cap_0)
50	0.52
60	0.55
70	0.59
80	0.63
100	0.68
120	0.72
150	074

TABLE 7 : Capacity Correction Factor D versus Sulphate to Total Anions Ratio.

SO_4 %	Factor D
0	0.92
25	0.96
50	1.00
75	1.04
99	1.08

TABLE 8 : Capacity Correction Factor E versus CO_2 to Total Anions Ratio.

CO_2 %	Factor E
0	0.97
20	1.00
30	1.02
50	1.05
75	1.08
99	1.12

TABLE 9 : Capacity Correction Factor F versus Silica to Total Anions Ratio and NaOH Temperature

% SiO_2	Factor F	
	35^0 C	50^0 C
5	1.02	1.05
25	0.96	1.00
50	0.87	0.98
75	0.81	0.91
90	0.79	0.90

TABLE 10 : Capacity Correction Factor G versus Silica Endpoint (D SiO_2 = difference between average leakage and endpoint)

D SiO_2 (ppb)	Factor G
50	0.90
100	0.95
200	1.00
300	1.04

SAFE HANDLING INFORMATION

A material Safety Data Sheet, Material handling & storage sheet are available for Duolite products. To obtain a copy contact Auchtel representative

CAUTION

Acid and basic regenerant solutions are corrosive and should be handled in a manner that will prevent eye and skin contact. Nitric acid and other strong oxidizing agents can cause explosive type reactions when mixed with Ion Exchange Resins. Proper design of process equipment to prevent rapid buildup of pressure is necessary if use of an oxidizing agent such as nitric acid is contemplated. Before using strong oxidizing agents in contact with Ion Exchange Resins, consult sources knowledgeable in the handling of these materials.

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SEPARATION TECHNOLOGIES

ION EXCHANGE RESINS

DUOLITE A 161

ENGINEERING DATA SHEET
COUNTER-CURRENT REGENERATION

Auchtel

Duolite A 161 is a type 1 Macroporous strong base Anion Exchange Resin. These data provides information to calculate the silica leakage and operating capacity of Duolite A 161 used with counter Current regeneration.

The properties of Duolite A 161 are described in the Product Data Sheet.

SILICA LEAKAGE

The average silica leakage is obtained by multiplying the basic leakage value from Table 1 by the correction factors A,B and C from Tables 2 to 4

$$Leak = Leak_0 \times A \times B \times C$$

TABLE 1 : Basic Silica Leakage versus NaOH regenerant level

NaOH g / L	Leakage ppm SiO_2 ($Leak_0$)
30	0.018
40	0.012
50	0.010
60	0.008
80	0.005
100	0.003
120	0.002

TABLE 2 : Leakage Correction Factor A versus Silica to Total Anions Ratio.

SiO_2%	Factor A
1	0.2
5	0.5
10	1.0
25	2.5
50	5.0
75	10.0
90	14.0

TABLE 3 : Leakage Correction Factor B versus water Temperature

Water ^{0}C	Factor B
5	0.7
10	0.8
15	1.0
25	1.5
35	2.3
45	3.3

TABLE 4 : Leakage Correction Factor C versus Regenerant Temperature

NaOH ^{0}C	Factor C
10	1.65
15	1.37
25	1.00
35	0.76
45	0.58
50	0.50

TABLE 5 : Suggested Operating Conditions

Maximum operating temperature.	60^0C (OH^-), 100^0C (Cl^-)
Minimum bed depth	1000 mm
Service flow rate	5 to 40 BV */ h
Maximum linear velocity	50 m /h
Regenerant	NaOH
Level	30 to 120 g/L
Flow rate	2 to 8 BV/ h (minimum contact time : 30 minutes)
Concentration	3 % to 5 %
Slow rinse	Minimum 2 BV at regeneration flow rate
Fast rinse	Same as service flow rate.
<u>Influent Limitations</u>	
Free chlorine	Nil
Turbidity	< 1 NTU
Iron & heavy metal	< 0.1 PPM

* 1 BV (Bed Volume) = 1 m^3 solution per m^3 resin

OPERATING CAPACITY

The operating capacity of Duolite A 161 is obtained by multiplying the basic capacity value from Table 6 by the correction factors **D** to **G** from Tables 7 to 10.

$$Cap = Cap_0 \times D \times E \times F \times G$$

TABLE 6 : Basic capacity versus NaOH regenerant level (counter -current regeneraion)

NaOH g / L	Capacity eq / L (Cap_0)
30	0.49
40	0.56
50	0.60
60	0.63
70	0.66
80	0.68
100	0.71
120	0.73

TABLE 7 : Capacity Correction Factor D versus Sulphate to Total Anions Ratio.

SO_4 %	Factor D
0	0.92
25	0.96
50	1.00
75	1.04
99	1.08

TABLE 8 : Capacity Correction Factor E versus Carbon Dioxide to Total Anions Ratio.

CO_2 %	Factor E
0	0.97
20	1.00
30	1.02
50	1.05
75	1.08
99	1.12

TABLE 9 : Capacity Correction Factor F vrsus Silica to Total Anions and NaOH temperature at 35°C

Silica / Total Anion %Ratio	Factor F
5	0.99
25	0.96
50	0.90
75	0.88
90	0.82

TABLE 10 : Capacity Correction Factor G versus Silica Endpoint (ΔSiO_2 = difference between average leak age and endpoint)

SiO_2 (ppb)	Factor G
50	0.90
100	0.95
200	1.00
300	1.04

SAFE HANDLING INFORMATION

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CAUTION

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