SEPARATION TECHNOLOGIES

ION EXCHANGE RESINS

DUOLITE A 101 D

ENGINEERING DATA SHEET
CO-CURRENT REGENERATION

Auchtel

Duolite A 101 D is a type 1 strong base Anion Exchange Resin. These data provide information to calculate the silica leakage and operating capacity of Duolite A 101 D used with Co-current regeneration. The properties of Duolite A 101 D 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 & C from Tables 2 to 4. For Silica to Total Anion ratio above 75% refer Table No. 11 Silica leakage will increase approximately by 15% for every 1 ppm Sodium leakage from preceding Cation Unit

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

TABLE 1 : Basic Silica Leakage versus NaOH regenerant level

NaOH g / L	Leakage ppm SiO_2 ($Leak_0$)
40	0.095
50	0.079
60	0.064
80	0.037
100	0.028
120	0.021
150	0.016
200	0.014

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

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* / hr
Maximum linear velocity	30 m / hr
Regenerant	NaOH
Level	40 to 200 g/L
Flow rate	2 to 10 BV/ hr (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.

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

Influent Limitations

Free chlorine - Nil

OPERATING CAPACITY

The operating capacity of Duolite A 101 D 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 regeneration)

NaOH g / L	Capacity eq / L (Cap_0)
40	0.56
50	0.59
60	0.62
80	0.70
100	0.76
120	0.80
150	0.83
200	0.85

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

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

%SiO_2	Factor F		
	25^0 c	35^0 c	50^0c
5	1.0	1.02	1.05
25	0.92	0.96	1.00
50	0.84	0.87	0.98
75	0.76	0.81	0.91

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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ION EXCHANGE RESINS

DUOLITE A 101 D

ENGINEERING DATA SHEET
CO - CURRENT REGENERATION

Auchtel

TABLE NO. 11
(Thorough fare regeneration system)

TABLE 11 : Operating exchange capacity realised verses NaOH regenerant level.

NaOH , gms / litre	basic Capacity eq / litre	Leakage ppm as SiO_2
80	0.70	0.45
120	0.80	0.40
150	0.83	0.35
200	0.85	0.30

Correction factor of Table No. 7 to Table No. 10 are not applicable for above data.

Please note that above data is based on following considerations

- Sodium leakage as nil from preceding cation unit. The silica leakage will increase approximately by 15% for every 1 ppm sodium leakage
- The above basic capacity given against respectively regeneration level is to be corrected by multiplying with the factor of 0.85 for every 0.1 ppm lower silica leakage.
- The above SiO_2 leakage figures are mentioned based on WBA - Duolite A 368 and SBA - Duolite A 101 D operated in thoroughfare regeneration system.
- NaOH regeneration level considered on 100% basis
- Silica to total Anion ratio is more than 75%

DUOLITE A 101 D

ENGINEERING DATA SHEET
CO - CURRENT REGENERATION

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SEPARATION TECHNOLOGIES

ION EXCHANGE RESINS

DUOLITE A 101 D

ENGINEERING DATA SHEET
COUNTER-CURRENT REGENERATION

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Duolite a 101 D is a type 1 strong base Anion Exchange Resin. These data provide information to calculate the silica leakage and operating capacity of Duolite A 101 D used with Counter-current regeneration.The general properties of Duolite A 101 D 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. For Silica to Total Anion ratio above 75% refer Table No. 11 Silica leakage will increase approximately by 15% for every 1 ppm Sodium leakage from preceding cation unit

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

TABLE 1 : Basic Silica Leakage versus NaOH regenerant level

NaOH g / L	Leakage ppm SiO_2 ($Leak_0$)
40	0.012
50	0.010
60	0.008
70	0.006
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

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^cC (Cl^-)
Minimum bed depth	1000 mm **
Service flow rate	5 to 40 BV* / hr
Maximum linear velocity	30 m / hr
Regenerant	NaOH
Level	40 to 160 g / L
Flow rate	2 to 10 BV/ hr (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.

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

** For selection of lower bed depth please contact Auchtel technical representative

Influent Limitations

Free chlorine - Nil

OPERATING CAPACITY

The operating capacity of Duolite A 101 D 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)
40	0.62
50	0.67
60	0.70
70	0.73
80	0.76
100	0.79
120	0.82

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		
	$20\ ^0c$	$25\ ^0c$	$35\ ^0c$
5	0.96	0.98	0.99
25	0.90	0.94	0.96
50	0.85	0.87	0.90
75	0.80	0.82	0.88

TABLE 10 : Capacity Correction Factor G versus Silica Endpoint (D SiO_2 = difference between average leakage 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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DUOLITE A 101D

ENGINEERING DATA SHEET
COUNTER CURRENT REGENERATION

Auchtel

TABLE NO. 11
(Thorough fare regeneration system)

TABLE 11 : Operating exchange capacity realised verses NaOH regenerant level.

NaOH , gms / litre	Basic Capacity eq / litre	Leakage ppm as SiO_2
80	0.76	0.35
100	0.79	0.30
120	0.82	0.25
140	0.85	0.20
160	0.87	0.20

Correction factor of Table No. 7 to Table No. 10 are not applicable for above data

Please note that above data is based on following considerations

- Sodium leakage as nil from preceding cation unit. The silica leakage will increase approximately by 15% for every 1 ppm sodium leakage
- The above basic capacity given against respectively regeneration level is to be corrected by multiplying with the factor of 0.85 for every 0.1 ppm lower silica leakage.
- The above SiO_2 leakage figures are mentioned based on WBA - Duolite A 368 and SBA - Duolite A 101 D operated in thoroughfare regeneration system.
- NaOH regeneration level considered on 100% basis
- Silica to total Anion ratio is more than 75%

DUOLITE A 101D

ENGINEERING DATA SHEET
COUNTER CURRENT REGENERATION

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