SEPARATION TECHNOLOGIES

ION EXCHANGE RESINS

DUOLITE A 113

ENGINEERING DATA SHEET
COUNTER CURRENT REGENERATION

Auchtel

Duolite A 113 is a type 1 strong base Anion Exchange Resin. These data provide information to calculate the silica leakage & operating capacity of Duolite A 113 used with Counter current Regeneration. The properties of Duolite A 113 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	Leakge ppm SiO_2 ($Leak_0$)
30	0.022
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

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^{0}C (OH^-) , 100^{0}C (Cl^-)
Minimum bed depth ________	1000 mm **
Service flow rate___________	5 to 40 BV* / hr
Maximum linear velocity____	60 m /hr
Regenerant ____	NaOH
Level__________	30 to 160 g /L
Flow rate ______	2 to 8 BV/ hr (min contact time 30 minutes)
Concentration______________	3% to 5%
Slow rinse	Min 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 consult your Auchtel technical representative

Influent Limitations

Free chlorine - Nil

OPERATING CAPACITY

The operating capacity of Duolite A 113 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 regeneration)

NaOH g / L	Capacity eq /L (Cap_0)
30	0.52
40	0.65
50	0.70
60	0.74
70	0.77
80	0.80
100	0.83
120	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
99	1.12

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

% SiO_2	Factor F		
	20 ^{0}c	25 ^{0}c	35 ^{0}c
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

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.

Auchtel ProductsLtd.,142 C,Victor House, N.M.Joshi Marg, Lower Parel(w),Mumbai-400 013

Tel. 91-22-493 3975, Fax. 91-22-493 9755, 497 4211 E-mail - auchtel@vsnl.com

ION EXCHANGE RESINS

DUOLITE A 113

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	0.82	0.25
100	0.83	0.25
120	0.85	0.25
140	0.87	0.20
160	0.89	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

- Temperature for regeneration is 20^0c to 25^0 c
- Sodium leakage as nil from preceding cation unit. The silica leak age 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 of lower silica leakage.
- The above SiO_2leakage figures are mentioned based on WBA - Duolite A 368 and SBA - Duolite A 113 operated in thoroughfare regeneration system.
- NaOH regeneration level considered on 100% basis
- Silica to total Anion ratio is more than 75%

DUOLITE A 113

ENGINEERING DATA SHEET
COUNTER CURRENT REGENERATION

14, Shriniwas Society,Ashish Banglow,
New Sharada Mandir Road,
Ahmedabad - 380 007
Ph.No.(079) 6620003,Tele fax -6640076.

Shantiniketan Building,
9th Floor, 8, Camac Street,
Calcutta - 700 017
Ph.No.(033) 2424517,2820183
E-mail - auchtel@cal2.vsnl.net.in

No. 3, Aarti Arcade,86,
86, Dr. Radhakrishnan Road,Mylapore,
Chennai - 600 004.
Ph.No.(044) 8278352.

Post Box No.12,3/ 64,
Vishnupuri,Nawab Gunj,
Kanpur - 208 002.
Ph.No.(0512) 561540,561012
E- mail - auchtel@lw.l.vsnl.net.in

K-48, connaught Circus,
New Delhi - 110 001.
Ph.No.(011) 3328208,3322116
E- mail - auchtel@del6.vsnl.net.in

Auchtel ProductsLtd.,142 C,Victor House, N.M.Joshi Marg, Lower Parel(w),Mumbai-400 013
Tel. 91-22-493 3975, Fax. 91-22-493 9755, 497 4211 E-mail - auchtel@vsnl.com

ION EXCHANGE RESINS

DUOLITE A 113

ENGINEERING DATA SHEET
(Co - current regeneration)

Auchtel

Duolite A 113 is a type 1 strong base Anion Exchange Resin. These data provide information to calculate the silica leakage and operating capacity of Duolite A 113 used with co-current regeneration. The properties of Duolite A 113 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 lieakage will increase approximately by 15% for every 1 ppm sodium leakage from peceding cation unit.

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

TABLE 1 : Basic Silica Leakage versus NaOH regenerant level.

NaOH g / L	Leakage ppm SiO_2 ($Leak_O$)
40	0.092
50	0.077
60	0.062
70	0.048
80	0.034
100	0.026
120	0.019
150	0.013

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

TABLE 3 : 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	60 m / hr
Regenerant	NaOH
Level	40 to 160 g / L
Flow rate	2 to 8 BV/ hr(min contact time 30 minutes)
Concentration	3% to 5% .
Slow rinse	Min 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

Regarding operating conditions of Duolite A 113 for condensate polishing unit consult Auchtel technical representative

Influent Limitations

Free chlorine - Nil

OPERATING CAPACITY

The operating capacity of Duolite A 113 is obtained by multiplying the basic capacity value from Table 6 by the correction factor D to G from Tables 7 to 10.

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

TABLE 6 : Basic Capacity versus NaOH regenerant level (Co- f low regeneration)

NaOH g/L	Capacity eq/L (Cap_O)
40	0.57
50	0.60
60	0.64
70	0.68
80	0.73
100	0.79
120	0.83
150	0.86

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		
	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 ($DSiO_2$ = difference between average leakage and endpoint)

$DSiO_2$ (ppb)	Factor G
50	0.90
100	0.95
200	1.00
300	1.04

SAFE USE INFORMATION

A Material Safety Data Sheet is available for each product. To obtain a copy contact your 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.

Auchtel ProductsLtd.,142 C,Victor House, N.M.Joshi Marg, Lower Parel(w),Mumbai-400 013

Tel. 91-22-493 3975, Fax. 91-22-493 9755, 497 4211 E-mail - auchtel@vsnl.com

ION EXCHANGE RESINS

DUOLITE A 113

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
90	0.76	0.40
110	0.81	0.35
130	0.84	0.30
150	0.86	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 basic capacity given against respective regeneration level is to be corrected by multiplying with the factor of 0.85 for every 0.1 ppm lower silica leakage.
- Temperature for regeneration is 20^0c to 25^0 c
- The above SiO_2leakage figures are mentioned based on WBA - Duolite A 368 and SBA - Duolite A 113 operated in thoroughfare regeneration system.
- NaOH regeneration level considered on 100% basis
- Silica to total Anion ratio is more than 75%

DUOLITE A 113

ENGINEERING DATA SHEET
CO - CURRENT REGENERATION

BRANCH OFFICES

14, Shriniwas Society,Ashish Banglow,
New Sharada Mandir Road,
Ahmedabad - 380 007
Ph.No.(079) 6620003,Tele fax -6640076.

Shantiniketan Building,
9th Floor, 8, Camac Street,
Calcutta - 700 017
Ph.No.(033) 2424517,2820183
E-mail - auchtel@cal2.vsnl.net.in

No. 3, Aarti Arcade,86,
86, Dr. Radhakrishnan Road,Mylapore,
Chennai - 600 004.
Ph.No.(044) 8278352.

Post Box No.12,3/ 64,
Vishnupuri,Nawab Gunj,
Kanpur - 208 002.
Ph.No.(0512) 561540,561012
E- mail - auchtel@lw.l.vsnl.net.in

K-48, connaught Circus,
New Delhi - 110 001.
Ph.No.(011) 3328208,3322116
E- mail - auchtel@del6.vsnl.net.in

Auchtel ProductsLtd.,142 C,Victor House, N.M.Joshi Marg, Lower Parel(w),Mumbai-400 013

Tel. 91-22-493 3975, Fax. 91-22-493 9755, 497 4211 E-mail - auchtel@vsnl.com