ION EXCHANGE
Refreshing the Planet

INDION® 850

Description

INDION 850 is a high porosity weak base anion exchanger in bead form, containing tertiary and quaternary ammonium groups. Its styrene-divinylbenzene macroporous structure gives excellent mechanical strength and exceptional resistance to osmotic shock.

INDION 850 also has excellent resistance to fouling by organic matter present in natural waters.

This anion exchanger can be operated at high regeneration efficiency like most weak base anion exchangers. Excellent kinetics of INDION 850 makes operation possible over a relatively wide range of flow rates.

Characteristics

Appearance	:	Opaque off white to brown beads
Matrix	:	Styrene divinyl benzene copolymer
Functional Group	:	Tertiary & quaternary ammonium
Ionic form as supplied	:	Free base
Total exchange capacity	:	1.5 meq/ml, minimum
Moisture holding capacity in Cl form	:	47 - 55 %
Shipping weight *	:	640 kg/m^3 approximately
Particle size range	:	0.3 to 1.2 mm
> 1.2 mm	:	5.0%, maximum
< 0.3 mm	:	1.0%, maximum
Uniformity co-efficient	:	1.7, maximum
Effective size	:	0.40 to 0.50 mm
Volume change	:	Free base to hydrochloride form, 25%, maximum
Osmotic strength	:	Excellent
Mechanical strength	:	Excellent
Maximum operating temperature	:	60 ^{0}C free base form
	:	80 ^{0}C hydrochloride form
Operating pH range	:	0 to 7
Resistance to reducing agents	:	Good
Resistance to oxidizing agents	:	Generally good, chlorine should be absent

* Weight of resin, as supplied, occupying 1 m^3 in a unit after backwashing and draining.

Applications

INDION 850 is recommended for use in two stages deionising, when the removal of silica and carbon dioxide is not desired. It is also commonly used after the cation exchanger in multiple stage deionising streams. It is generally followed by a strong base anion exchanger or mixed bed unit, or both, for production of high quality deionised water. INDION 850 when used before a degasser gives higher operating capacity.

Because of its high regeneration efficiency, it keeps operating costs low for most deionising treatment schemes. As INDION 850 needs a little more sodium hydroxide than the stoichiometric requirement, it can also be efficiently regenerated using waste sodium hydroxide from a down stream strong base anion exchanger reducing operating costs considerably. This process is commonly referred to as "Thoroughfare regeneration". If used as the anion exchanger in a two stage deionising plant preceding a polishing unit, INDION 850 protects the down stream strong base anion exchanger from organic fouling and thus assists in the production of ultra pure water.

Operating Exchange Capacity

The operating exchange capacity of INDION 850 is dependent upon the following factors:

- The ratio of sulphate to free mineral acidity (FMA) in the feed water.
- FMA content of the feed water.
- Carbon dioxide content of the feed water.
- Exhaustion period.

Figure 1 shows the operating exchange capacity of INDION 850 at various exhaustion periods and for different sulphate to FMA ratios.

Sodium hydroxide used for regeneration should be 115% of the capacity realised in the previous exhaustion cycle. The regenerant quantity can be reduced to 110% for feed waters not containing organics.

Effect of FMA :

Higher FMA content in the feed water increases operating exchange capacity of INDION 850. Figure 2 shows the effect of FMA content of feed water on the operating exchange capacity of INDION 850.

Effect of CO_2:

Presence of CO_2 increases the operating exchange capacity of INDION 850. Figure 3 shows the effect of CO_2 on operating exchange capacity of INDION 850.

Typical operating data

Minimum bed depth	750 mm upto 1200 mm diameter 900 mm above 1200 mm diameter
Treatment flowrate	60 $m^3/h\ m^2$, maximum
Pressure loss	Typical values for pressure loss at various temperatures are shown in figure 5
Backwash	$3m^3/h\ m^2$, for 5 minutes
Regenerant	Sodium hydroxide, sodium carbonate or Ammonium hydroxide
Regenerant concentration	1 - 5 % w/v
Regenerant flowrate	3 $m^3/h\ m^2$, minimum
Regenerant injection time	30 minutes, minimum
Displacement rinse	1.5 - 2.5 bv
Final rinse*	5 - 7.5 bv
Rinse time*.....	30 - 40 minutes

* Depending on the end of rinse quality requirements

Regeneration

Regenerant

Sodium hydroxide is the preferred regenerant when effective elution of organics and high quality treated water are desired. INDION 850 can also be regenerated with soda ash or ammonia. Please consult us for regenerants other than sodium hydroxide.

Thoroughfare Regeneration :

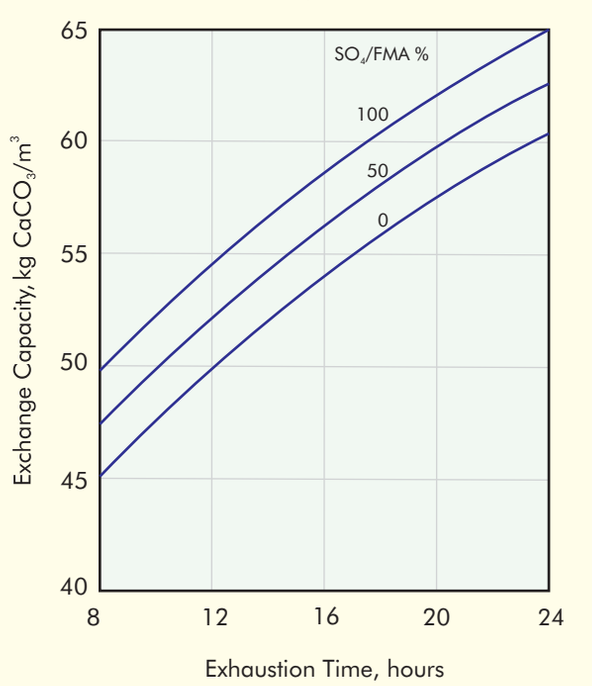
Particularly when the free mineral acidity of feed water is high, the use of the thoroughfare regeneration technique improves overall regeneration efficiency of a weak base-strong base anion exchanger system. The regeneration efficiency can be improved by proper process design of the system and by allowing the strong base anion exchanger to treat higher chloride slip from the preceding weak base anion exchanger while obtaining expected treated water quality specifications at the outlet of the strong base anion exchanger. In thoroughfare regeneration, the concentration of sodium hydroxide solution going in the weak base anion exchanger is generally reduced to prevent precipitation of silica on INDION 850.

Treated Water Quality

INDION 850 produces low conductivity treated water. In most cases conductivity of treated water will be 10 microsiemens per cm or less depending upon sodium leakage from the preceding cation exchanger. The treated water pH from INDION 850 depends on the carbon dioxide content and the positioning of the degasser before or after the anion unit. If the degasser is after the anion unit, the treated water pH will be in the range of 4.5 - 5.5.

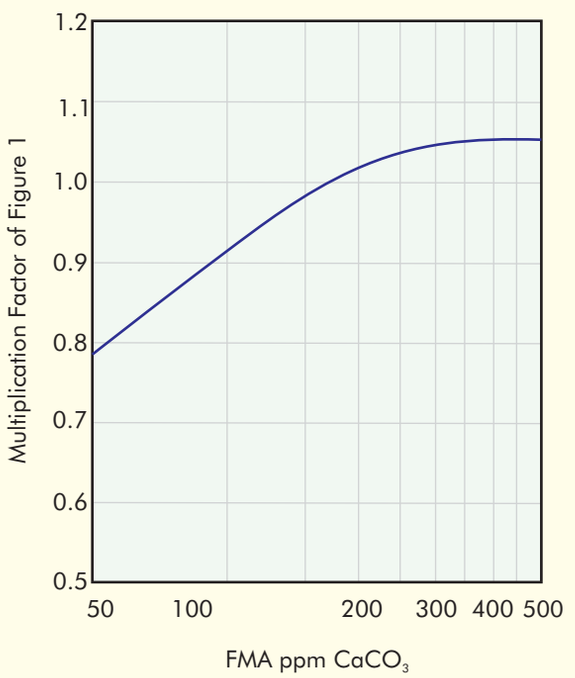
OPERATING EXCHANGE CAPACITY

Figure 1



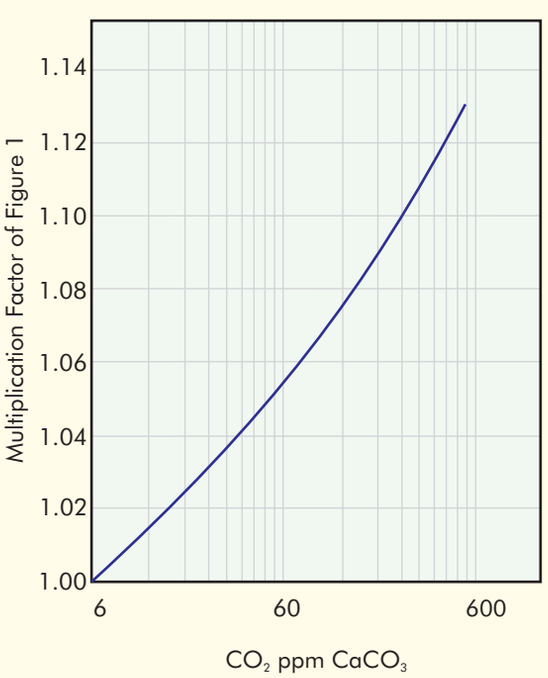
EFFECT OF FMA ON CAPACITY

Figure 2



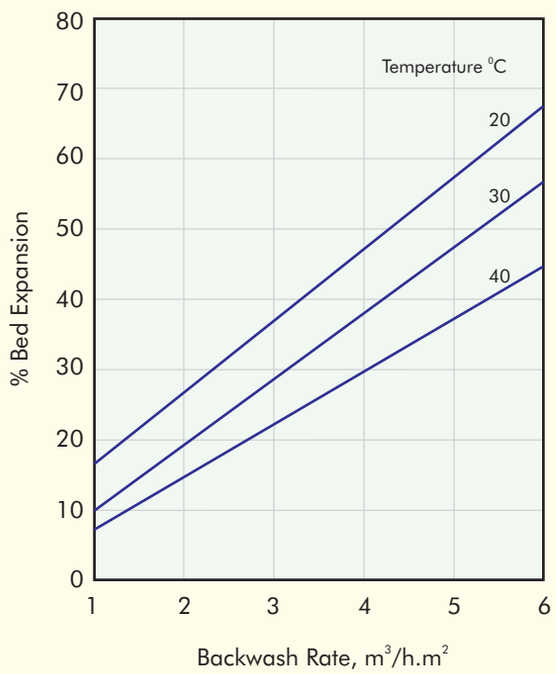
EFFECT OF CO_2

Figure 3



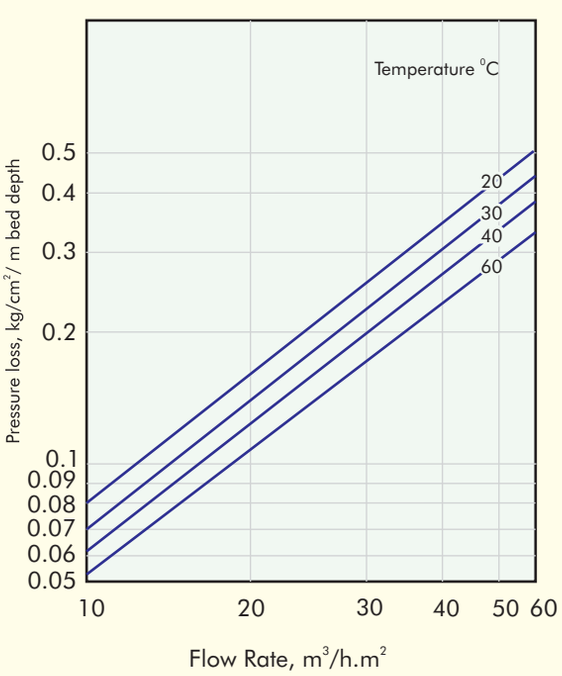
BED EXPANSION

Figure 4



PRESSURE LOSS

Figure 5



Use of good quality regenerants

All ion exchange resins are subject to fouling and blockage of active groups by precipitated iron. Hence the iron content in the feed water should be low and the regenerant sodium hydroxide must be essentially free from iron and heavy metals. All resins, especially the anion exchangers are prone to oxidative attack resulting in problems such as loss of capacity, resin clumping, etc. Therefore sodium hydroxide should have as low a chlorate content as possible. Good quality regenerant of technical or chemically pure grade should be used to obtain best results.

Packing

HDPE lined bags	25/50 lts	LDPE bags	1 cft/25 lts
Super sack	1000 lts	Super sack	35 cft
MS drums with liner bags	180 lts	Fiber drums with liner bags	7 cft

Storage

Ion exchange resins require proper care at all times. The resin must never be allowed to become dry.

Regularly open the plastic bags and check the condition of the resin when in storage. If not moist, add enough clean demineralised water and keep it in completely moist condition. Always keep the resin drum in the shade. Recommended storage temperature is between 20° C and 40° C.

Safety

Acid and alkali solutions are corrosive and should be handled in a manner that will prevent eye and skin contact. If any oxidising agents are used, necessary safety precautions should be observed to avoid accidents and damage to the resin.

INDION range of Ion Exchange resins are produced in a state-of-the-art ISO 9001 and ISO 14001 certified manufacturing facilities at Ankleshwar, in the state of Gujarat in India.

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