ION EXCHANGE
Refreshing the Planet

INDION® 236

Description

INDION 236 is a weak acid, unifunctional cation exchange resin containing carboxylic acid groups. It is based on cross-linked polyacrylic acid and is supplied as moist white beads in the hydrogen form.

INDION 236 is recommended for the reduction of alkalinity in boiler feed water.

It is also widely used in the treatment of water for many industrial processes.

Information is given in this publication for the operation of INDION 236 in the hydrogen cycle, using a mineral acid as the regenerant.

Characteristics

Appearance	:	Opaque white to pale yellow beads
Matrix	:	Gel polyacrylic copolymer
Functional Group	:	Carboxylic acid
Ionic form as supplied	:	Hydrogen
Total exchange capacity	:	4.0 meq/ml, minimum
Moisture holding capacity	:	46 - 54 %
Shipping weight *	:	740 kg/m^3, approximately
Particle size range	:	0.3 to 1.2 mm
> 1.2 mm	:	5.0%, maximum
< 0.3 mm	:	2.0%, maximum
Uniformity co-efficient	:	1.7, maximum
Effective size	:	0.40 to 0.50 mm
Volume change	:	H to Na, 80-120 %
Maximum operating temperature	:	120^{0}C
Operating pH range	:	0 to 14
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

De-alkalizing

This high capacity resin is particularly suitable for water containing a high proportion of alkalinity. A working capacity of upto 130 kg $CaCO_3/m^3$ of resin can be obtained by regeneration with the stochiometric acid equivalent of the capacity utilised during the rinse and exhaustion cycle. When used as recommended, it is virtually impossible for free mineral acid to be present in the treated water unless a considerable excess of acid is used during regeneration. The maximum capacity of the resin for exchanging salt of strong mineral acids is 3 kg $CaCO_3/m^3$.

De-alkalising-softening

INDION 236 removes calcium bicarbanate alkalinity from water, thus reducing total dissolved solids. It can also be used to soften water containing sodium alkalinity. If removal of non-alkaline hardness is required, de-alkalising should be followed by softening using INDION 225 in the sodium form.

Two stage de-ionising

INDION 236 is used with INDION FF-IP in the two stage purification of sugars. For certain purposes it can also be used with INDION FF-IP in two stage deionising of water, but commonly INDION 236 is used as the first stage in a deionising train followed by a strong acid cation resin such as INDION 225 or 525 to yield high regeneration efficiency or layered bed de-ionising.

Typical operating data

(Co-flow regeneration)

Bed depth	0.75 to 2.0 m	
Treatment flowrate	60 $m^3/h\ m^2$, maximum	
	40 bv/h, maximum	
Backwash.....	4 $m^3/h\ m^2$ until effluent is clear	
Bed expansion	Refer figure 6-8	
Regenerant	Sulphuric acid	Hydrochloric acid
Regenerant concentration	0.8 % w/v	1- 5% w/v
Regenerant injection time	17 bv*/h	2bv/h
Regenerant injection time	15 minutes, minimum	
Slow rinse	1 bv at regenerant flowrate	
Rinse flowrate	10 bv/h or at treatment flowrate	

* 1 bv (bed volume) = 1 m^3 solution per 1 m^3 resin

Operating Exchange capacity

De-alkalizing

When operated in the hydrogen cycle, the exchange capacity of INDION 236 is determined by

- The rate of exhaustion of the resin (see Figure 1)
- The sodium alkalinity of the feed water (see Figure 2)
- The temperature of the feed water (see Figure 3)

The operating capacity data given in this publication is based on a methyl orange end point of 30 ppm $CaCO_3$.

Exhaustion Rate

The treatment flowrate should be such that the design capacity of the plant in which INDION 236 is used will be achieved in the design exhaustion time or longer (see Figure 1).

Sodium Alkalinity

The operating exchange capacity of INDION 236 needs to be corrected for feed water containing sodium alkalinity (see Figure 2). However when the water being treated contains appreciable sodium alkalinity, the cycle can be continued beyond the recommended alkalinity end point of 30 ppm $CaCO_3$, so that the resin acts as a partial softener by exchanging calcium for sodium ions. In this case INDION 236 is operated to hardness breakthrough and the correction factor need not be applied.

Feed water Temperature

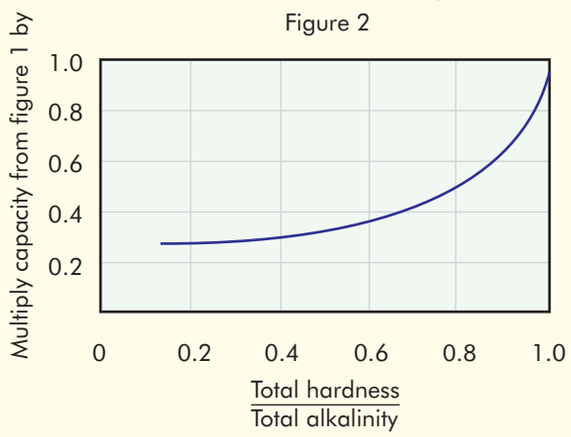
The effect of increased temperature of the feed water is to improve capacity as shown in Figure 3.

Maximum capacity is obtained when the feed water temperature is 40°C, approximately.

OPERATING EXCHANGE CAPACITY

Capacity correction factor for feed water with $\frac{\text{Total hardness}}{\text{Total alkalinity}} < 1.0$

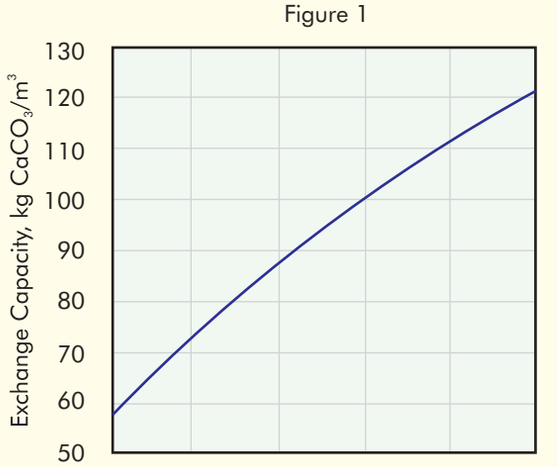
Figure 2



OPERATING EXCHANGE CAPACITY

Total hardness > Total alkalinity at 25°C

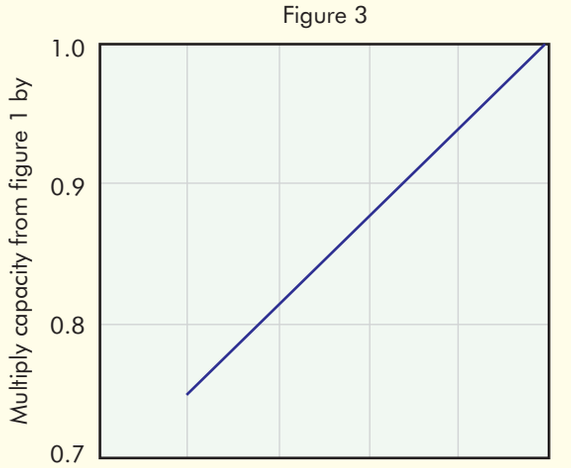
Figure 1



OPERATING EXCHANGE CAPACITY

Capacity correction factor for feed water temperature

Figure 3

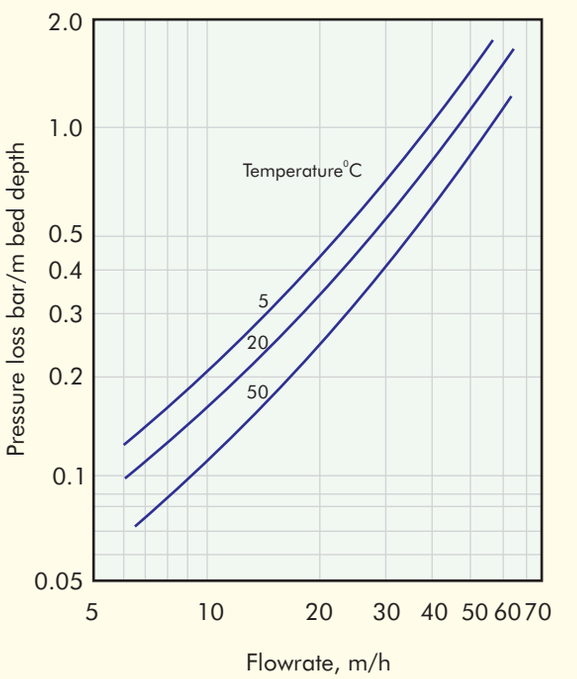


Treated Water Quality

When operating under the conditions indicated viz, the appropriate flowrate to give the design capacity, the average treated water from INDION 236 will always be alkaline to methyl orange. Figure 4 shows typical treated water quality when utilizing the maximum capacity of INDION 236 to M-alkalinity end-point of 30 ppm $CaCO_3$. If in relation to the capacity required a very large excess of regenerant acid is used or the EMA of the water is greater than 250 ppm $CaCO_3$ some acidity may be present in the treated water.

PRESSURE LOSS

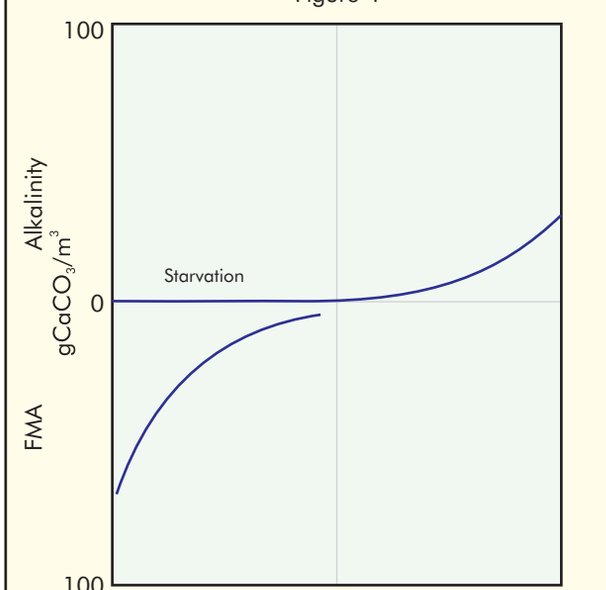
Figure 5



TREATED WATER QUALITY

Typical treated water quality

Figure 4

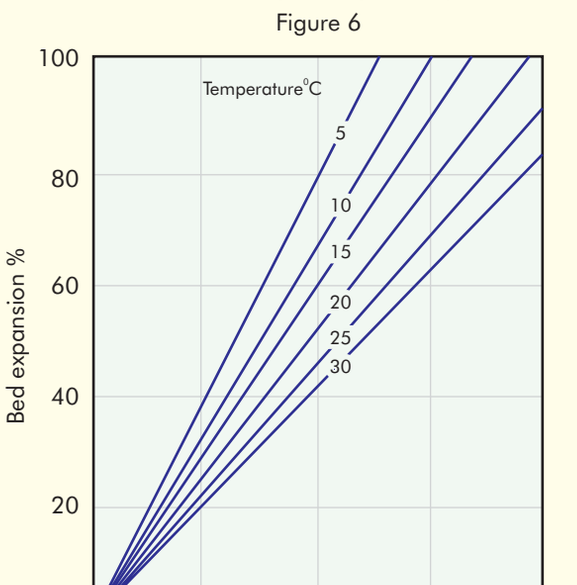


BED EXPANSION

Bed expansion (Ca^{++} form)

Resin loading 100 kg $CaCO_3/m^3$

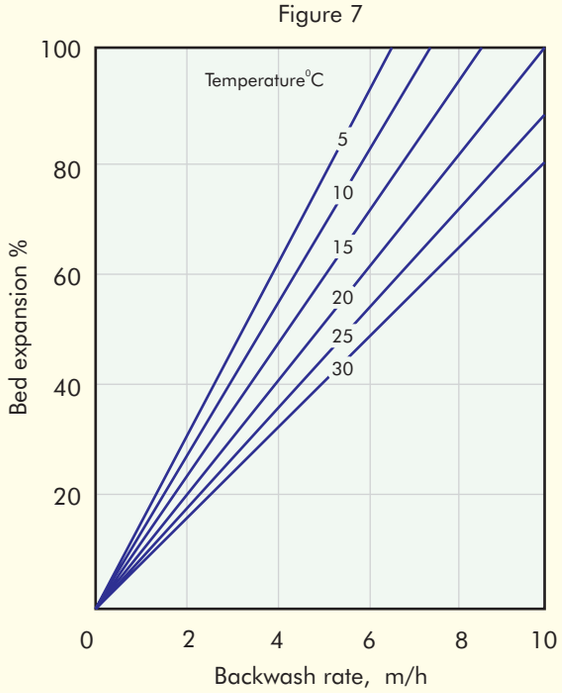
Figure 6



BED EXPANSION

Bed expansion (H^+ or Na^+ form)

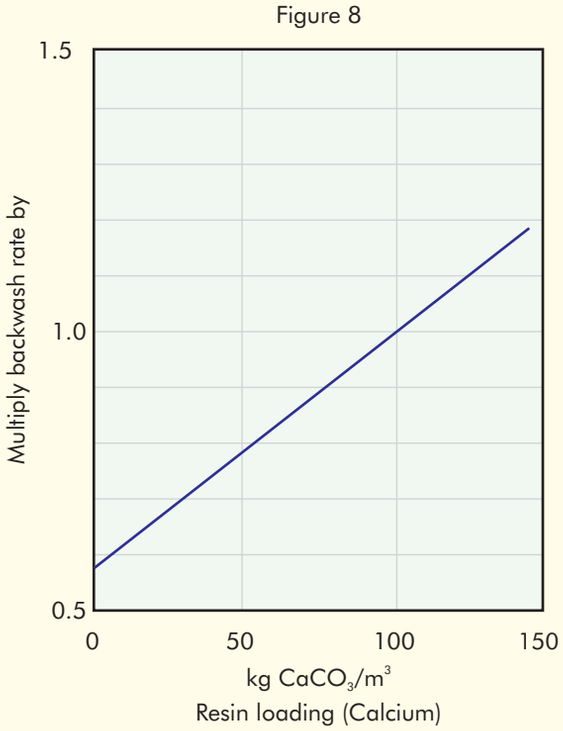
Figure 7



BED EXPANSION

Backwash rate correction factor

Figure 8



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 must be essentially free from iron and heavy metals. All resins are prone to oxidative attack, resulting in problems such as loss of physical strength. Therefore, the regenerant should have as low chlorine content as possible. Good quality regenerant of technically or chemically pure grade should be used to obtain best results.

Packing

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