ION EXCHANGE (INDIA) LTD
THE POWER BEHIND WATER

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.....	Moist ,white to pale yellow spherical opaque beads
Matrix.....	Gel polyacrylic copolymer
Functional groups.....	-COOH
Ionic form as supplied.....	Hydrogen, H+
Total exchange capacity.....	4.0 meq/mi, minimum
	200 kg CaCO3/m^3 minimum
Moisture holding capacity.....	46 - 54%
Shipping weight *	70 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 coefficient	1.7 maximum
Effective size.....	0.40 - 050 mm
Operating pH range.....	0-14
Maximum operating temperature	120^0 C
Volume change	80 to 120 %. H+ to Na+
Resistance to reducing agents	Good
Resistance to oxidising 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-alkalising

This high capacity resin is particularly suitable for water containing a high proportion of alkalinity. A working capacity of up to 130 kg CaCO3/m^3 of resin can be abtained 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 salts 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-IPin the two-stage purification of sugars. For certain purposes it con also be used with INDION FFIP in two-stage de-ionising of water; but commonly INDION 236 is used as the first stage in a de-ionising train followed by a strong acid cation resin such as INDION 225 or 525 to yield a high regeneration efficiency or in layered bed de-ionising.

Typical Operating Data

(CO-flow regeneration)

Bed depth	0.75m - 2.0m	
Treatment flow Rate	60 m/h, maximum 40 Bv/h, maximum	
Backwash	4 m/h until the effluent is clear. For typical bed expansion characteristics see Figs. 6-8	
Regenerant	Sulphuric ocid	Hydrochloric acid
Regenerant concentration	0.8% wlv	1-5% w/v
Regenerant injection time	17 BV*/h	2BV/h
Regenerant injection time	15 minutes, minimum	
Rinse flow rate	10 BV/h or treatment flow rate	
Rinse time	40 minutes, minimum	

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

Operating Exchange Capacity

De-alkalising

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

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

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

Exhaustion Rate

The treatment flow rate should be such that the design copacity of the plant in which INDION 236 is used will be achieved in the design exhaustion time or longer (see Fig 1).

Sodium Alkalinity

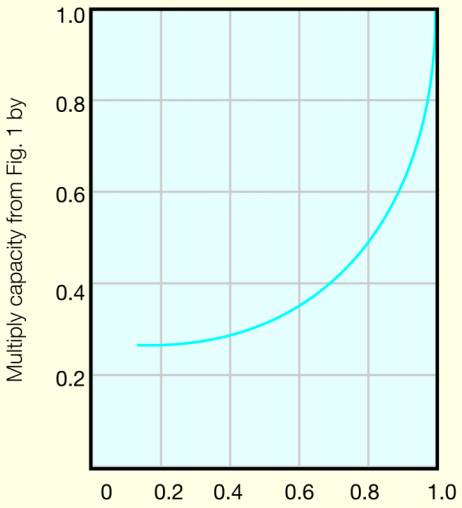
The operating exchange capacity of INDION 236 needs to be corrected for feed water containing sodium alkalinity (see Fig. 2) .However when the water being treated contains appreciable sodiumalkalinity, the cycle can be continued beyond the recommended alkalinity end point of 30 ppm $CaCO_3$, so that the resin acts as a partial softener by exchanging calcium for sodium ions. In this case INDION 236 is operated to hydrardness 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 Fig. 3.
Maximum capacity is obtained when the feed water temperature is 40°C, approximately.

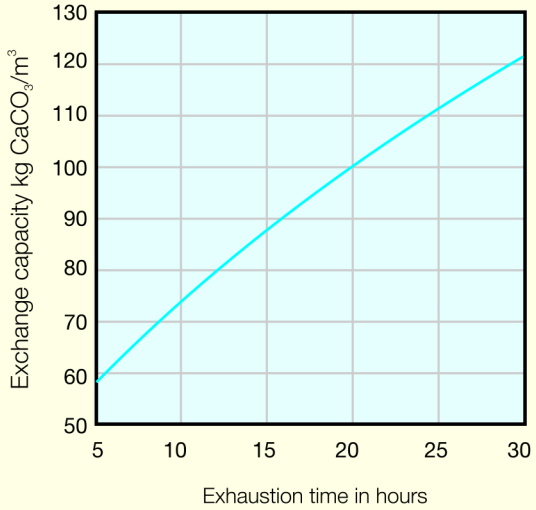
OPERATING EXCHANGE CAPACITY
Capacity correction factor for
feed water with $\frac{\text{Total hardness}}{\text{Total alkalinity}} < 1.0$

Figure 2



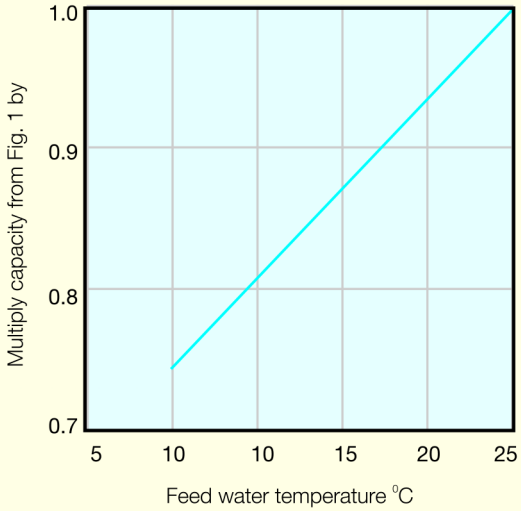
OPERATING EXCHANGE CAPACITY
Total hardness > Total alkalinity at 25°C

Figure 1



OPERATING EXCHANGE CAPACITY
Capacity correction factor for
feed water temperature

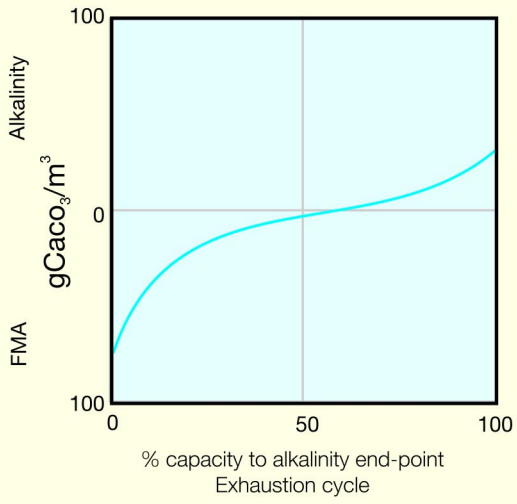
Figure 3



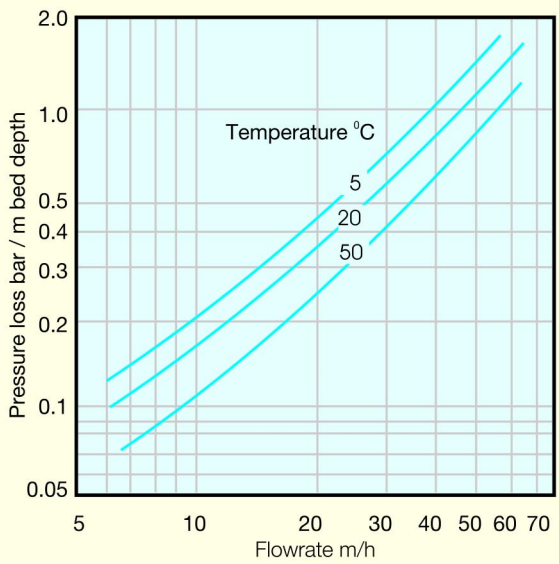
Treated Water Quality

When operating under the conditions indicated viz, the appropriate flow rate to give the design capacity, the average treated water from INDION 236 will always be alkaline to methyl orange. Fig. 4 shows typical treated water quality when utilising the maximum capacity of INDION 236 to M-alkalinity end-point of 30 ppm CaCO3. If in relation to the capacity required , a very large excess of regeneration 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.

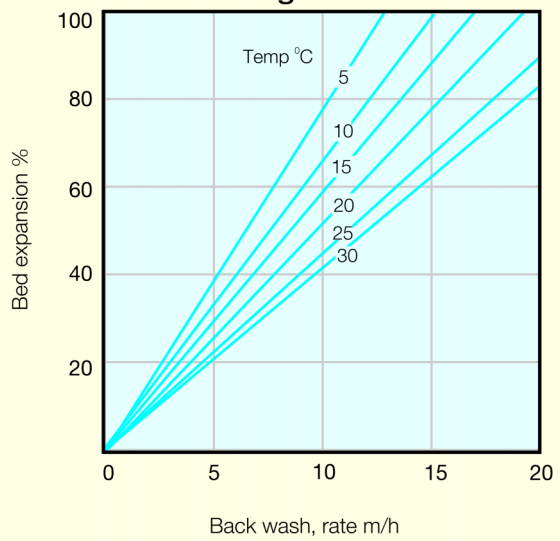
TREATED WATER QUALITY
Figure 4.0



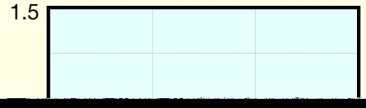
PRESSURE LOSS
Figure 5.0



BED EXPANSION
(Bed expansion (Ca++form)
Resin loading 100 kg $CaCO_3/m^3$
Figure 6



BED EXPANSION
Backwash rate correction factor
Figure 8



BED EXPANSION

[redacted]

Use of good quality regenerant chemicals

All Ion exchange resins are subject to fouling and blockage of active groups by precipitated iron. Hence the iron content of the influent water should be low and the regenerant must be essentially free from iron and heavy metals. All resins are prone to oxidative att ack resulting in problems, such as loss of physical strength. Therefore the regenerant should have as low a chlorine content as possible .Good quality regenerant of technically or chemically pure grade should be used to obtain best results

Resin maintenance in storage

Ian exchange resins require proper care at all times. The resins 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.

INDION

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