

INDION[®] 790

Hydrochloric acid Regeneration

Description

INDION 790 is a macroporous strong acid cation exchange resin containing sulphonic acid groups. It is supplied in wet form as dark grey spherical beads. A proper mix of high cross linkage and porosity gives this product outstanding physical stability and makes it extremely resistant to breakdowns by osmotic,

mechanical and thermal shock. INDION 790 can be used directly in aqueous systems such as condensate water treatment or in organic media after conditioning with a water miscible solvent. It is also used for chemical processing applications to remove impurities (metal ions) and basic organic compounds (amines etc.) from aqueous and non aqueous systems (appropriate pretreatment is required).

Characteristics

Appearance	:	Opaque dark grey beads
Matrix	:	Styrene divinylbenzene copolymer
Functional Group	:	Sulphonic acid
Ionic form as supplied	:	Hydrogen, H ⁺
Total exchange capacity in Na form	:	1.9 meq/ml, minimum
Moisture holding capacity	:	51- 55 %
Shipping weight *	:	740 kg/m ³ approximately
Particle size range	:	0.3 to 1.2 mm
> 1.2 mm	:	5.0%, maximum
< 0.355 mm	:	1.0%, maximum
Uniformity co-efficient	:	1.7, maximum
Effective size	:	0.45 to 0.60 mm
Maximum operating temperature	:	120° 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 m³ in a unit after backwashing & draining.

Applications

De-ionising

INDION 790 in hydrogen form is used as a first step in de-ionising. Technical data for counter current regeneration is given in this literature.

Two stage de-ionising

Two stage de-ionising uses two units in series - the first containing INDION 790 as cation exchanger and second containing strong base anion exchanger Type I

resins such as INDION FFIP/GS 300/810 or Type II resins such as INDION NIP/GS 400/820.

Mixed bed de-ionising

When treated water of highest possible quality is required, INDION 790 strong acid cation exchange resin is used with INDION FFIP in a mixed bed unit. A mixed bed is often operated as the last unit in a de-ionising stream to act as a polisher for producing water of highest quality.

Typical operating data

Two stage/multiple stage de-ionising

Minimum bed depth

Treatment flowrate

Pressure loss

Bed expansion

Backwash.....

Regenerant

Regenerant flowrate

Regenerant injection time

Slow rinse

Final rinse.....

* After a set number of regenerations

Counter Current regeneration

1.0 m

45 m³/h m², maximum

Refer Figure 7

Refer Figure 6

9 m³/h m² till effluent is clear*

Hydrochloric acid
(2.5 to 5.0% w/v)

3-18 m³/h m²

20 minutes, minimum

2-3m³/m³ at injection flowrate

For 5 minutes at treatment flowrate

Operating Exchange capacity

Operating exchange capacity of INDION 790 in counter current mode depends on :

- Regeneration level
- Alkaline content of feed water
- Sodium content of feed water
- Active bed-depth

Figures 1, 2, 3 and 4 give operating exchange capacity and correction factor of INDION 790 in counter current regeneration mode.

Regeneration

Counter current regeneration

The concentration of hydrochloric acid used in regeneration is 2.5 to 5 % w/v. For acid dilution and rinsing, decaionised water must be used.

To prevent the disturbance of the resin bed during upward acid injection and uprinse, use of down flow of water is employed. Alternatively, a downward air pressure can also be used for the same purpose. Backwashing of complete bed, during every regeneration is not desirable and only subsurface wash must be employed.

Whenever the counter current unit is backwashed, higher than the normal quantity of regenerant has to be used in subsequent injection operation.

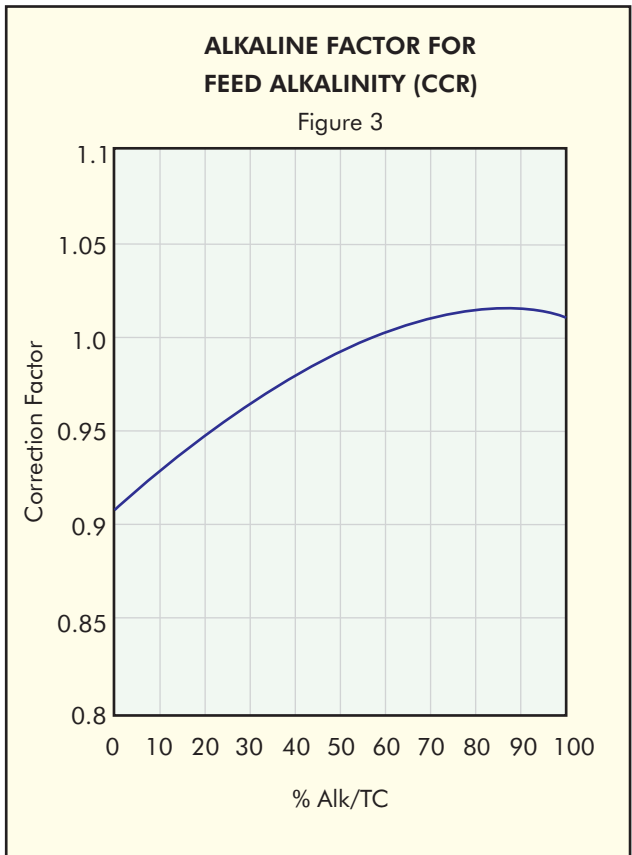
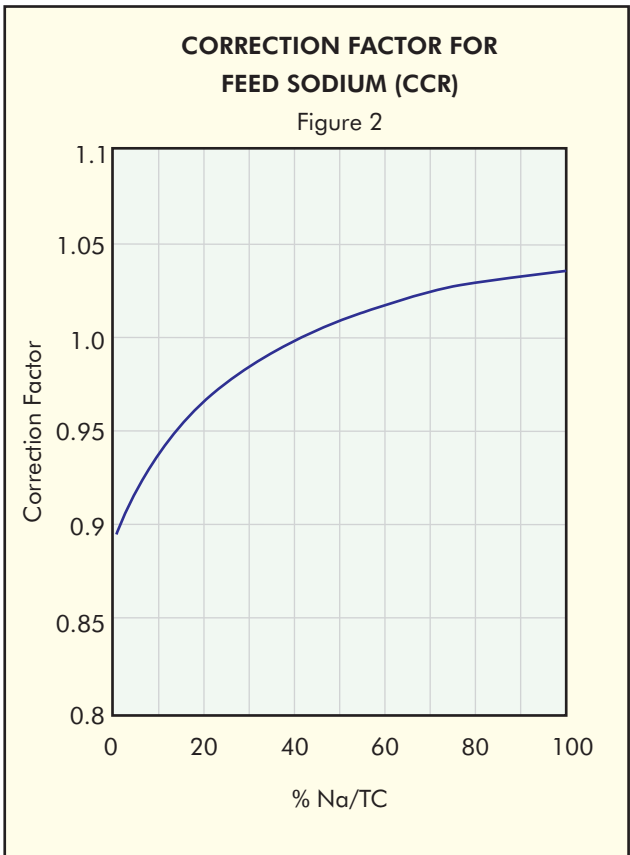
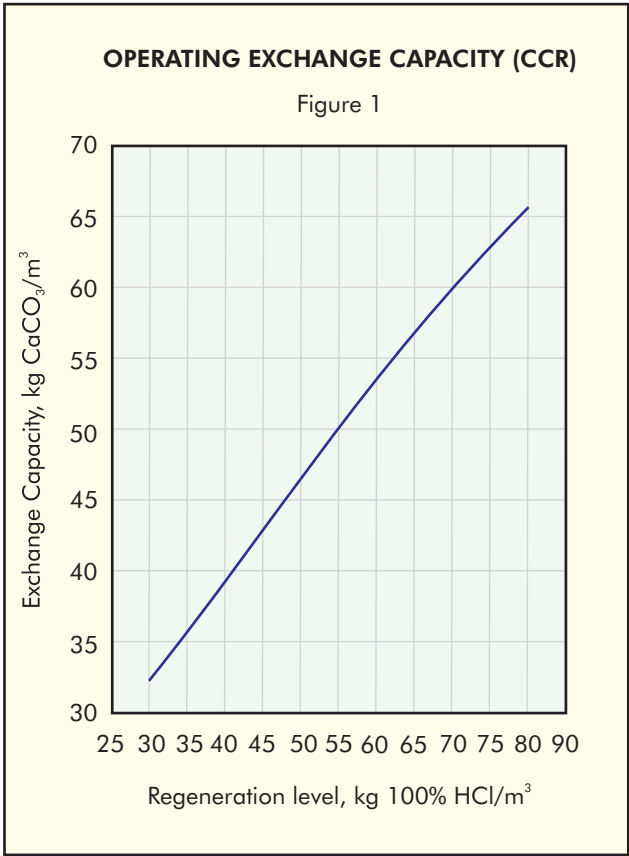
Thoroughfare regeneration

When the alkaline hardness is high, use of INDION 236 weak acid cation exchanger preceding INDION 790 is recommended.

In such cases, the regeneration can be conducted first through strong acid cation exchanger, followed by weak acid cation exchanger. The waste acid from the strong acid cation exchanger is utilised to regenerate the weak acid cation exchanger. This process improves the utilisation of acid and minimises the effluent while obtaining highest quality treated water. This process is commonly referred to as thoroughfare regeneration.

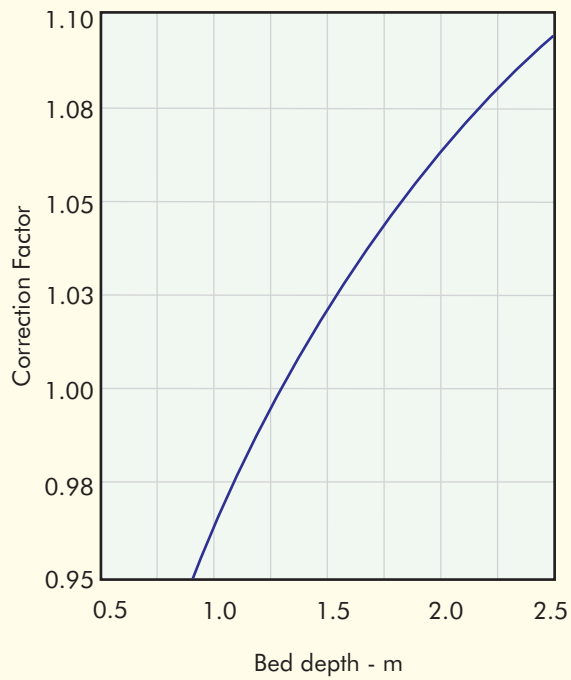
Treated water quality

The exchange capacities of INDION 790 in counter current mode of regeneration are shown in Figure 1. These are based on end point of one ppm of sodium slip expressed as CaCO_3 . For sodium slip less than one ppm, consult us.



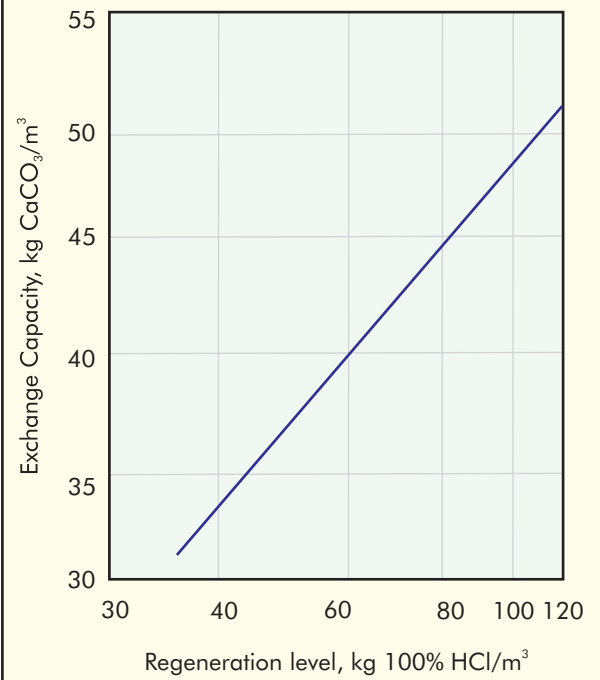
**CORRECTION FACTOR FOR
BED DEPTH (CCR)**

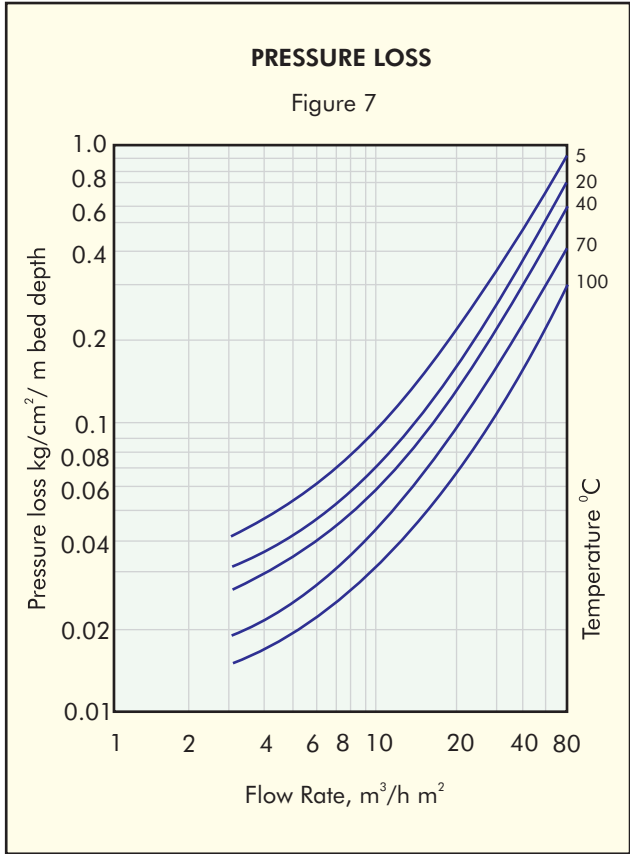
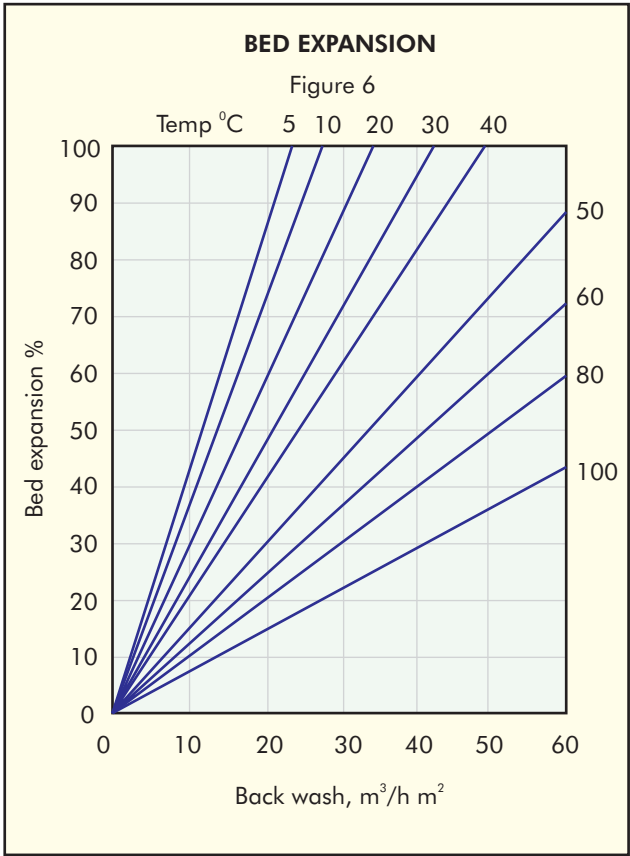
Figure 4



**OPERATING EXCHANGE CAPACITY
MIX BED DE-IONISING**

Figure 5





Mixed bed de-ionising

When used as the cation exchanger in a mixed bed unit, variation with feed water composition in operating exchange capacity is less than that, in two stage deionising. For practical purposes, feed water may be classified as

- Ion exchange softened or demineralised
- Low ionic load influent.

In both cases, INDION 790 may be regenerated with hydrochloric acid of 5% concentration.

Figure 5 gives operating exchange capacity when used in a mixed bed unit.

Typical operating data

Mixed bed de-ionising

Total Bed depth	1.2 2.4 m using INDION 790 and INDION FFIP
Rising space	75% of bed depth
Treatment flowrate	60 m ³ /h m ² , maximum
Pressure loss.....	1.2 kg/cm ² , maximum when using INDION 790 & INDION FFIP
Bed separation	9 m ³ /h m ² for 10 minutes
Bed settlement	Allow 5 minutes for separation before commencing injection of regenerants
Acid injection rate	3-18 m ³ /h m ² for 6-10 minutes with 3-5% w/v concentration
Downflow	1.5 m ³ /h m ²
Acid rinse	2 m ³ /m ³ in 10-15 minutes
Unit drain down	Before remixing the resins, the water level should be lowered to approximately 0.4 m above the bed
Bed re-mixed	2 m ³ /minute m ² oil free air at 0.4 kg/cm ² pressure for 10 minutes
Settle bed, refill unit, final rinse	These operations should be carried out in such a way to avoid separation of the two resins. Final rinse to satisfactory water quality should be effected at the treatment flowrate, or at 24 m ³ /h m ² , whichever is greater. Total time required is normally about 5-10 minutes depending upon end point conductivity required.

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	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

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.

To the best of our knowledge the information contained in this publication is accurate. Ion Exchange (India) Ltd. maintains a policy of continuous development and reserves the right to amend the information given herein without notice.

INDION is the registered trademark of Ion Exchange (India) Ltd.



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