

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 | : | 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 |
| < 0.3 mm | : | 1.0%, maximum |
| Uniformity co-efficient | : | 1.7, maximum |
| Effective size | : | 0.45 to 0.60 mm |
| Maximum operating temperature | : | 120 - 150° 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-ionsing

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.....

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

* After a set number of regenerations

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, decationised 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.

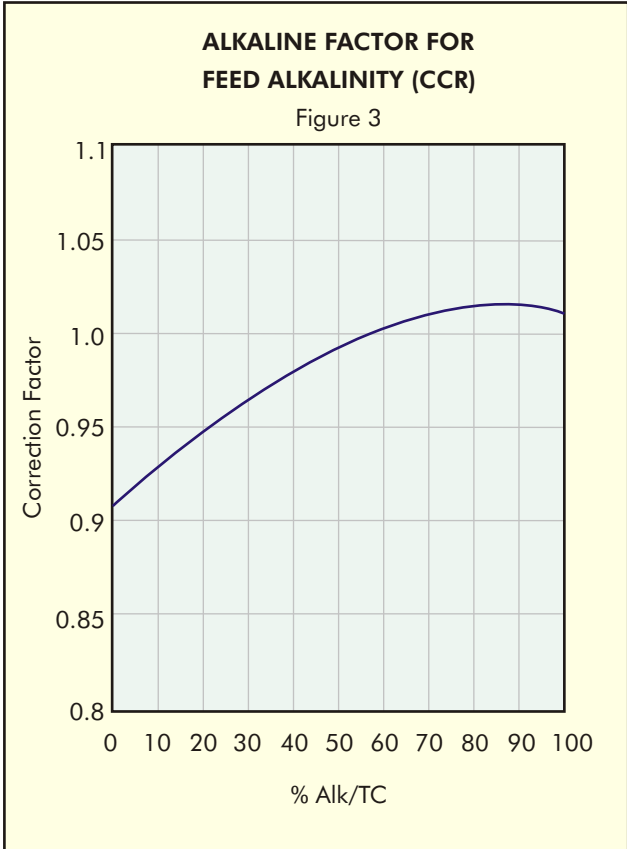
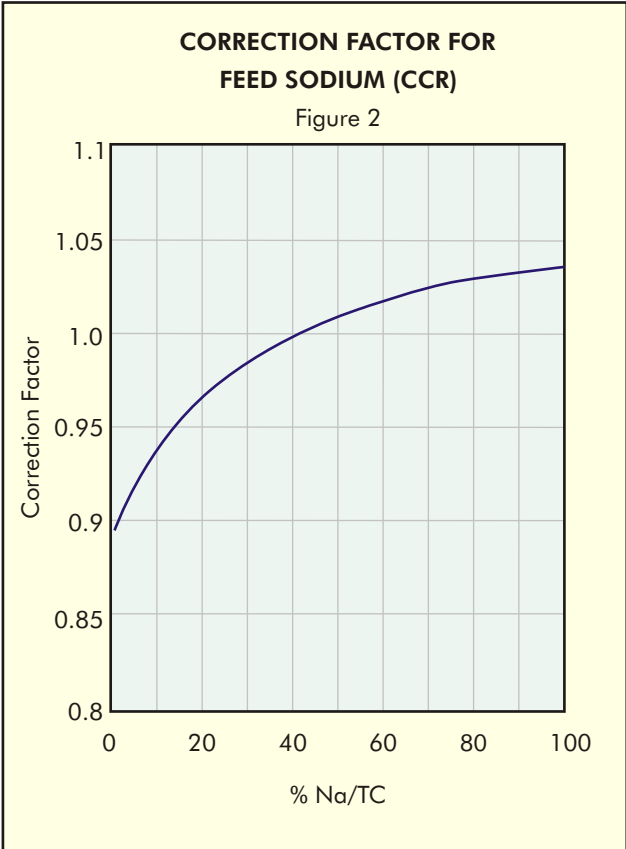
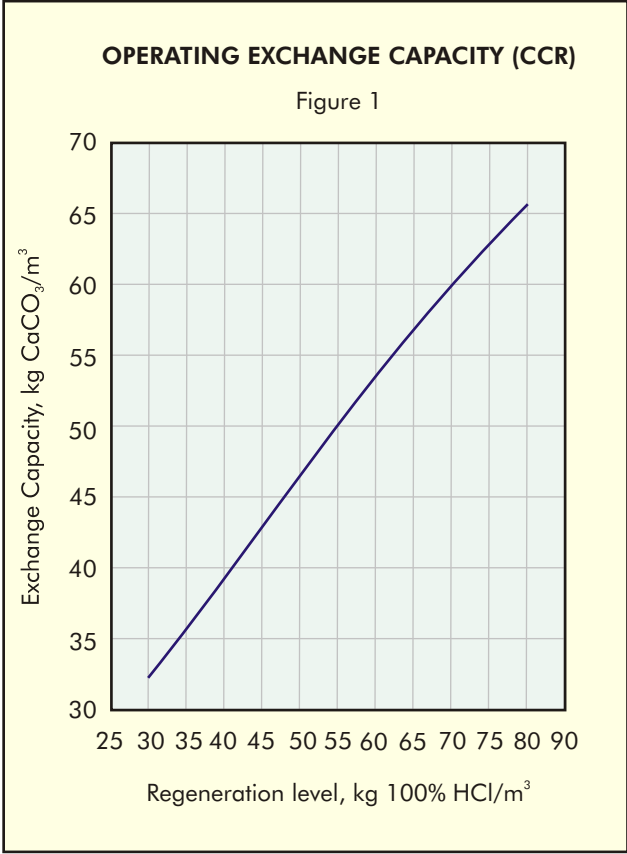
Thoroughfare regeneration

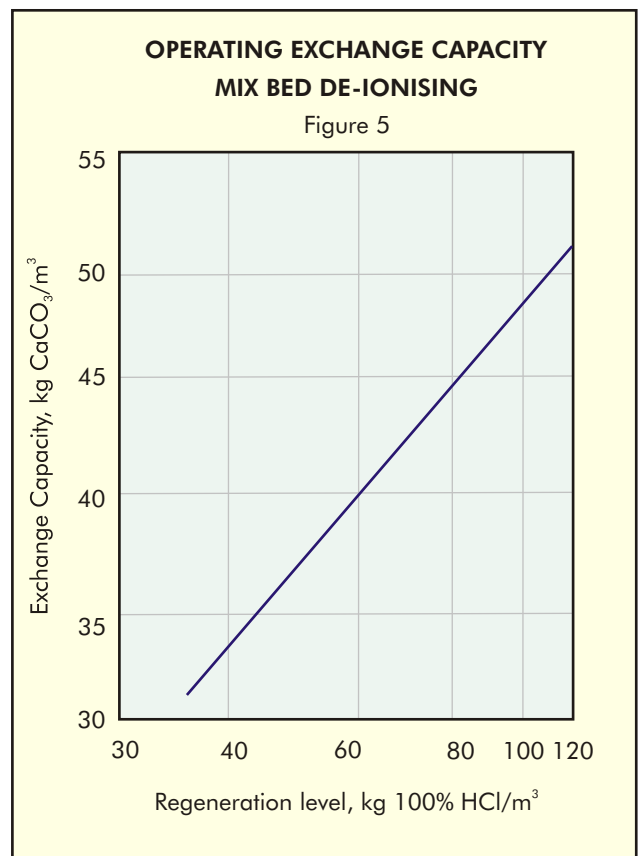
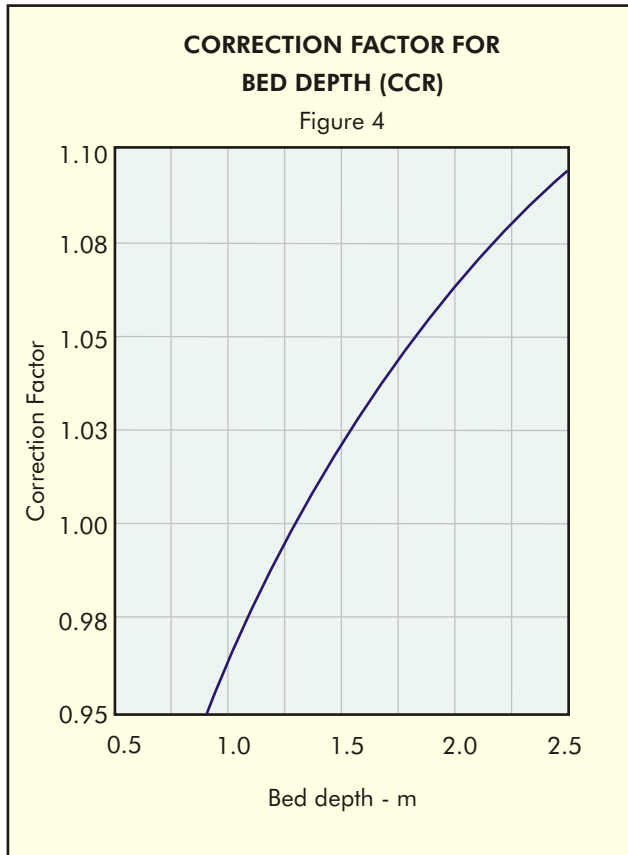
When the alkaline hardness is high, use of INDION 236 weak acid cation exchanger preceding INDION 790 is recommended.

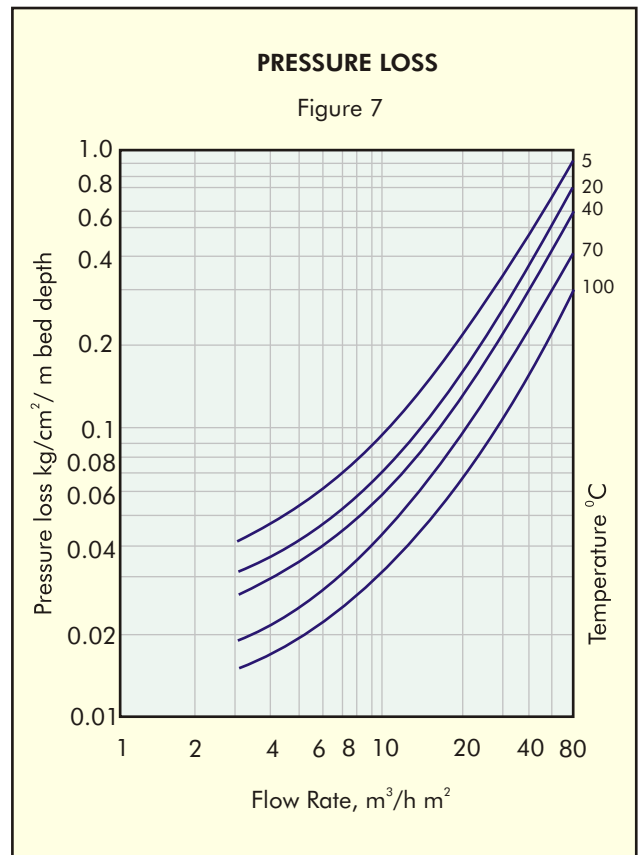
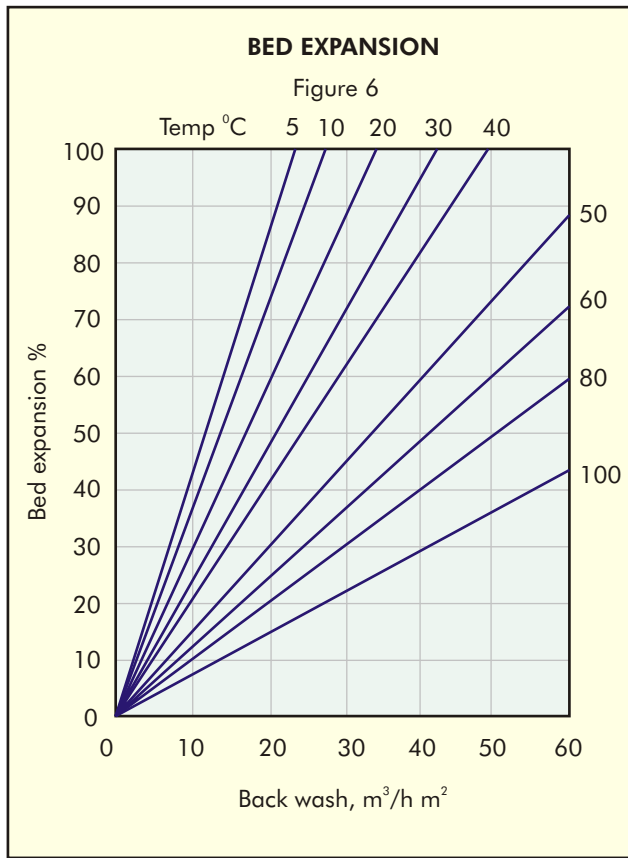
In such cases, the regeneration can be conducted first through strong acid cation exchanger, followed by weak acid cation exchanger. The waste acid from the strong acid cation exchanger is utilised to regenerate the weak acid cation exchanger. This process improves the utilisation of acid and minimises 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.







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 |

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. This product data sheet (issue 09/2008) replaces previous issues.

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



CORPORATE OFFICE

Tiecicon House, Dr. E. Moses Road, Mahalaxmi, Mumbai 400 011
Tel: 022-3989 0909 Fax: 022-2493 8737
E-mail: ieil@ionexchange.co.in ; hocro@ionexchange.co.in

INTERNATIONAL DIVISION

R-14, T.T.C MIDC, Thane-Belapur Road, Rabale, Navi Mumbai 400 705
Tel: 022-3989 0909/3047 2400 Fax: 022-2769 7918
E-mail: rabcrointl@ionexchange.co.in; export.sales@ionexchange.co.in

REGIONAL OFFICES

- **Chennai** - Tel: 044-3910 2900/ 3989 0909 Fax: 044-2815 3361
E-mail: checro@ionexchange.co.in
- **Delhi** - Tel: 011-3989 0909/3054 3200 Fax: 011-2577 4837
E-mail: delcro@ionexchange.co.in
- **Kolkata** - Tel: 033-3989 0909/3043 3400 Fax: 033-2400 4345
E-mail: calcro@ionexchange.co.in
- **Vashi** - Tel: 022-3989 0909/3913 2300 Fax: 022-2788 9839
E-mail: mumcro@ionexchange.co.in

BRANCH OFFICES

- **Bangalore** - Tel:-080-3251 6205, Cell:09341247700
E-mail: bngcro@ionexchange.co.in
- **Chandigarh** - Tel: 0172-274 5011 Fax: 0172-274 4594
E-mail: delcro@ionexchange.co.in
- **Hyderabad** - Tel: 040-3066 3101/02/03 Fax: 040-3066 3104
E-mail: hydrcro@ionexchange.co.in
- **Lucknow** - Tel: 0522-301 3401/02 Fax: 0522- 301 3401
E-mail: luk.general@ionexchange.co.in
- **Pune** - Tel: 020-3062 6160 Fax: 020-2714 6109
E-mail: pun.general@ionexchange.co.in
- **Vadodara** - Tel: 0265-239 6506/6507 Fax: 0265-239 8508
E-mail: brdcro@ionexchange.co.in
- **Vizag** - Tel: 0891-324 6253
E-mail: sales.vizag@ionexchange.co.in

FACTORIES

• Ankleshwar • Hosur • Patancheru • Rabale • Verna

ALL INDIA NETWORK OF SERVICE COMPANIES AND DEALERS

Visit us at : www.ionindia.com