Description

INDION 225 H is a premium grade strong acid cation exchange resin containing sulphonate acid groups. It is based on cross-linked polystyrene and has a gel structure. The resin has high capacity and excellent kinetics.

Characteristics

- **Appearance**: Golden yellow to brown beads
- **Matrix**: Styrene divinylbenzene copolymer
- **Functional Group**: Sulphonic acid
- **Ionic form as supplied**: Hydrogen, H⁺
- **Total exchange capacity**: 1.8 meq/ml, minimum
- **Moisture holding capacity**: 49 - 55%
- **Shipping weight ***: 780 kg/m³ 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 0.55 mm
- **Maximum operating temperature**: 120°C
- **Operating pH range**: 0 to 14
- **Volume change**: Na to H, 8% approximately
- **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 225 H in hydrogen form is used as a first step in de-ionising. Technical data for co-flow and 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 225 H 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 225 H 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

<table>
<thead>
<tr>
<th>Two stage/multiple stage de-ionising</th>
<th>Co-Flow Regeneration</th>
<th>Counter Current regeneration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum bed depth</td>
<td>0.75 m</td>
<td>1.0 m</td>
</tr>
<tr>
<td>Treatment flowrate</td>
<td>45 m³/h m², maximum</td>
<td>45 m³/h m², maximum</td>
</tr>
<tr>
<td>Pressure loss</td>
<td>Refer Figure 12</td>
<td>Refer Figure 12</td>
</tr>
<tr>
<td>Bed expansion</td>
<td>Refer Figure 11</td>
<td>Refer Figure 11</td>
</tr>
<tr>
<td>Backwash</td>
<td>9 m³/h m² for 5 minutes</td>
<td>9 m³/h m² till effluent is clear*</td>
</tr>
<tr>
<td>Regenerant</td>
<td>Hydrochloric acid</td>
<td>Hydrochloric acid</td>
</tr>
<tr>
<td></td>
<td>(4.0 to 5.0% w/v)</td>
<td>(2.5 to 5.0% w/v)</td>
</tr>
<tr>
<td>Regenerant flowrate</td>
<td>3-18 m³/h m²</td>
<td>3-18 m³/h m²</td>
</tr>
<tr>
<td>Regenerant injection time</td>
<td>15 minutes, minimum</td>
<td>20 minutes, minimum</td>
</tr>
<tr>
<td>Slow rinse</td>
<td>2.5 m³/m² upto 5/6 injection flowrate</td>
<td>2-3 m³/m² at injection flowrate</td>
</tr>
<tr>
<td>Final rinse</td>
<td>7.5 m³/m² at 10 m³/h m³ or at treatment flowrate whichever is higher</td>
<td>For 5 minutes at treatment flowrate</td>
</tr>
</tbody>
</table>

* After a set number of regenerations
Operating exchange capacity

Figures 1, 2, 3 and 4 give operating exchange capacity of INDION 225 H when used in co-flow regeneration mode. Operating exchange capacity of INDION 225H in counter current mode depends on:

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

Figures 5, 6, 7 and 8 give operating exchange capacity and correction factor of INDION 225 H in counter current regeneration mode.

Regeneration

Co-flow regeneration
The concentration of hydrochloric acid used in regeneration is 4-5 % w/v.

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 regeneration 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 225 H 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
Leakage of sodium ions in treated water from strongly acidic cation exchanger depends on:

- Sodium content of feed
- Regeneration level employed

Refer to Figure 10 for leakage characteristics of INDION 225 H in co-flow regeneration mode. The exchange capacities of INDION 225 H in counter current mode of regeneration are shown in Figure 5. 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.
OPERATING EXCHANGE CAPACITY (CCR)

CORRECTION FACTOR FOR FEED SODIUM (CCR)

ALKALINE FACTOR FOR FEED ALKALINITY (CCR)

CORRECTION FACTOR FOR BED DEPTH (CCR)
Mixed bed de-ionsing

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 225 H may be regenerated with hydrochloric acid of 5% concentration.

Figure 9 gives operating exchange capacity when used in a mixed bed unit.

### Typical operating data

#### Mixed bed de-ionsing

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Bed depth</td>
<td>1.0 - 2.4 m using INDION 225 H and INDION FFIP</td>
</tr>
<tr>
<td>Rising space</td>
<td>75% of bed depth</td>
</tr>
<tr>
<td>Treatment flowrate</td>
<td>60 m³/h m², maximum</td>
</tr>
<tr>
<td>Pressure loss</td>
<td>1.2 kg/cm², maximum when using INDION 225 H &amp; INDION FFIP</td>
</tr>
<tr>
<td>Bed separation</td>
<td>9 m³/h m² for 10 minutes</td>
</tr>
<tr>
<td>Bed settlement</td>
<td>Allow 5 minutes for separation before commencing injection of regenerants</td>
</tr>
<tr>
<td>Acid injection rate</td>
<td>3-18 m³/h m² for 6-10 minutes with 3-5% w/v concentration</td>
</tr>
<tr>
<td>Downflow</td>
<td>1.5 m³/h m²</td>
</tr>
<tr>
<td>Acid rinse</td>
<td>2 m³/m² in 10-15 minutes</td>
</tr>
<tr>
<td>Unit drain down</td>
<td>Before remixing the resins, the water level should be lowered to approx. 0.4 m above the bed</td>
</tr>
<tr>
<td>Bed re-mixed</td>
<td>2 m³/minute m² oil free air at 0.4 kg/cm² pressure for 10 minutes</td>
</tr>
<tr>
<td>Settle bed, refill unit</td>
<td>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 m³/h m², whichever is greater. Total time required is normally about 5-10 minutes depending upon end point conductivity required.</td>
</tr>
<tr>
<td>final rinse</td>
<td></td>
</tr>
</tbody>
</table>
Figure 9
OPERATING EXCHANGE CAPACITY
MIX BED DE-IONISING

Figure 10
LEAKAGE CHARACTERISTIC (Co-Flow)

Figure 11
BED EXPANSION

Figure 12
PRESSURE LOSS
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  
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.

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.

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