**Indion Ion Exchange Process for Decolourisation of Cane Sugar**

Sugar is one of the most important ingredients of traditional sweets as well as in the confectionery, beverage and pharmaceutical industries. Enhanced quality of sugar gives better shelf life and enables optimum inventories without the risk of colour degradation.

Realising the potential of refined, decolourised sugar for the sugar industry, Ion Exchange India, undertook intensive R&D, working in close conjunction with a leading sugar mill in North India, and ion exchange resins Polystyrenic – INDION 830S and Polyacrylic - INDION 930A were successfully developed and commercialized for decolourization of cane sugar. The sugar produced from the refined sugar plant, after the addition of ion exchange columns supplied by Ion Exchange India, qualified as EC Grade 2 sugar and was exported to Europe against their quota for India as well as sold in the Indian market at a premium. This ion exchange technology, which has a synergistic effect with phosfloatation and carbonation, has replaced the conventional colour removal method with a much more economical operating cost.

The salient features of INDION 930A/830S resins are:

- pH of the sugar juice is not changed
- High porosity required to fix high molecular weight colorants by adsorption
- High resistance to osmotic shock, to withstand sudden changes in concentration between the regeneration and exchange steps.
- Specially designed particle size – very fine beads, associated with the viscosity of the juice would cause excessive headloss; very coarse beads would have less power of adsorption.
- Cleaner to handle than traditional carbon based adsorbents; regeneration in-situ with brine is easier and cheaper than transporting the carbon to a furnace to have the impurities burned off.

**Benefit to industry and nation:**

- Sugar mills in India are now able to produce EC1 and EC2 quality sugar. This will open new channels for export of quality sugar, enabling the sugar industry to increase exports of a value-added product and generating foreign exchange.
- The decolourisation process reduces/eliminates the need to import high quality/refined sugar thereby considerably reducing the foreign exchange outgo.
- By adopting the Ion Exchange Decolourisation process, sugar mills in the country can now utilize their idle capacity for refining of raw sugar or off grade sugar during the off season, thus optimizing their plant capacities and creating employment during the off-season.

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**Indion-ISR (Iron Specific Resin)**

**Promising Technology for Removal of Dissolved Iron from Ground Water**

Iron in drinking water is a common pollutant particularly in ground water sources. When water percolates through soil and rocks, it dissolves iron present in it and subsequently enters ground water supplies. In deep wells and springs, where both the oxygen content and pH tend to be low, water containing dissolved iron appears colourless. High concentration of iron causes reddish brown stains on laundry and household fixtures. Some-times, it may even clog water distribution pipes. High levels of iron can impart a bittersweet or metallic taste to drinking water. The drinking water standard for iron is 0.3 ppm
Ion Exchange (India) Limited has developed INDION ISR (Iron Specific Resin), a catalytic media which effectively removes dissolved iron from ground water as per USEPA and IS 10500:1996.

**Basics of INDION-ISR**

INDION ISR has manganese dioxide as a catalytic moiety promotes iron oxidation. Basically, iron and oxygen are attracted to manganese dioxide, where INDION-ISR enhances the oxidation of dissolved iron and converts the soluble iron (Fe ++ ) into insoluble ferric (Fe+++); this can be filtered through the media that acts as catalyst in the process and does not get consumed. In the reaction, manganese dioxide is reduced to manganese oxide and ferric hydroxide is precipitated.

During the backwash, the surface of this material is scoured, converting it to MnO₂, which is further used to oxidise the iron. Simple backwash regenerates the manganese dioxide. No chemicals are required to regenerate the resin.

**Characteristics of INDION–ISR media**

1. The media size ranges from 0.3 to 1.2 mm
2. Being a catalyst, INDION-ISR is not consumed in iron removal, and as a result it gives tremendous life to media and produces iron free (<0.3 ppm) water.
3. It does not require chemicals for regeneration; only periodic backwashing is required to remove the precipitated iron. The media can be easily backwashed due to less density.
4. The media can work up to 2500 ppm total dissolved salts.
5. The INDION-ISR unit may be used in either gravity flow or pressurized water treatment systems with varied temperature range.
6. Service velocity of INDION-ISR is 15 m/h for inlet 10 ppm iron, but can be increased up to 25 m/h at lower concentration of the iron content. This ultimately reduces the cost of unit.
7. The backwash velocity of the unit is 26 m/h for 1 to 10 ppm iron concentration. INDION-ISR media requires a lesser bed depth and hence lesser quantity compared to other catalytic media quantity, thus reducing the cost.

8. The resin shows best performance where pH is above 6.5, total dissolved salt is <2500 ppm, alkalinity is at least 10% of combined chlorides and sulphates. The media can work at temperature between 25° to 45° C.

**Major Advantages of the media**

- Works with higher TDS and lower alkalinity levels
- Lower bed depth and higher velocity, hence reduced cost
- Uniform distribution of manganese dioxide throughout the resin matrix structure gives higher efficiency
- Due to the spherical nature of the particles, backwashing completely removes the precipitated iron, thus restoring the efficiency of the media to near original level.
Commercialisation of INDION-ISR Technology

Ion Exchange (India) Ltd. has commercialised the above technology for domestic and industrial use. The Point of Use (POU) device is developed mainly for domestic use. It is an online iron removal filter having 90 l/h flow rate and consists of two cartridges in series. Water passes through the first iron removal cartridge which selectively removes iron, odour and colour from the water. The second cartridge is a sediment filter that traps fine suspended particles in water.

De-Ferrous 500 device is a Point of Entry (POE) Unit used as a complete house water conditioning plant. It is connected to direct source of ground water.

How does De-Ferrous work?

De-Ferrous 500 consists of an FRP vessel which contains INDION-ISR media. A semi-automatic valve, which is mounted on this tank. The iron contaminated water enters through the inlet of valve, passes through the filter media where dissolved iron is removed. The treated water which comes out of the outlet is devoid of excessive iron. After consistent use, the filter media gets clogged with the iron precipitate and the unit needs to be backwashed. This can be done by injecting the same inlet water into the vessel under high pressure for 15 -20 minutes. The performance of De-Ferrous depends entirely on the backwash. It is essential that regular backwash is done to ensure iron free water at all times.

Scope of Media for Industrial Use

The INDION-ISR De-ferrous unit can be directly attached to borewell. However pretreatment is required if suspended solids in the underground water are above 10 ppm.

The treated water from INDION - ISR De-ferrous unit will have iron in the range of 0.1 to 0.3ppm. The feed water to the ion exchange system or RO system requires iron below 0.1ppm. The iron content of 0.3 ppm from the De-ferrous unit can be further reduced to 0.1 ppm or less, by removal of fine colloidal iron precipitates by it passing through a sand filter, carbon filter or any other sediment filter.

Conclusion

INDION – ISR media is an excellent media for iron removal from ground water. Its performance is proven through laboratory and field studies. The POU and POE devices are designed for user friendly domestic use. It can also be applied for industrial use or as pretreatment to reverse osmosis systems.

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