

Technical Bulletin

INDION[®] ISR

(IRON SPECIFIC RESIN)



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Introduction

Iron is a common metallic element found in nature. Water percolating through soil and rocks dissolves Iron present in it, which subsequently enters into ground water bodies. In deep wells and springs, where both oxygen and pH content tend to be low, water containing dissolved Iron appears colorless. When the same water is exposed to air, the dissolved Iron reacts with atmospheric oxygen and converts to yellow colored suspended particles which finally forms a reddish brown residue. High concentration of Iron cause reddish brown stains on laundry and household fixtures, sometimes clogs water distribution pipes and imparts a bittersweet or metallic taste to drinking water.

The following types of Iron can be found in potable water supplies

- Sequestering Iron
- Organic Iron - “Heme Iron”
- Iron Bacteria
- Ferric Hydroxide or Red Water Iron
- Ferrous Bicarbonate or Clear Water Iron

We see that Iron is found in many different forms. It is a challenge to remove Iron from water as the treatment method differs for each type for Iron. In India there is an acute problem of Iron in water. **The concentration of Iron range from 1 – 20 ppm in areas such as West Bengal, Assam, Tripura, Chhattisgarh and in the east coast (Chennai and surrounding areas) and groundwater of Bhubaneshwar is also found to be contaminated with higher concentration of Iron. This problem is faced in countries like Bangladesh, Malaysia and Kenya as well as in some part of the United States.**



Existing Iron Removal Methods

A. Oxidation & Chemical Precipitation Methods:

Aeration, Chlorination and Ozone are generally used to precipitate Iron in a retention tank. Supernatant water is then passed through sand filter to get Iron free water.

Demerits:

This requires large space and continuous monitoring. Precipitated Iron may cause clogging and rusting of pipes which affects the treatment cost.

B. Use of Green Sand

Naturally occurring green sand coated with Manganese results in purple - black resin and acts as catalyst to precipitate Iron and Manganese.

Demerits:

As density of resin is > 1.5 , the required backwash pressure and flow is high. Continuous regeneration increases the chemical and operating cost of the unit.

C. Ion Exchange Water Softener

Can treat low level Iron concentration (< 1 ppm).

Demerits:

Cleaning of resin is difficult. Oxidized Iron may reduce the operating capacity of softener resin.



INDION® ISR

INDION®ISR (Iron Specific Resin) is a resin based catalyst having catalytic moiety to promote the Iron and Manganese oxidation.

INDION® ISR is a patented product of Ion Exchange.

Basically, Iron and Oxygen are attached to catalytic moiety, which enhance the oxidation of dissolved Iron and Manganese and convert into insoluble ferric (Fe^{+++}) and MnO_2 , which can be filtered through the resin. Simple backwash is sufficient to recharge the resin (INDION®ISR).

INDION®ISR

➤ Efficiently removes Dissolved Iron to < 0.3 ppm as per BIS Standards 10500 -2012 for Drinking Water

➤ ***NSF-61 Gold seal Certification by WQA (Water Quality Asia). Hence, water is safe for Drinking***



Unique Features of **INDION® ISR**

- The resin size ranges from 0.3 to 1.2 mm therefore it also acts a filter resin, apart from Iron precipitation
- The resin doesn't get consumed in the process of Iron removal; as a result resin has longer life.
- Non- Chemical treatment; as no chemical is required for regeneration, simple backwash is sufficient to recharge the resin.
- The catalytic oxidation by the resin requires less contact time and hence, less bed depth.
- Negligible labor and operational cost, Easily adaptable.
- Due to spherical beads, resin undergoes less compaction.
- Increased service velocity at lower feed Iron content, resulting in cost reduction
- Operable in a wide range of temperature (20-40° C)
- Operates with high TDS (up to 2500 ppm) and lower alkalinity level
- Efficient in Manganese removal from 5 ppm to 0.05 ppm
- resin is CSIR approved



Design Guideline

Characteristics

Colour	Physical	Black
Form		Moist Beads
Wet Screen Grading		0.3 - 1.2 mm
Osmotic Strength		Good
Mechanical strength		Good
Voids		40% approximately
Bulk Density		0.8 kg/l
Particle Density (Wetted in water)		1.23 kg/l
Uniform Coefficient		1.7 max
Effective Size		0.45 - 0.5mm



Recommended Influent Limitations

U.S. Environmental Protection Agency (USEPA) 2004, WHO 2017 and IS 10500:2012 have listed Iron and Manganese in secondary drinking water standards, applicable to drinking water contaminants that cause offensive taste, odour, colour, corrosion, foaming or staining problems. Secondary drinking water contaminants do not pose risks to humans at the levels usually found in natural water.

Drinking water standard for Iron is 0.3 ppm as per USEPA, WHO & IS. For Manganese, it is 0.1 ppm (WHO 2017), 0.05 ppm (USEPA 2004) and 0.3 ppm (IS 10500:2012).



Design Guideline

Suggested Feed Water Characteristics

Sr. No.	Parameter	Specification/ Value
1	pH	> 7
2	Dissolved Oxygen	minimum 15% Iron content
3	Alkalinity	100 ppm, minimum
4	Hydrogen Sulfide	Nil
5	Oil	Nil
6	Free Chlorine	Nil
7	Organic Matter	< 1 ppm
8	Total Dissolved Solids	2500 ppm, max
9	Total Suspended Solids	10 ppm, max
10	Temperature range	20 – 40 degree Celsius
11	Iron (as Fe)	10 ppm, max
12	Manganese (as Mn)	5 ppm, max

Suggested Operating Conditions

Feed Iron < 10 ppm	
Bed Depth	0.7 m
Service Velocity	10 – 22 m/h
Backwash Velocity	8 – 10 m/h
Backwash Frequency	ΔP of 0.4 - 0.6 kgf/cm ²
Backwash Time	15-20min
Backwash Bed expansion	40-50%

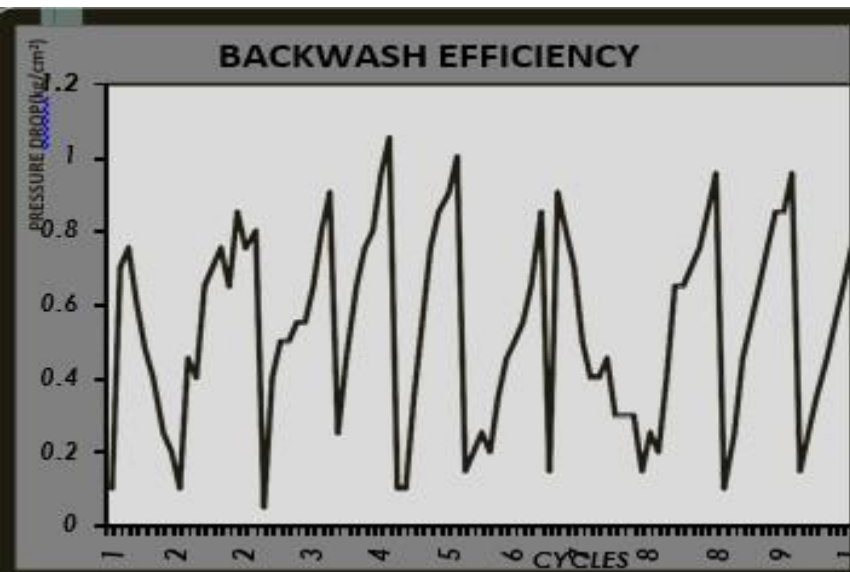
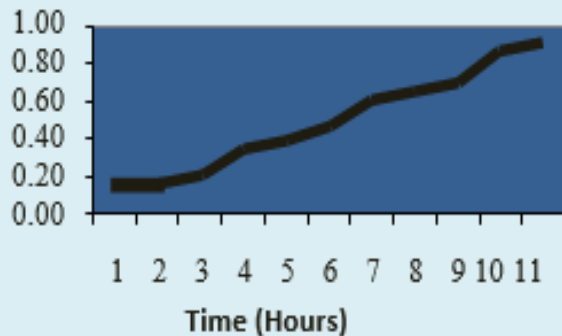
** In Ground and Surface Water Treatment, Depending upon the further application of treated water and the desired concentration of Iron & Manganese , the design of resin vessel will be customized by Ion Exchange (I) Ltd.*



System Hydraulics

AVERAGE PRESSURE DROP STUDY

Service velocity = 10 - 15 m/h, Iron = 10 ppm,
Number of cycles = 10



Applications of **INDION®** ISR

**POU device
(POU)**



Pre-treatment to drinking water systems

**Household applications like pretreatment to washing machines, bathroom showers
Other Domestic Applications.**



**HPA
Unit**



Directly attach to Hand pump, Ideal for Rural communities- Sturdy, Economical, No chemicals and Electricity required. Hence applicable in remote areas



**Community
Based units**



Drinking water for residential colonies and commercial complexes

Suitable for Hospitals, Hotels, schools, college, corporate offices and other institutions



**Industrial
plants**



Pre treatment for Industrial water treatment plants

Beverage, Food processing and mineral water.

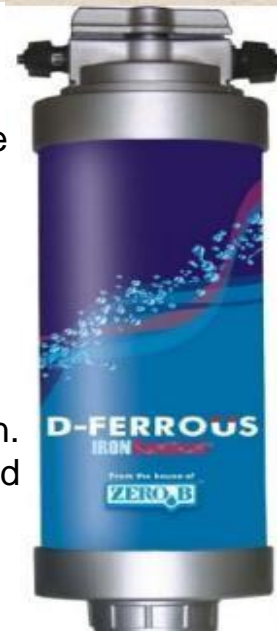
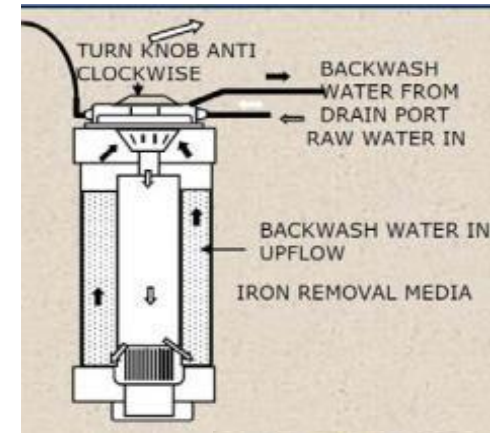
Pre treatment to cooling towers



Point of Use (POU) Unit

- POU device is an online Iron removal gravity filter that handles 90 litres per hour. In this mode, the knob should be in straight position.
- The raw water enters the inlet port, passes downward through the resin bed which facilitates the conversion of dissolved Iron to insoluble Iron.
- This precipitated Iron settles down on the resin bed and water free of Iron is then pushed through the bottom distributor through the riser pipe to the outlet port.
- The product water is delivered through outlet port. In this mode drain port inactive. In this way the unit delivers Iron free water.
- The product water is delivered through outlet port. In this mode drain port inactive. In this way the unit delivers Iron free water.
- In backwash mode, the knob should be turned anticlockwise. During backwash mode the flow of water is reversed.
- The incoming water passes through the riser pipe and flows upwards through the resin resin. During this reverse flow, the resin bed and trapped dirt is loosened, precipitated Iron is flushed through the drain port. There will be no water at the outlet port.

Along with Iron, it will also reduce Manganese upto drinking limit, if any, present in water



Hand Pump attachment (HPA) Unit

Unique Features

- Economical
- Sturdy
- Does not require electricity
- Easy to operate
- No chemicals required
- Ideal for rural applications
- Long life
- Flow of unit is 8-10 lpm
- Along with Iron, it will also reduce Manganese upto drinking limit, if any, present in water



Time: 21-09-2020 11:39
Note: SI no 56/mkg/MV 10/1000 Subject: Manganese

Powered by MoteCam



Point of Entry (POE) units

- **De-Ferrous POE** is a complete house water conditioning plant, which will be primarily connected to direct source of ground water.

-**De-Ferrous 500** has FRP vessel which contains filter resin. The performance of the unit is controlled by Multiport valve, which is mounted on the tank.

- The Iron contaminated water enters through the inlet of the valve and passes through the filter resin where dissolved ferrous Iron is converted to ferric Iron which is insoluble in water and gets trapped in the Iron removal resin.

- The treated water which comes out of the outlet, is devoid of excessive Iron. After consistent use, the filter resin gets clogged with the Iron precipitate and the unit needs to be backwashed. In order to do this, the same inlet water is injected into the vessel under high pressure for 15 - 20 minutes.

- The filter resin gets rubbed against each other thereby releasing the trapped Iron precipitate which is washed out through the drain. Performance of De-ferrous depends entirely on the backwash. It is mandatory to do backwash regularly to ensure that you get Iron free water at all times.

- **Along with Iron, it will also reduce Manganese upto drinking limit, if any, present in water**



- **Economical, Sturdy**
- **Maintenance Free**
- **No chemical regeneration. Backwash is sufficient**
- **Easy to Operate**
- **Provides consistent quality & quantity of water**
- **Ideal for Rural, Domestic, Commercial, Industrial**



Standard Systems for Domestic & Industrial Design

Model	Flow Rate (m ³ /h)	Specifications
NGIF* 1	1.0	<ul style="list-style-type: none">➤ One vertical cylindrical FRP pressure vessel.➤ One initial charge of under bed material and ISR resin.➤ One set of frontal pipe work and valves➤ Two pressure gauges to monitor head loss across the IRF system.➤ Maximum / minimum operating pressure will be 3.5 kg/cm² and 2.0 kg / cm² gm respectively.➤ INDION IRF systems are extended range up to 3000 mm diameters.
NGIF 2	2.0	
NGIF 5	5.0	
NGIF 7	7.5	
NGIF 10	10.0	
NGIF 12	12.0	
NGIF 15	15.0	
NGIF 17	18.0	
NGIF 20	20.0	

Note: Industrial systems available as per design specifications in mild steel pressure vessel



Commercial success



More than 2000 HPA have been sold across India

45m³/Hr Iron Removal & softening Plant-

0.6m³/Hr RO with Iron removal Pretreatment



Iron Removal & softening Plant- Raspunja



Packaging, storage and safety

Packing Specifications

The resin is supplied in 180 liters of mild steel with plastic liner or in plastic drum. It can also be supplied in 50 liter bags.

Storage

INDION® ISR requires proper care at all times. The resin should not be stored in a dry condition. Always keep the resin drum in shade. Recommended temperature is between 20° to 40° C



Thank You

www.ionresins.com

