

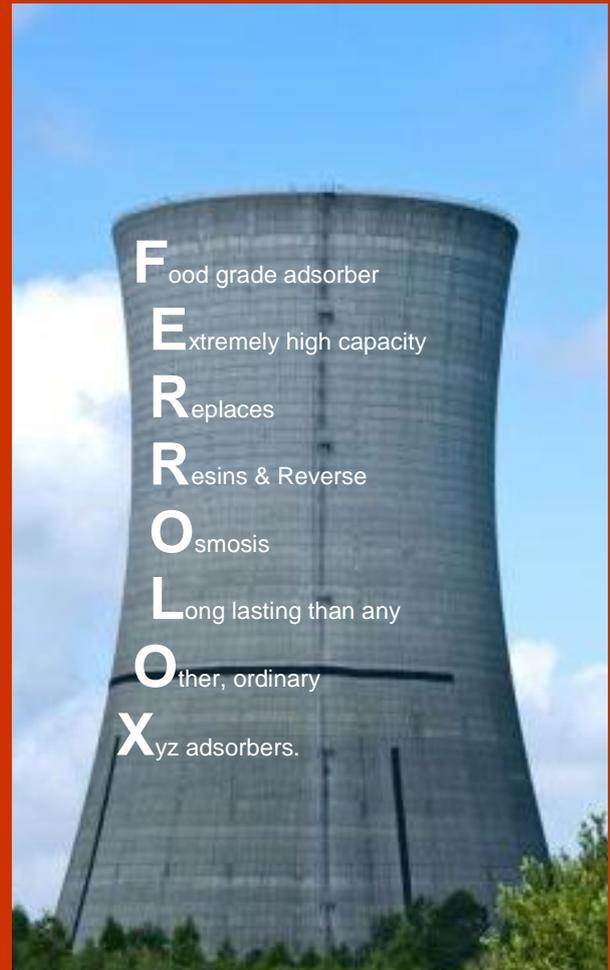
FERROLOX FOR COOLING TOWERS

A New Technology to handle Heavy Metals and Copper

Introduction

Heavy Metals residuals

Heavy Metals residuals has become a big issue and great concern for worldwide cooling waters and cooling water blow-down in all industrial manufacturers and utilities. One of the very major concern in **COPPER**, which can be released as a result of metals in the feed water as well as corrosion in cooling tower systems. These system components are Pumps, Condenser coils, Heat exchangers, all surfaces and many more reasons. It is also contained in biocides such as isothiazolin. May be residuals of Heavy Metals and Copper in feed water are low but they have very highly concentrated by cycling the cooling tower water.



IMPORTANT

All Government and Environmental regulators worldwide have setup a maximum discharge level of copper to less than 10 micrograms/liter. No blow down will be allowed more than this level to surface or any sanitary sewer systems. Additionally, all municipalities are concerned about the impact that copper from cooling tower discharges are poisoning the biology in all clarifiers as copper over this limit is highly toxic to fish and plants. All river and lakes are found to be toxic actually from cooling water discharges.

For Cooling water blow-down

Without Chemicals
Without Ion-Exchanger
Without Membranes
Without Antiscalants

WATCH WATER FILTRATION TECHNOLOGY

Leading Manufacturer of Filtration Media for Water Treatment

FERROLOX IN COOLING TOWERS

BLOW DOWN FROM COOLING TOWERS

Ion Exchange, Membrane filtration, flocculation and precipitation all of these technologies have huge drawbacks, such as creating a significant regenerated effluent or high concentrates in waste stream, which requires either a significant application of chemistry (chemicals) or a very intensive capital expenses. Due to the cooling towers' high flow rates, (which is sometimes an average of 500 liters to 30000 liters (132 - 7925 gallons) per minute) the operators cannot adjust the pH so fast or add so much chemicals needed to avoid corrosion. All cooling towers have huge leakage of heavy metals and the only alternative choice to all the traditional methods mentioned above is Adsorption. An adsorption systems of **FERROLOX**[®] in pressure vessels in series and each of it can be loaded with proprietary metals removal media. **FERROLOX**[®] is the only choice due to its high affinity and high capacity for Copper. Once adsorbed, the copper cannot leave the media. The media does not require regeneration, backwash, valves, electricity and does not waste water. As such, the **FERROLOX**[®] can be disposed off as non-hazardous waste or solid. Common cations like sodium, calcium or magnesium are pass-through ions and do not react with the media.

The average removal rate of Copper will always be more than 99% throughout the service. The exchange should be done on concentration level of maximum 12 micrograms/liter. No pH adjustment is required like in ion exchange or reverse osmosis.

Watch is always ahead with all Adsorbers available in the market knowing that with high and increased regulations on waste water, all cooling towers operators will now need to start treating their cooling tower blow down. Therefore, a very simple **FERROLOX**[®] solution, that is not adding acids, chemicals or create a huge and intensive hazardous waste that will then need to be treated by far expensive systems. Among all metal removal systems, Ferrolox metals removal media is the simplest and the finest choice and a simplified solution as well. The use of the **FERROLOX**[®] media is not equipment intensive. It is easy to run from 50 liters/minute up to 50000 liters/minute from a small cooling tower up to a nuclear power plant.

Ferrolox adsorbent can
Eliminate all Ion-Exchange systems without any
Regeneration and waste products from
Reverse osmosis concentrates, it is the
Only solution to adsorb and
Load six worst contaminants in
Our drinking water problem having

WATCH WATER FILTRATION TECHNOLOGY

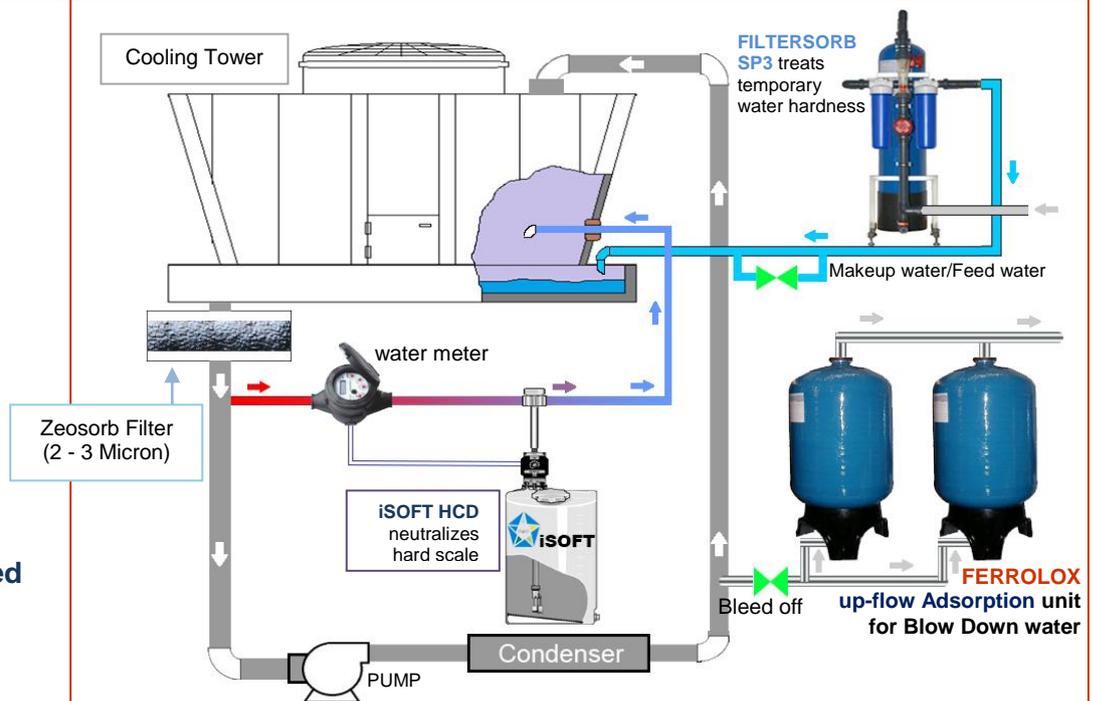
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COOLING TOWERS

BLOW DOWN

ADVANTAGES

- Cost Effective
- Less Chemical required
- Less hazardous chemicals
- Better control of bacteria
- Innovative Technology
- Only one injection pump
- Water can be reused for irrigation



Typical Cooling loop with **complete Scale Prevention + Corrosion Control + Blow Down Solution**

NO CHEMICALS RELEASED INTO ENVIRONMENT

Description

Among various available technologies for water pollution "FERROLOX[®] adsorption" process is considered better than compared to all other conventional methods because of convenience, easy operation and simplicity of design. FERROLOX[®] is one of them to remove Arsenic, phosphates, copper, hydrogen sulfide. FERROLOX[®] is the best solution to remove toxic metals from water. The adsorption capacity of FERROLOX[®] is 12 to 14 grams of copper. To replace the ion-exchange and membrane treatment which are both very expensive only inexpensive FERROLOX[®] is available with very satisfactory results.

NOTE:

Concentration of Arsenic & other contaminants can be expressed as Micrograms per liter, abbreviated as µg/L, milligram per liter (mg/L), parts per billion (ppb) or parts per million (ppm).

1 microgram per liter (µg/L) = 1 parts per billion (ppb)
1 milligram per liter (mg/L) = 1 parts per million (ppm)

10 microgram per liter (µg/L or ppb) is same as 0.01 milligram per liter (mg/L or ppm)

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ONLY - FERROLOX

Options for Copper removal

- **Never Membrane Filtration:**

Many cooling towers are applying Reverse Osmosis or Ultra filtration membranes to remove copper from feed water as well as blow down water. Both these technologies have shown good results to make good quality water but what happens to the concentrates or waste stream which must be treated with chemicals to precipitate the copper or other heavy metals! It also needs additional chemicals to remove oxidants such as chlorine or bromine which can degrade the membranes and they can only be removed with Activated Carbon or bisulfate prior to membrane treatment, and also Antiscalants, so every operator of cooling towers has his own chemical yard. **FERROLOX®** is the only choice to go green.

- **Never Ion Exchange:
(NO RESINS NO CRY)**

Oh God!

How can any ion exchange resins can decrease heavy metals or copper concentrations to the required discharge limits ? Selective resins, chelating resins, weak acid cation resins, this resins that resins, this acid to regenerate that resins to recondition - waste water units again acids or alkalis to regulate pH, crazy !! When the resins are exhausted the operator of the systems exhaust faster. The regeneration process will create a huge nuisance of concentrates waste system that needs to be treated or ?

Think of **FERROLOX®**. Thank God.

IMPORTANT !

By decreasing the cycles of operation, the heavy metals or copper will be lower level in the blow-down. This method may need little increase in water but much less chemicals.

Material Properties

Chemical formula and composition:
Amorphous $Fe(OH)_3$

Mineralogical composition:
Up to 40% of Ferric Ions from its weight.

Physical Properties:

Bulk weight	640 kg/m ³
Porosity	min. 70%
Humidity	~ 10%
Fe(OH) ₃	min. 75%
Specific surface	270 m ² /gram
Color	Dark brown
Mesh size	0.5-2.0 mm x 2.0-4.0 mm

Physical Data

Operation conditions and exchange capacity

Bed depth up flow	70 - 75%
Freeboard up flow	10 - 20%
Bed depth down flow	450 - 1500 mm
Freeboard down flow	50 - 75%
Service flow rate	10 - 20 m/h
Back wash flow rate	25 - 30 m/h
Total adsorption capacity for P ⁵⁺	15 g/kg
Total adsorption capacity for As ⁵⁺	12 g/kg
Oxidation capacity for H ₂ S	Up to 20% of its dry weight
pH	5 - 9



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