A Guide to Types of Water Treatment

Water softeners and limescale treatments:

Electronic or Magnetic Water Descalers
These devices operate by wrapping coils of wire or fixed magnets around the incoming water main to pass a magnetic field through the water. The causes the calcium in the water to stay in solution, thereby inhibiting it from adhering to taps, baths and kettles. Electronic descalers typically operate with one coil, but a few (such as Eddy) use two. This feature increases the time for which the water is exposed to the magnetic waveform.

Water Softeners
A water softener works on the principle of cation (ion exchange) in which ions of the hardness minerals (such as calcium and magnesium) are exchanged for sodium or potassium ions, effectively reducing the concentration of hardness minerals to tolerable levels. Water softeners add a slight amount of salt to the water, which has the effect of greatly reducing the amount of dissolved limescale (which is released when the water is heated). They are suitable for dishwashing or laundry, or other purposes where the water is not directly used for consumption. The least expensive form of water treatment, it can lead to streaking of glasses in glass washers and over time, the salt can corrode welds on internal pipe-work.

There are three basic types of ion transfer softeners available on the market:

Automatic Softener
This type of softener is connected to a clock timer, which at certain time intervals begins the renewal process by flushing out the hard ions stuck to the resin and replacing them with the soft ions. This then allows for a constant exchange of hard and soft ions throughout the day.

Demand Initiated Regeneration (DIR)
With a DIR, regeneration occurs only when soft water has run out. Since this system adjusts to the amount of water utilized as opposed to the automatic type, it uses less salt and water and is more efficient.

Portable Exchange
Here, a tank is rented to the homeowner and has a regenerated resin. When the resin can no longer exchange ions, the tank is returned to the company, where it is regenerated.

Water filtering and disinfection:

Chlorination
Both municipal systems and households usually disinfect water by adding chlorine. Chlorination does not remove nitrate or other chemicals, but may oxidize organics and some other minerals such as iron. Chlorine metering pumps have to be calibrated and maintained carefully. Using a carbon filter after chlorination removes any excess chlorine and chlorine-based chemicals that may form.Distillation Units

Distillation removes most impurities from water, including minerals such as sodium, nitrate, and sulfate, and many organic chemicals. Distillation units boil water to generate steam, which is then condensed and collected as purified water. Most impurities remain in the heating chamber and should be periodically removed. Units vary from the kitchen countertop size to larger units.

De-alkalising Units
These units are essentially remove the hardness are are commonly reffered to as calcium treatment units. De-alkalising units are suitable for steamers, combi-ovens, icemakers beverage machines and vending machines.

De-mineralisation Units
De-mineralisation removes almost all the dissolved minerals and hardness in the water. These units are useful for glass washers where there has been a history of smearing on glasses due to high levels of dissolved salts in the washing water.

Activated Carbon Filters
Activated carbon filters (also known as carbon or charcoal filters) treat general taste and odour problems, including

chlorine residue. When water flows through carbon filters, contaminants adsorb or stick to the surfaces of the carbon particles. Activated carbon filters are considered the best method available for removing specific organic chemicals, including some pesticide residues.

Mechanical Filters
Mechanical filters trap, through a straining process, soil, sand, and other suspended particles in water. These filters reduce turbidity in water, and improve its appearance.

Iron Removal Equipment
Iron and manganese can cause staining of clothes and plumbing fixtures. While ferric (soluble) iron usually appears as rust colored particles floating or settling in the water, ferrous iron is in the dissolved form and cannot be seen in water. When water containing ferrous iron is exposed to air, the iron oxidizes and ferric iron is produced. Five types of iron-removal equipment are available:

Iron Filter
Iron filters are only useful for removal of soluble iron and manganese. These filters look like water softeners but contain a bed of natural or synthetic manganese green sand. Manganese dioxide oxidizes iron and manganese, and the oxidized particles are then filtered out in the lower part of the bed. Most such filters can remove 75 Ç 90% of ion in concentrations as high as 10 Ç 15 mg\litre.

Iron removal
Water softeners contain a zeolite mineral in the resin that removes soluble iron on an ion-exchange basis (the same way calcium and magnesium are removed in water softening). Depending on the kind of zeolite used and the regeneration process, up to 5 mg per litre of soluble iron can be removed. The slime produced by iron bacteria clogs the zeolite and reduces its effectiveness.

Polyphosphate Feeders
These units can handle up to 3 mg\l of iron in solution. Polyphosphate feeders contain a phosphate compound that coats the soluble iron and prevents its oxidation when the water is exposed to air. The compound is not effective against ferric iron that has already oxidized. Polyphosphate is only helpful in treating cold water. Heating the water releases the iron so that oxidized iron accumulates in the water heater. This heated water will be rusty and unsatisfactory for home use.

Chlorinator and Filter
Chlorination followed by filtration through a sand filter can remove iron in any form. The chlorine oxidizes and precipitates the iron, and the filter filters out the particles. Carbon filtration, however, may be required to remove excess chlorine residue. This method also destroys iron bacteria. When the bacteria cannot be permanently eliminated by shock chlorination, continuous chlorination is needed.

Aerator and Filter
An alternative to chlorination for iron removal is that of aeration followed by filtration. An aerator introduces oxygen into the water, thereby causing ferrous iron to precipitate through oxidation.

Neutralizers
This system treats corrosive (acidic) water by increasing alkalinity, resulting in a pH near 7.0. Reducing corrosivity may also lower the concentration of harmful metals, such as lead and copper, that may be dissolved from pipe walls and fittings.

Reverse Osmosis
A reverse osmosis unit substantially removes most suspended and dissolved matter from water. The water is forced under pressure through a very thin filtering membrane, like a sieve, that allow water molecules, but not larger compounds. Water flushes away the contaminants held by the membrane, thereby removing not just the harmful limescale but also many other trace elements that may change the flavour of beverages.