HYDROPATH

SPECIALISTS IN WATER CARE TECHNOLOGY

Comparison of HydroFlow with Other Water Conditioners

Below we describe some of the ways water can be treated for limescale.

- Chemical treatment (softeners, anti-scalant)
- Double-wire wrap
- Electrolytic
- Magnetic (magnets, electromagnets, single wire wrap)
- HydroFlow Technology

There are two main categories of ways to deal with limescale, physical (like HydroFlow) or chemical. We will not discuss the chemical treatments too much detail, but let us in take a brief look at them.

Chemical treatment: Softeners

Limescale forms when ions in the water crystalise out onto the surfaces of equipment. One of the crudest ways to prevent limescale is therefore to simply remove all of the ions from the water. This is often done in what is called an ion exchange softener (Figure 1). The idea in these is to replace the calcium ions with something else that will not cause scale, usually sodium. This is done by passing water over a resin than contains some replacement ions, which will then change places with the calcium ions in the water. Sometimes a second type of resin is used to also remove the bicarbonate ions as well.

There are several obvious disadvantages of these:

- They change the chemical composition of the water:
- The water will contain more sodium, which many people are trying to reduce in their diet.
- Softened water is considered bad to drink by many people.
- Water will not have the same feel when washing, and may feel “slimy” (or “silky” as described by softener manufacturers!)
- The water can become more corrosive
- As with all chemical treatments, the chemicals will be used up over time and will continually need replacing

Physical conditioners

Our view is that all physical water conditioners follow the same basic principle: they try to encourage the ions to form small suspended crystals in the water rather than a solid mass of crystals on pipes or equipment (other manufacturers may not agree!). To do this they need to manipulate the ions in some way. HydroFlow manipulates the ions using electric fields, but another common way of doing this is to use magnetic fields.

Double Coil System

In these types of device, two coils are wrapped around the pipe (Figure 2). These devices attempt to get an electric field into the pipe, but are doing this in a very inefficient way. This is in contrast to the HydroFlow system of using the ferrite/ transformer technology to directly put a current along the pipe. The difference in the amount of power transferred to the pipe (and the water) is huge: testing shows that the HydroFlow unit can put about 30,000 times more power into the water than a double coil system.

These double-coil systems also have a high tendency to cause interference with radios and other electronic devices.

- Very weak signal
- High level of interference

Electrolytic

Electrolytic devices function effectively as a battery.

These devices consist of two electrodes of different metals placed in the water (Figure 3). Just as in a battery, a voltage develops between them and there is a local electric field.

- Just as a battery will run down, so the electrodes will stop producing a voltage – they are gradually being used up. They will have to be replaced to maintain the conditioning.
- It is impossible to know how long it will take to lose effectiveness due to different water conditions – the customer has to guess.
- Metal ions are released into the water.
- The effect only occurs at a particular point, meaning all the usual problems with intermittent flow occur.
- In many of these devices, the copper pipe itself functions as one of the electrodes – this means that the pipe corrodes over time.

Physical conditioners: Magnetic

Some very common types of physical water conditioners rely on magnetic fields to affect the ions in the water. One type uses permanent magnets, either outside the pipe or protruding through the pipe into the water. A very similar type replaces the permanent magnets with electromagnets (a coil wrapped around an iron core) which acts in the same way. The other type uses a coil of wire passed around the pipe, which essentially acts like an electromagnet.

How do magnetic fields affect the ions? Ions are atoms or small molecules which have too many or too few electrons, and so carry an electric charge. This can be either positive (e.g. calcium) or negative (e.g. bicarbonate). Charged particles are affected by both electric and magnetic fields, but the way this happens is rather different.

Magnetic fields, very roughly speaking, affect electric charges in a much weaker way than electric fields.

One way of remembering this is that *electric charges* are strongly affected by *electric fields*, and less so by *magnetic fields.*

A charged particle will only be affected by a magnetic field when it is moving; a stationary charged particle feels no force due to a magnetic field (this is basic physics[1]). This means that the magnetic devices require moving water before they can affect the ions *at all*. Whenever the water is still, there is no treatment of the system. Considering that water in a house is rarely flowing constantly, this means that the water is only being treated about one hour in every 24 (about 4% of the time).

The magnetic fields do not propagate very far, so that the water is only treated as it passes through the device (as we shall see this is very different from the electric fields used by HydroFlow). When combined with the fact that the water is only treated when it flows, this means that as soon as the water passes out of the magnetic conditioner, any treatment begins to decay. If the tap is closed for a while, the treatment decays, and so when the tap is turned on again the first water out of the tap will be untreated.

One further problem with the electromagnets is that over time, they will attract small magnetic particles which build on the magnets, reduce the magnets' effectiveness, and can cause blockages. The electromagnets have the advantage that they can be turned off, releasing the built up particles.

- Magnetic fields only affect the ions when the water is moving.
- The fields are local (at a point) so the water is only treated at a single point.
- The effect starts to decay as soon the water passes that point, causing a problem with intermittent flow.
- Magnetic fields generally act more weakly on electric charges than electric fields.
- Magnetic particles can build up, reducing effectiveness and causing blockages.

HydroFlow in contrast to magnetic conditioners.

HydroFlow Technology uses electric rather than magnetic fields. The way this field is transmitted into the system means that the signal propagates both up- and downstream, all the way through the system.

The reason the HydroFlow signal propagates, unlike the magnetic field from the other devices is due to how the signal is applied. One way of thinking about this is that the magnetic field is applied from *outside* by the magnets, whereas HydroFlow technology essentially makes the pipes part of an electrical circuit, and *induces* a current along the pipe. This is done in exactly the same way as a transformer, by making the pipe and the water effectively the secondary coil of the transformer (Figure 5). Just as a wire in a circuit carries current all through the wire, so the pipe carries the current all along the wire.

Electric fields affect the ions much more strongly than magnetic fields, and so they experience a larger force. Electric fields, unlike magnetic fields, affect electric charges whether they are moving or not. This means that the HydroFlow signal is continually treating the water in the house. Furthermore, the treatment affect does not depend on how fast the water is flowing.

Because the signal propagates and is continually treating the water, when you return to your house after a vacation, the first drop of water out of the tap, and the first drop into the boiler will be treated. This is completely unlike the magnetic conditioners.

- Does not use chemicals and so
    - Does not alter the composition of the water
    - Does not require replacement
- Uses Electric fields
- Propagates the signal all along the pipe
- Works independent of flow
- Gives constant 24hr Protection