

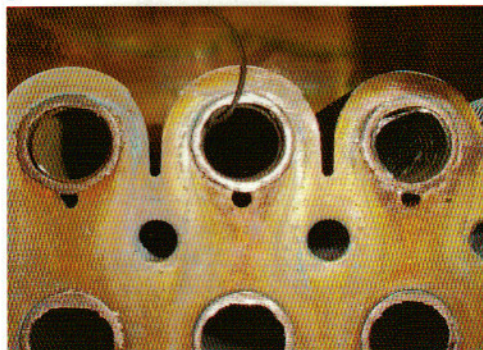
Tipping the Scale

Physical water conditioners can help fight tankless-killing scale *By Jonny Secombe*

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The increasing use of tankless heaters across the USA has focused attention on the problems of calcium scaling caused by the hard water found in many parts of the country. Just as tankless can be more energy efficient than a tank heater, their tendency to scale up causes them to lose efficiency, ultimately resulting in potential complete failure of the heater.



Above: A cut-away view of a tankless heater descaled by an electronic physical water conditioner. Note the length of wire sticking out. This wire is welded in a coil inside the heater to induce turbulence for better heat transfer. It also significantly increases the tendency for scaling as a result of the pressure drop in the turbulence. Aqua-Rex photo.

Limescale is roughly 400 times less conductive of heat than copper so a layer of scale inside a heat exchanger acts as an insulator for heat transfer. A commonly quoted statistic is that one eighth of an inch of scale can lead to a 12 percent efficiency loss. If you have just paid a few hundred extra bucks for a high-efficiency water heater it is a bit disconcerting to think all of that money could be wasted in a few months after the heater has scaled up a bit.

So what can be done about it? Is it practical to fit a water softener in front of every tankless heater? Of course not, so what are the alternatives? There are various so-called filters which are actually dosing silico phosphates into the water supply which is fine if

you are happy to periodically refill with phosphates and to accept the consequences of increased phosphates in the waste water stream. You can try citric acid but again you have to replace the cartridge periodically.

In the UK there is widespread use of physical water conditioners, so much so that now about 95 percent of all hard water treatment uses such technology. What type of technology is this that is so widely used?

Magnets are still used in the UK but they have a poor reputation in the USA, understandably so. Generally magnets dose zinc into the water by causing a DC current to corrode a zinc surface acting as an anode. Zinc hydroxide in the water acts as a nucleation seed to attract the scale to bond to it rather than the surfaces where the scale would normally attach. It can be very effective but its life is limited, normally because of "passivity" occurring on the anode so the process slows up and stops. Typically a magnet that has an effective life of two years in the UK can stop being effective in a quarter or less of that time when exposed to Colorado water.

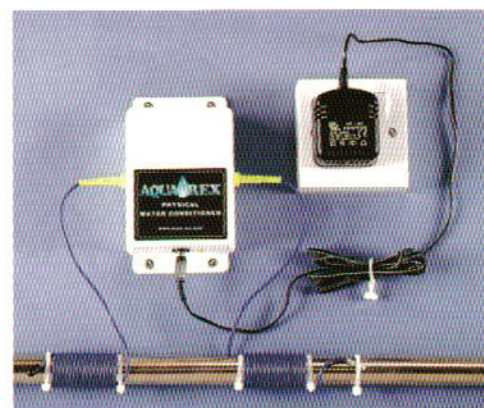
A longer-term solution can be provided by some form of electronic PWC of which there are many types, some considerably more effective and reliable than others. Generally the electronic PWC is acting indirectly to generate nucleation seeds from ions already in the water supply. Typically iron in one form or another can be stimulated by electromagnetic forces to act as a nucleation seed for scale, forcing it to form in suspension in the water, rather like chalk dust. Once in suspension the scale will not adhere to

surfaces and thus is no longer a problem in a heater.

Some of the more effective electronic physical water conditioners can also descale an existing heater. The scale breaks up where it is attached to the surface of the heater exchanger.

The resulting debris can cause problems of its own, blocking strainers and aerators for example. Normally this problem is shortlived, the descaling taking place over the first six or seven weeks following installation after which the problem disappears. Currently there is no scientific explanation for this phenomena but the results are clear for all to see.

A very few PWC's using radio wave technology can treat heaters installed both upstream and downstream from the unit thus making their installation very flexible and allowing the effect to cover all the water used in the home and even



An example of an electronic physical water conditioner. Installing one will go a long way toward keeping that tankless heat exchanger clean. Aqua-Rex photo.

in some cases the swimming pool.

Generally electronic PWC's require no maintenance or servicing and some have a design life in excess of 25 years. On the whole they can be very effective in most water supplies.