Power flushing extends pump and boiler service life.

The importance of maintaining a heating system in clean condition has long been recognised as desirable from the efficiency and fuel saving aspects, whilst boiler manufacturers have focussed on its effect on boiler reliability and service life.

Modern high efficiency boilers tend to be more compact and to have smaller waterways. Whilst the gains in efficiency and fuel savings are very welcome, the 'down-side' is that it is now critical to maintain the rest of the heating system in as clean a condition as possible.
The drive towards extended boiler warranties of five years and upwards is a bold move by the manufacturers and can only be supported if heating engineers play their part in preparing a system properly for the installation of a new boiler, and that includes rigorous cleaning of a system.

Whilst it can be tempting to think that all that is necessary to clean and protect a system is to install a compact magnetic filter in the return pipe work to the boiler, as always in life things really aren't that simple - or cheap!

Some engineers suggest that temporarily fitting a larger magnetic filter into the system and circulating a cleaning chemical for a couple of hours is quite adequate. The belief that a heating system can be thoroughly cleaned in two hours sounds an attractive proposition, but as most experienced heating engineers know, if it sounds too good to be true, it usually is.

Why? There are five good reasons why this is not suitable for systems other than those with only very modest contamination [##].

1. This system relies on the standard heating system circulator pump to drive the debris to the magnetic filter, which may be many metres away. Circulator pumps are designed to circulate the water at a relatively leisurely pace, and this is a contributory factor to heavier particles of debris falling out of circulation and accumulating in areas of extra low flow, such as the base of radiators. Scientific research has proved that the amount of debris removed from a water system is directly related to the velocity of the flushing water – the higher the velocity, the better the effect. Without a high flow rate heavier debris has little incentive to move, and so settles and compacts in radiators.

2. Whilst there are concerns about even a circulator pump in good condition being able to move debris, there is another factor to be considered. Historically, circulator pumps are themselves a 'magnet' for magnetic corrosion debris (see attached pictures). The magnetic field generated by the electric motor attracts debris which then accumulates in pump passageways and in the impellor, dramatically reducing what is already a low flow rate.
This is a problem which is only set to increase as new high efficiency circulator pumps enter the market. Most of these now have permanent magnet electric motors, and generate a magnetic field at all times, not just when the pump is running.

Users and manufacturers of these pumps are already beginning to flag up performance concerns about pumps installed in systems which contain corrosion debris, and this will inevitably lead to combination boiler manufacturers insisting on greater system cleanliness when a new boiler (with permanent magnet motor) is installed on an existing system. In systems with a high load of corrosion debris these pumps tend to accumulate a layer of magnetic debris on the rotor, lowering both the system and pump efficiency significantly, with further debris causing the rotor to seize.

It may even be prudent in future to insist on a thorough flush whenever a new 'stand alone' pump is installed, let alone when a new boiler installation takes place.

There should also be consideration in the next revision of BS7593 (The Code of Practice for treatment of water in domestic hot water central heating systems) of specifying an inspection of the circulator pump before any system cleaning operation, and disassembly, cleaning, or replacement if necessary.

3. In a heating system, the pump, and therefore the water, only ever travels in one direction. This leads to areas of low flow, again typically in the base of radiators, where debris collects sheltered from the flow of water, and unless the direction of flow can be rapidly reversed, this debris will remain untouched.

4. A power flushing magnet can only collect debris passing within a few centimetres of the magnet, and so without the assistance of a vigorous flow rate generated by a power flushing pump, accumulated deposits will remain static within radiators and pipe work, continuing to diminish the efficiency of the system. The situation is complicated by the fact that sludge and corrosion debris is a variable mixture of magnetic and non-magnetic debris, and engineers need to be aware that the non-magnetic debris will not be captured by a magnetic filter and will continue to circulate unless it can be driven from the system to waste by a high flow of water.

5. A temporary (or indeed a permanent) magnetic filter will not have any effect in cleaning and removing existing debris from the critical primary water side of plate heat exchangers in combination boiler systems, and therefore the heat exchanger would need to be cleaned separately. Less than 15gm of debris can be sufficient to impede the flow sufficiently for a boiler to 'lock out', and this is one of the reasons why boiler manufacturers encourage the use of a filter on the return flow to the boiler- **once it has been cleaned!**

<u>What's the answer to getting systems thoroughly clean?</u>

Whilst using a filter alone seems tempting as a cheap and quick proposition, it is simply no substitute for the well proven technique of power flushing when it comes to a thorough and effective system cleanse.

A good power flushing pump will have a much higher flow rate, generated by a large impellor to give high flow and the pressure needed to dislodge debris. See fig1 for a comparison in size between a power flushing pump impellor and that of a system circulator pump. The kinetic energy imparted to impacted debris as water slams into it increases with the square of the water velocity and this is why a high performance power flushing pump can remove far more debris than any other method of system cleansing.

Power flushing pumps should also incorporate an instantaneous flow reversal device to ensure that fast flowing turbulent water penetrates all areas of the heating system and can drive the debris to a point where it can be collected by a magnetic power flushing filter or in the case of non magnetic corrosion debris, forcibly discharged to waste.

Using a power flushing pump together with a magnetic filter gives the best of both worlds, reducing the time for a power flush and getting even the dirtiest of systems thoroughly clean.

This comment begs the question "How can you tell whether a heating system is only moderately contaminated" in order to decide whether to 'chance it' or go for a full power flush? An inspection and check of the water quality and colouration can confirm that a power flush is advised, BUT cannot be relied upon to indicate that a full flush is NOT necessary. Older systems can have perfectly clear system water because corrosion debris has formed and settled to the base of radiators, undisturbed by the normal lethargic system water flow, and waiting only for some minor change or work on the system to let it loose on the boiler.