Magnets are not enough

Powerflushing extends pump and boiler service life, says Keith MacBain of Kamco.

Modern high-efficiency boilers tend to be more compact and have smaller waterways. The gains that this gives in efficiency and fuel savings are very welcome, but the downside is that it becomes critical to maintain the rest of the heating system in as clean a condition as possible.

Extending boiler warranties to five years and upwards is a bold move by the manufacturers, and it can only be supported if gas engineers play their part in preparing systems properly before fitting a new boiler – and that includes rigorous cleaning.

It can be tempting to think that installing a compact magnetic filter in the return pipework to the boiler is all that is necessary to clean and protect a system. However, as always in life, things really aren't that simple – or cheap.

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

There are five good reasons why this method of cleaning is not suitable for heating systems, other than those with only very modest contamination:

1 It relies entirely 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 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.

Research has proven that the amount of debris removed from a water system is related directly 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 Historically, circulator pumps are themselves a magnet for magnetic corrosion debris (see Figure 1). The magnetic field generated by the electric motor attracts debris, which then accumulates in pump passageways and in the impeller, dramatically reducing what is already a low flow rate. This problem is 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.

In systems with a high volume 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.

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. Unless the direction of flow can be reversed rapidly, this debris will remain untouched.

4 A powerflushing magnet can only collect debris passing within a few centimetres of it. Without the assistance of a vigorous flow rate generated by a powerflushing pump, accumulated deposits will remain static within radiators and pipework, continuing to diminish the efficiency of the system. The situation is complicated by the fact that sludge and corrosion

Figure 1: Magnetic corrosion debris in a circulator pump

debris is a variable mixture of magnetic and non-magnetic debris – and engineers should 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 permanent, magnetic filter will not have any effect on cleaning and removing existing debris from the critical primary water side of plate heat exchangers in combi boiler systems. Therefore the heat exchanger would need to be cleaned separately.

Less than 15g of debris can be enough 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.

So, what's the answer to getting systems thoroughly clean? Using a filter alone seems tempting as a cheap and quick proposition, but it is simply no substitute for the well-proven technique of powerflushing when it comes to a thorough and effective system cleanse.

A good powerflushing pump will have a much higher flow rate, generated by a large impeller, to give high flow and the force required to dislodge debris. Figure 2 compares the size of a powerflushing pump impeller with a system circulator pump. The kinetic energy imparted to impacted debris as water slams into it increases the faster the water is pumped, which is why a high-performance powerflushing pump can remove far more debris than any other method of system cleansing.

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

Using a powerflushing 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. ■

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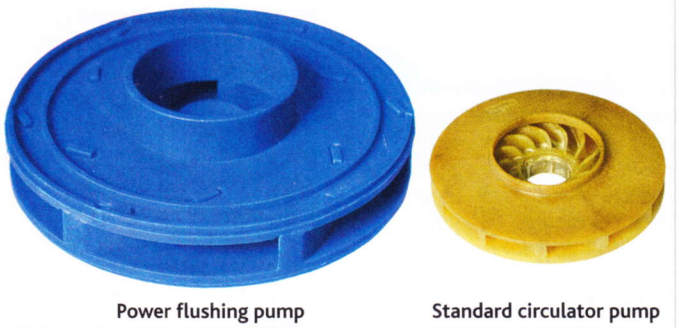

Power flushing pump | Standard circulator pump

Figure 2: Impeller size comparison