Concerned about softened water & aluminium boilers - then read this!

AQUA nouveau
A new concept in water quality

This is a POSITION STATEMENT from the ***United Kingdom Water Treatment Association*** *(UKWTA). It is reproduced as published in May 2006.*

Softened water and boilers / water heaters with aluminium heat exchangers

Naturally soft waters of low alkalinity have a tendency to increase the corrosion of metals typically used in the construction of domestic boilers. This has led to the misconception that artificially softened water is corrosive and should not be used in domestic boilers and central heating systems under any circumstances. In fact, softening has been shown to be beneficial to most system metals when small amounts of dissolved heavy metal ions that are present in the water are removed by the softening process (these have a tendency to increase corrosion).

Soft to moderately soft water is supplied to approximately 35% of the country. Certain Water Utilities partially soften the water before it reaches customer premises.

The removal of dissolved calcium and magnesium ions by artificial softening, is an effective means of preventing limescale formation, which has been shown to have a dramatic effect on maintaining boiler efficiency. The Domestic Heating Compliance Guide, issued by the Office of the Deputy Prime Minister, which gives guidance on how to comply with Part L of the Building Regulations, specifies the use of some form of water treatment in hard water areas (>200ppm total hardness) to inhibit limescale formation to maintain boiler efficiency. The installation of an ion-exchange water softener provides an effective means of complying with this part of the regulations.

Although it is recognised that waters of high alkalinity (pH > 8.5) may be corrosive towards aluminium, the Water Supply (Water Quality) Regulations: 2000 (Statutory Instrument No. 3184) allow the supply of water with alkalinity of up to pH 10 in England and Wales.

Softening water with an ion-exchange softener does not significantly increase pH. Experts have now considered the effect of water quality on the materials used in the latest high efficiency boilers and systems and concluded the following:

Central Heating Systems

Although waters of certain quality may be more corrosive than others, water quality is largely determined by the supply to the premises - consumers often have no choice when filling a central heating system. British Standard 7593 : 2006 *Code of practice for treatment of water in domestic hot water central heating systems* has therefore been revised to allow the use of any supply waters, including artificially softened water, in central heating systems (including those with aluminium) provided an appropriate corrosion inhibitor is added. Installers are advised to consider hardness of the water being used to fill the system and to check suitability of the inhibitor product.

Softener sales representatives and installation engineers are advised to refer boiler manufacturers and consumers to British Standard 7593: 2006, or the UKWTA, where there are objections to the use of artificially softened water in central heating systems, particularly those containing aluminium.

Water Heaters and Combination Boilers

Softening water may increase the potential for the corrosion of aluminium where the supply water exceeds pH 8.5 but many manufacturers of boilers with aluminium heat-exchangers are confident of the durability of their products across the entire range of water quality in the UK. (The UKWTA is in the process of compiling a list of boilers manufacturers who deem their products suitable for use with softened water

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and which should be avoided when using artificial softeners). None of the boiler manufacturers seem to consider variation in the pH of natural water a problem even though this may have been partially softened by the Water Utility!

Softener sales representatives and installation engineers are advised to request that consumers insist on the installation of a high efficiency boiler with a stainless steel heat-exchanger where there are issues over the corrosion of aluminium and validity of the boiler warranty.

The following statement was made by the UKWTA in December 2007.

Softened water / aluminium corrosion debate goes on!

Despite changes to British Standard BS7593:2006 *Code of practice for treatment of water in domestic hot water central heating systems* which now allows the use of ion-exchanged softened water in central heating systems provided an inhibitor formulated for the purpose is added, there is still major reluctance of boiler manufacturers to reach accord with the revised protocol. Following letters to all boiler manufacturers, in the UK, requesting advice on the suit-ability of their boilers with aluminium heat-exchangers with softened water, positive responses were only received from WarmWorld UK and MTS (GB) Ltd (Ariston). (For consumers wishing to have softened water the UKWTA now only recommends boilers with stainless steel heat exchangers or models from these two suppliers).

Argument as to why softened water is unsuitable usually derives from a perceived increase in pH due to the evolution of carbon dioxide when the water is heated in a open vessel and sodium from the resin column, exchanged for the calcium and magnesium ions in the water, bonding with the increased hydroxide concentration to form a caustic sodium hydroxide solution. (Corrosion of aluminium lifts off in aqueous solution with pH above 8.4). In reality, there appears to be very little (non-existent?) evidence for the catastrophic failure of systems which would result if systems were full with caustic solution.

To try and resolve the issue once and for all it is the intention of the UKWTA, during 2008, to carry out comparative tests on heating systems filled with hard and softened water to demonstrate that carbon dioxide evolution does not occur at typical heating system water pressures and that corrosion of aluminium is therefore not an issue. The UKWTA will work with an independent accredited laboratory. Tests will include results from customers' premises where trials have been undertaken.

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