ELYSATOR
engineering water

Summary of VDI 2035, Part 2

Prevention of Damage in Water Heating Installations

* A guideline for water treatment, informed by VDI 2035, Part 2

VDI 2035, Part 2, published in August 2009 by Verein Deutscher Ingenieure (The Society of German Engineers), is *the* authoritative guideline in Europe for prevention of damage in water-based heating systems. As of November, 2012 it is applicable as a European Standard for all of the European continent, as cited by the European Committee for Standardization. The inclusion of more detailed water requirements, with reference to VDI 2035, is the most significant change to the 2012 update of European Standard EN 12828.

Causes of Corrosion

The composition of the heating water is of central importance for corrosion and its prevention. The chief characteristics of the heating water which determine corrosion are

1) Dissolved Oxygen content
    a. Oxygen (O_2) reacts with all metals used in heating systems, causing oxidation of the metal—also known as corrosion. While air bubbles are visible, dissolved oxygen is not. Some oxygen always enters a system, because it will be dissolved in the fill water. But if it is able to consistently enter a system in other ways, corrosion damage can be significant.
2) Electrical conductivity
    a. Corrosion is a process that involves a movement of charged particles (metal ions and electrons). Water with high conductivity facilitates the corrosion process. Demineralized water with low conductivity slows the process down. Demineralization of fill water is always recommended.
3) pH
    a. Acidic (low) pH can attack metals even without the presence of oxygen. Therefore, an alkaline pH (8.2-10) is recommended. This occurs naturally through the self-alkalinization of metals, so it is not normally necessary to alkalinize heating water.

Corrosion Prevention

In order to prevent corrosion damage, the three characteristics of water quality, cited above, should be controlled. The following guide values should be maintained

Dissolved oxygen	< 0.1 mg/l (0.1 ppm)
Electrical conductivity	< 100 µS/cm (TDS ~ 67ppm)
Operating pH	8.2-10

If the system is sealed from oxygen-entry, filled with demineralized water, and maintains a pH within the range 8.2-10, corrosion should be minimal. Water treatment involving chemicals should be restricted to rare cases. Chemical additives raise conductivity, and when under or over-dosed can lead to further corrosion. In cases of inevitable oxygen entry, electrochemical treatment is preferred.

For more information about water treatment, see Elysator's expanded summary of VDI 2035, Part 2, available at www.elysator.com/en/standards.