Recommendations by the Quality Task Group (25) Water for Operating Washer-Disinfectors

The customer must provide a drinking water connection for the washer-disinfectors. The waterworks company will ensure that water of a drinking quality is provided as far as the house connection. But inside the building, the proprietor, tenant or user is responsible for the quality of the water.

➜ **DRINKING WATER** contains salts and other constituents which have no adverse effects on health, but can cause major problems when used to operate washer-disinfectors.

➜ **DRINKING WATER is often not suitable for operating washer-disinfectors**.

Hardening Constituents

The hardening constituents found in water are the salts of calcium (Ca) and magnesium (Mg), also called alkaline earths. These are to be found dissolved in water at room temperature or lower temperatures. The calcium and magnesium salts bound as hydrogen carbonates to carbonic acid are known as carbonate hardness. These salts, too, are found in a dissolved state. But when water is heated they disintegrate, releasing carbonic acid, into ➜ **INDISSOLUBLE SALTS** and then precipitate. They form deposits of calcium carbonate ($CaCO_3$) and magnesium carbonate ($MgCO_3$), also commonly known as lime or (boiler) scale.

➜ **INDISSOLUBLE SALTS precipitate when water is heated.**

Precipitation can occur during the cleaning step, and in particular during the thermal disinfection step, i.e. in the final step in the Vario programme. To prevent precipitation of hardening constituents, the water is softened in cation exchangers (base exchangers).This means simply that Ca^{++} and Mg^{++} ions (cations) are exchanged for 2 sodium (Na^+) ions. The corresponding sodium salts do not form any water-indissoluble compounds when heated. The anions remain unchanged in the water. Likewise, the total salt content of the operating water remains practically unchanged.

The ➜ **CATION EXCHANGER** contains what is termed an "exchange resin". This is a special synthetic granulate that has a higher affinity for Ca^{++} and Mg^{++} than for Na^+ and thus effects exchange until the existing capacity is exhausted. This is calculated on the basis of the local water hardness and on the water consumption per load. Based on the value calculated for the capacity, a display lamp is set, and this then shows the regeneration time. Regeneration is performed with regeneration salt composed of sodium chloride (NaCl) = table salt. The exchange resin is exposed to a concentrated saline solution and thus compelled to effect reverse exchange. In general regeneration is conducted with what is known as a regeneration programme.

➜ **THE CATIONS of the hardening constituents are exchanged. This prevents precipitation of lime. However, the total salt content remains practically unchanged.**

The ➜ **LIME DEPOSITS** inside a machine, boiler or on items being sterilised do not form an impermeable layer. Rather, they give rise to cavities in which microorgamisms can replicate unhindered. They thus pose a hygiene risk and must be prevented. If they are formed, they must be immediately dissolved and removed by descaling with appropriate descalers (acids).

➜ **LIME DEPOSITS pose a hygiene risk**

Chlorides

The maximum content of chlorides permitted in drinking water is 250 mg/l. If there is a higher content, the water will have a salty taste (seawater). Chloride-induced ➜ **PITTING CORROSION** can occur if water with a high chloride content is allowed to act on the steel of instruments or if water containing chloride dries, by evaporating and thus becoming concentrated, on stainless steel surfaces. This is an irreversible process and results in destruction of stainless steel instruments.

➜ **CHLORIDES in the rinse water can lead to chloride-induced pitting corrosion**

To preclude this risk, at least the last rinse in the washer-disinfector is conducted with demineralised water, which as such contains no salt.

Drinking water is likewise demineralised in ion exchangers, using what is known as a mixed bed ion exchanger.

In these exchangers the cations are exchanged for hydrogen ions (H^+) and the anions for hydroxyl groups (OH^-). H^+ and OH^- ions bond to form water.

A conductometer is used to signal when the capacity is exhausted. The display unit is normally set to 10 – 15 µS. Since it is difficult to regenerate the resins, in general the exchange resins are exchanged. The "consumed" resins are sent for regeneration in a special operation. Hospitals and other large establishments have duplicate systems to ensure that if the capacity of one system is exhausted they do not find themselves unwittingly without demineralised water. If one system is exhausted, the second system can be automatically activated and resin exchange commenced in the first system.

Exchange is conducted only for salts. Any compounds that are not present in the water as salts will not be removed. For example, silicates will be exchanged but not silicic acid.

Will be continued in the next issue

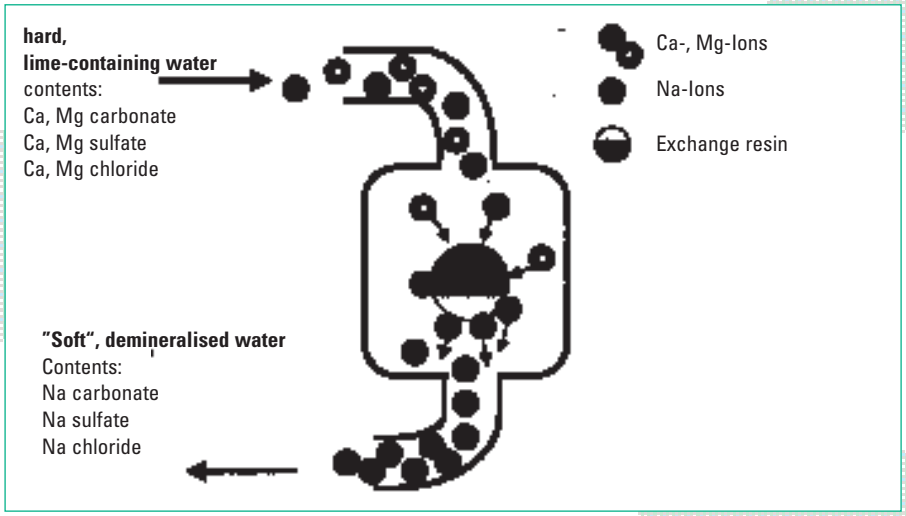

Fig. 1: Pinciple of water softening

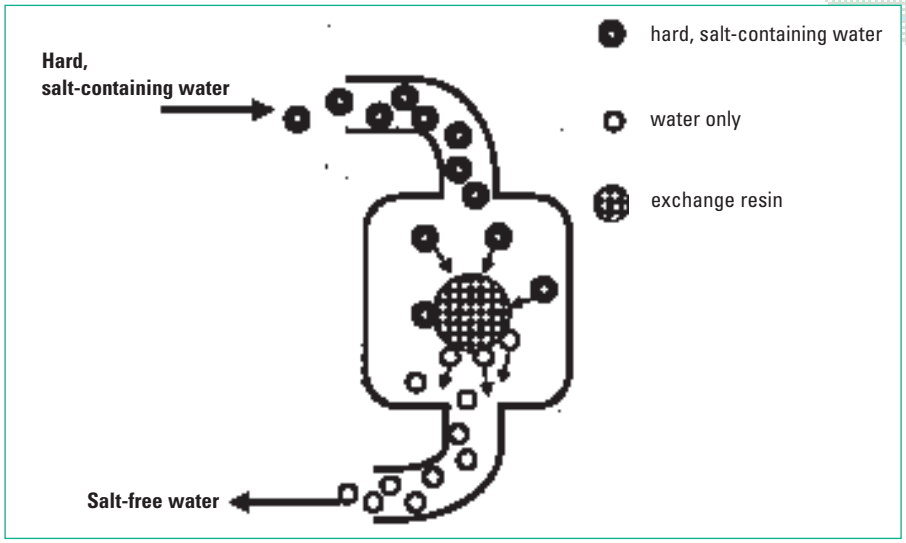

Fig. 2: Principle of complete demineralisation by ion exchange