Commercial dishwashing & water

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How important is water in automated warewashing?	Water features in many cleaning processes. It is also fundamental to machine warewashing Its characteristics influence overall warewashing results quite substantially. Particular attention should therefore be paid to water.
Are there different kinds of water?	Visually, there are often no differences. However, differences do arise out of substances contained in the water, which can have adverse effects on warewashing results. It is possible to prevent these adverse effects through appropriate treatment measures.
Can warewashers be run on a hot-water supply (above 40°C)?	In principle, yes, but in each case checks should be made in the light of the manufacturer's specifications as to whether the warewasher being used, all the supply pipes/hoses and the water treatment equipment connected upstream are suitable for the operating conditions prevailing on site.
What ingredients are there in water?	Water may contain both solid and dissolved materials. *Solid materials* include e.g. sand, rust or small dirt particles from the pipework, which may result in damage to the warewasher and water treatment equipment (e.g. solenoid valves). In this respect, it is helpful to install a suitable filter system in accordance with the manufacturer’s recommendations. *Dissolved materials* are gases and minerals.
Do the gases dissolved in water influence warewashing results?	*Dissolved gases* are primarily the constituents of air: nitrogen, oxygen and carbon dioxide. They do not affect warewashing results.
Do the minerals dissolved in water influence warewashing results?	*Dissolved minerals* affect water quality as hardness minerals and non-hardness minerals. Hard water and/or water containing minerals makes the warewashing process more difficult and adversely influences warewashing results (e.g. stains, deposits, corrosion).

What types of hardness are distinguished?	**TH (total hardness):** Sum total of the calcium and magnesium ions dissolved in the water. The total hardness is made up of carbonate hardness (temporary hardness) and non-carbonate hardness (permanent hardness). **CH (Carbonate hardness):** Sum total of the calcium and magnesium ions which are assigned to hydrogen carbonate (these are the minerals which, when the water is heated, are precipitated as lime or form limescale. Generally, however, only the value of the total hardness of the water is mentioned or used to classify the quality of the water. The hardness type of water is indicated in country-specific units: °d (German hardness) °e (English hardness) °f (French hardness) or internationally in mmol/l 1°d = 1.25°e = 1.78°f = 0.18 mmol/l= 10 mg/l CaO= 17.8 mg/l $CaCO_3$.
What ranges of hardness are there?	Since March 2007, the ranges of hardness have, in accordance with the Cleaning Agents and Detergents Act, been classified as follows: Hardness range soft < 1.5 mmol/l < 8.4 °d Hardness range intermediate 1,5 – 2.5 mmol/l 8.4 °d – 14 °d Hardness range hard > 2.5 mmol/l > 14 °d **Water with a total hardness of up to 3°d is - provided the total mineral content is low at the same time - particularly well suited for automated warewashing.**
What happens if water of excessive hardness is used?	The use of very hard water leads to deposits in and damage to the machine and on the wash ware, impairs the warewashing result, adversely affects hygiene and hampers efficiency by increasing the amounts of detergent, rinse aid and descaling agent consumed. A lime layer of just 0.4 mm on heating elements will result in an approx. 25% increase in energy consumption being recorded.
What can be done to counter water hardness?	Agents contain components which to a limited extent prevent the precipitation of hardness minerals. Where the water hardness is 3°d or higher, special measures to soften the water should be taken on efficiency grounds. Depending on the wash ware concerned (e.g. dishes, glasses, cutlery) and the requirements in terms of the warewashing result, special treatment of the water (softening, partial mineralization, full demineralization) will be necessary.

What affect does the addition of phosphates and silicates (inhibitors) in the water supply have on the warewashing result?	The addition of these substances raises the total mineral content of the water and as a consequence the evaporation residue. That can lead to the formation of stains and streaks on wash ware.
What affect does the total mineral content of the water have on the warewashing result?	The total mineral content must not be too high in order that the warewashing result is not impaired by mineral deposits. Both soft and softened water can have a high total mineral content that impairs the rinsing result. It is expressly pointed out here that, when water is softened, the total mineral content is not reduced. A reduction is possible only using a partial or full demineralisation unit.
How is water softened?	Softening is defined as an ion-exchange process on which all the calcium and magnesium ions are exchanged for sodium ions. In this way, only minerals which cannot form lime are left in the water. Regeneration is usually carried out on site, using special regenerating salt (sodium chloride). Evaporation residues are slightly increased by softening. Thus, after softening, visible mineral residues may be left on pieces of wash ware, but these are water-soluble and are washed off again during the next washing process. In domestic softening systems, raw water is mixed with the softened water (blend). In this way, the hardness of the water rises again depending on the blend and does not in every case fulfil commercial warewashing requirements.
What is meant by partial demineralization/ carbonate removal?	Decarbonisation refers to a cation exchange method in which the carbonate hardness of water is removed completely. The calcium and magnesium ions contained in the water, which are associated with carbonate hardness, are exchanged for hydrogen ions. These react further with the hydrogen carbonate dissolved in the water to produce carbon dioxide which is dissolved as a gas in the water or, as the water is heated, is emitted into the air. In contrast to conventional softening (see above), the total mineral content is significantly reduced by this method, to be precise by the proportion of carbonate hardness. Regeneration of the ion exchanger is normally carried out using strong acids at special regenerating stations and not on site.

What is meant by demineralisation?	2 methods of demineralisation are differentiated: • demineralisation by means of ion exchange • reverse osmosis by means of membrane technology In the case of demineralisation by means of ion exchange, all minerals, including all hardness minerals, are removed from the water through the combination of cation and anion exchange. The regeneration of these ion exchangers is normally carried out at special regenerating stations and not on site. Reverse osmosis refers to demineralization of water by a membrane, whereby the minerals are separated from the water by pressure. The separating membrane has such small openings that minerals, unlike water, can pass through them only with difficulty. In order to protect the membranes, the manufacturer's specifications and maintenance instructions should be observed.
Who provides advice on matters relating to the treatment of potable water for commercial warewashers?	On all matters relating to the treatment of potable water for commercial warewashers, advice should be sought from the machine or agent manufacturers or from experienced water-filter manufacturers.
Technical advice provided by the member companies of the VGG	This technical information sheet, which has been drawn up by experienced practitioners, is intended to draw the attention of the reader to the fact that commercial warewashing cannot be carried out successfully if it is approached superficially and without the appropriate involvement of all those participating in the warewashing process. Only an understanding of the technical processes and of the interdependencies that these entail, teamwork on the part of all those involved, in particular the operator of the warewasher and his/her personnel, and regular maintenance of the warewasher, dosing equipment and water treatment system by the manufacturer will produce the washing results expected by the user. Consistent cooperation between warewasher, agent and dosing equipment manufacturers as well as manufacturers of water treatment equipment and wash ware will ensure constant and optimum adaptation to practical requirements, to the benefit of the customers they share and of the environment.

	Enquiries regarding this technical information sheet *"Commercial dishwashing & water"* should be addressed to **Arbeitsgemeinschaft Gewerbliches Geschirrspülen, Feithstraße 86, D-58095 Hagen, Germany** **Phone: +49 (0)2331/ 377 544 – 0,** **Fax: +49 (0)2331/ 377 544 – 4,** **E-mail: info@vgg-online.de.**