Compendium of practice for Commercial Dishwashing

Section 08

Metal wash items

Arbeitskreis Gewerbliches GeschirrSpülen

Contents

1. Specifications for metal wash items

A wide variety of materials and qualities characterises the market for metallic wash items, as well as their cleaning and maintenance in the commercial sector.

Due to the greater prevalence of commercial dishwashers, statements about dishwasher-resistance can be a significant decision-making factor for users. Such statements are an important parameter for use, and queries should be directed to the manufacturer.

Compared to household dishwashers, cleaning in commercial dishwashers places less strain on the wash items.

For this reason, normally, the manufacturer's proof of suitability for domestic use is also applied to the washing process in the commercial sector.

Investigations to establish whether items are dishwasher-proof can be conducted based on the following standards:

- RAL-RG 604: Dishwasher suitability of cutlery
- DIN EN 12875-1: Mechanical dishwasher resistance of utensils – Part 1: Reference test method for domestic articles
- DIN EN ISO 8442: Materials and articles in contact with foodstuffs – Cutlery and table holloware (incl. corrosion resistance)

2. Different materials

2.1. Non-cutting cutlery

2.1.1. Stainless steel cutlery

Steels that are alloyed with 12 % chrome or more and may also contain nickel, molybdenum and other metals are referred to as stainless steel. Articles produced from such steels are normally labelled with the following mark.

Figure 1: "Stainless" mark
Source: WMF

Depending on the level of the individual constituents, the degree of corrosion-resistance can be influenced, which can also lead to the alteration of further properties, e.g., the hardenability or the magnetisability.

Within stainless steels, a distinction is made between chrome and chrome-nickel (molybdenum) steels. In accordance with DIN EN 10088, the different types are labelled by their material numbers, e.g., 1.4301 for the much-used chrome-nickel steel with the short description X5CrNi18-10. (For more examples of material numbers, see *Compendium of practice for Commercial Dishwashing, Section 03 "Commercial dishwashers"*).

The considerably stronger corrosion resistance, compared with other steels, is based predominantly on the presence of the "passive layer". This is composed largely of chromium oxides. The corrosion resistance is increased further by nickel constituents. If the passive layer is damaged (for example, by mechanical surface impact), it can

regenerate in the presence of oxygen and sufficient action time. Molybdenum encourages faster repassivation.

A distinction is made between cutlery made of non-magnetisable chrome-nickel steel with approx. 18 % chrome and approx. 9 % nickel, and cutlery made of magnetisable chrome-steel with approx. 13 % to 17 % chrome.

- Cutlery made of chrome-nickel steel is fully dishwasher safe / dishwasher proof
- Cutlery made of stainless chrome-steel with a chrome proportion of approx. 13 % cannot generally be presumed dishwasher proof.
- 17 % chrome steels are recommended for automatic cutlery intake, for which only magnetisable steels are suitable.

2.1.2. Silver-plated cutlery

According to the compendium, silver-plated cutlery is dishwasher proof.

However, washing such cutlery along with chrome-steel and chrome-nickel steel cutlery should be avoided due to their different properties, e.g., surface hardness. Instead, different types of cutlery should be washed separately.

2.2. Cutting cutlery – knife blades, hollow-handled knives, monoblock knives

Today, hardenable chrome-steels, e.g., steels with increased carbon content, are used predominantly for knife blades and monoblock knives. They are characterised by their considerable magnetisability.

Unlike hollow-handled knives, whose handle and blade are made of different materials (e.g. hardenable chrome-steel for the blade; chrome-nickel steel for the handle), the monoblock knife is forged from one piece. Monoblock knives, however, are predominantly produced with basic qualities. Normally stainless-chrome-steels are processed with partly differing carbon contents (up to 0.40 %), whereby monoblock knives cannot generally be presumed dishwasher-proof.

If the handle of a monoblock knife is not hardened, it cannot be termed dishwasher-proof. Hardenable chrome and chrome-molybdenum steels with more than 15 % chrome content are suitable for cleaning in commercial dishwashers (see point 2.1.1).

2.3. Stainless steel kitchen utensils and tableware

Stainless steel is also used for pots and pans, plates, containers, etc., due to its smooth non-porous surface and exceptional performance characteristics as regards abrasion, scratch, corrosion and impact resistance. Chrome-nickel steel is used predominantly here. Simple utensils can also be manufactured from chromium steel.

As regards resistance, the same statements as for cutlery apply.

As stainless steel has low thermal conductivity properties, a sandwich layer is often applied to pan bases. This layer, which comprises mainly heat-conducting aluminium alloys, is not resistant to caustic alkaline detergents and should therefore be completely encapsulated in stainless steel.

2.4. Mixed material wash items

For mixed material wash items, e.g., made of wood, ceramic, non-ferrous metal and plastic, it is generally not possible to make a binding statement about their dishwasher suitability. The suitability is determined mainly by these materials used. For example, tarnishing often occurs when copper comes into contact with alkaline detergents.

2.5. Aluminium and non-ferrous metal wash items (e.g. copper, brass, zinc)

Utensils made of aluminium and non-ferrous metals should not be used any more due to their low chemical resistance and for hygiene reasons.

Copper and copper alloys are not resistant to acidic media; thus copper can be dissolved by acidic rinse aid solutions.

Aluminium alloys are resistant to neither acids nor alkalis.

3. Influence of finish quality on the serviceability

Processing, in addition to the material, plays a significant role in the dishwasher suitability of cutlery. In principle, the better the surface finish the greater the dishwasher suitability of the cutlery. This is true not only for the front and rear sides, but particularly for the cross-section areas, e.g., the areas between fork tines.

Only a perfect surface finish prevents the appearance of corrosion in commercial dishwashing. The demand for a high surface finish is even greater in lower grade materials.

This means that, e.g., cutlery of 17 % chromium steels (as is recommended for automatic magnetic cutlery intake) should have a better surface finish than cutlery manufactured from chrome-nickel steels. Both knife blades and monoblock knives require the best possible surface finish to ensure optimum performance of the hardening treatment on this material and to ensure that any pre-treatment stages for surface finishing do not cause prior damage to the material.

Corresponding tests are available to monitor these properties, and these are regularly applied by renowned premium cutlery manufacturers. Thus providing assurance that using such high-quality cutlery shall pose no cleaning problems in commercial dishwashers.

Normally, cutlery in the lower price segment cannot be presumed to be corrosion-resistant in every application.

The aforementioned comments apply likewise for pots, pans and plates. Joints between container and handle are often weak points in processing, and corrosion can be stronger here.

4. Stainless steel and corrosion

The material is corrosion-resistant and permanently retains its bright metallic appearance. As no protective layers are applied, abrasion, scratches, impacts or blows cannot impair its performance characteristics.

Standard detergent, rinse aid and softening processes, hot water or the subsequent drying process do not damage higher grade stainless steels.

Should rust stains appear despite correct use of the product, this is predominantly extraneous rust that accumulates on steel surfaces.

Extraneous rust can be caused by the carriage of rust particles from water pipes, by washing with non-corrosion-resistant wash items or the presence of rusting dish racks. Even the use or washing alongside metallic scourers, for instance, can cause stainless steel items to rust.

If there are already small rust stains on the stainless steel, such stains should be removed immediately. Simple rubbing usually suffices; sometimes a non-scouring detergent is required.

Uniform corrosion, i.e., the entire surface of the stainless steel is evenly rusted, does not normally occur. Today, if stainless steels of a suitable grade are used properly, they are entirely suitable for machine dishwashing.

A particular form of corrosion is pitting. Pitting is the result of excessive chloride load. Pitting is a rust-coloured stain, at the centre of which is a small crater. If this and the cause of the pitting is not remedied, a pit can appear relatively quickly. Pitting can be triggered by:

- unsuitable steel alloys or improper processing of the steel, defective surface quality
- unsuitable water with high chloride content (should not exceed 50 mg/L)
- sustained action of acidic and / or salty food residues prior to washing
- underdosage of detergent
- functional fault of the water softener system (regeneration salt carry-over)

5. Avoid residues on different types of wash items

The primary objective for the washing cycle is to leave no residues on the surface of the wash item. Should deposits appear nevertheless, these may be:

unremoved food residue (defective cleaning)

Assuming that the washing conditions (e.g. machine, process chemicals, dosing, handling) are satisfied in full, a poor cleaning result can nevertheless occur if food residues are left to dry over an extended period of time, particularly where heated trolleys are used, and items are not sufficiently pre-immersed.

As a result of unfavourable washing conditions, finely dispersed food residues that have already been removed can resettle on the wash items, even in areas where there were originally no food residues. This can happen particularly if the detergent solution is excessively loaded with food residues or the detergent dosage is too low.

Limescale deposits and other residues

Excessive water hardness, too little detergent, malfunctioning water treatment systems, excessive mixed water hardness, and in some cases the combination of several of the aforementioned factors, can cause calcification.

Such deposits must be removed using acidic products such as descaling agents.

Detergent solution and food residue can remain on the wash items if the fresh water rinse is incorrectly dimensioned, or the wash items are regularly packed too tightly into the racks.

Excessive salt content in the water can also lead to residues (stain formation). These can be avoided, e.g., with the help of a demineralisation system (desalination unit) (see *Compendium of practice for Commercial Dishwashing, Section 05 "Water quality"*).

The prevention and / or remedy of all residues on stainless steel cutlery and wash items listed here is of major importance, as the full corrosion resistance can only be guaranteed if a wafer-thin, invisible, protective passive layer can reform on the clean surface through an unhindered supply of oxygen.

6. Discolourations – appearance and removal

Blue, purple or rainbow discolourations on stainless steel surfaces are completely harmless, but are undesirable. They can be caused simply by water and contact with specific food ingredients. Such discolourations can occur, e.g., when cooking celery root in stainless steel pots (see *Compendium of practice for Commercial Dishwashing, Section 03 "Commercial dishwashers"*).

A sufficiently high amount of detergent can counteract tarnish.

The majority of tarnish can be removed with a suitable descaling solution (free of hydrochloric acid), especially immediately after the tarnish appears. However, some tarnish can only be removed by experts (steel manufacturers, process chemical suppliers). Particularly if the tarnish is left to "age" over a long period of time, as it can also become "fixed".

Even special cutlery immersion detergents can be used to remove these discolourations.

7. Points of note when cleaning cutlery

Faultless use of the commercial dishwasher is contingent upon compliance with the instructions of the machine manufacturer.

Precise adherence to dosing information and notes on the processing technology of the detergent industry is equally important. Powder detergents must not be scattered over cutlery, as these can cause tough, dark discolourations. Special attention must be paid to the correct function of water treatment systems. This should prevent the formation of disruptive deposits (see *Compendium of practice for Commercial Dishwashing, Section 05 "Water quality")*.

Furthermore, the user must ensure that cutlery is not packed too tightly into special cutlery racks immediately after use.

It has been proven useful to pre-immerse cutlery in a heatable immersion basin containing special immersion detergent (the respective instructions of the detergent manufacturer must

be observed) to prevent food residues becoming dried on. A pre-soaking of cutlery and dishes with unsuitable, foam-intensive hand dishwashing detergents is to be omitted in any case.

Furthermore, there are special machines for cleaning cutlery, which also allow the use of other processes.

8. Points of note for purchasing stainless steel cookware and tableware, as well as cutlery

The wash items must be declared “dishwasher-proof” by the manufacturer. The items should be as smooth as possible, with a surface design that is easy to clean.

This compendium of practice, which has been drawn up by experts, should remind the reader that commercial machine washing cannot be successfully conducted on a superficial level or without the corresponding input of all persons involved in the cleaning process.

Only the understanding of technical processes, the resulting interrelations and the cooperation of all participants, particularly the dishwasher operator and staff, as well as having regular maintenance of the dishwasher, the dosing equipment and the water treatment system by the manufacturer, can produce the cleaning results expected by the user.

Consistent cooperation between the dishwasher, detergent and dosing equipment manufacturers, as well as the manufacturers of wash items, guarantees constant and optimal adaptation to practical requirements for the benefit of customers and the environment.

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