BRILLIANTLY CLEAN

Machine Warewashing Guide

CLEAN, SAFE, EFFICIENT & SUSTAINABLE

ECOLAB®

PROTECTING WHAT'S VITAL™

WASHING ITEMS IN DISHWASHERS

Dishwashers make daily operations significantly easier and consistently using **Ecolab products** will ensure that not only crockery, cutlery and glasses but also the machinery itself will remain spotlessly clean, as our products are designed with the specific requirements of the dishwashing process in mind.

Our precise metering systems deliver **Ecolab's powerful and highly concentrated products** in small amounts in line with specific requirements based on local conditions and circumstances. This avoids the expense of using too much product, as well as hygiene risks of not using enough.

Items that undergo frequent dishwashing can often change in appearance. Typical examples of this include pearlescent opalescence or clouding on glassware, loss of shine, fading or complete loss of overglazes on porcelain items, metal abrasion on opal glassware, tarnishing/ discolouration of stainless steel, corrosion on knife blades and tarnishing of silverware.

This newsletter explains the causes and correlations of these issues when dishwashing items made from glass, stainless steel, silver, opal dishes and decorated porcelain. It also gives hints and tips on how to stop them from occurring and clean items correctly.

WASHING GLASS

In terms of volume, glass items are washed most frequently since glass is used constantly for tableware. Generally speaking, it is more durable than most other materials. It has many special properties – including translucency, refraction of light, reflection, shine, ability to hold water and resistance to chemicals – which is also why it is so popular for household items.

In chemical terms, glass is a fused product made from inorganic metal oxides, namely sand, alkaline and earth alkaline compounds. In physical terms, glass is a solidified melt that also has the properties of a solid object – which means that it does not have a defined crystalline structure. And that applies to its surface as well.

The physical and chemical properties of glass are determined primarily by its composition, shaping and tempering, as well as how it is handled during the manufacturing process. Although glass is resistant to many influences, there is no limit to the number of times it can be chemically modified.

Types of glass

The basic recipe for glass is a melt consisting of silicon oxide (sand, particularly quartz sand) and a mixture of metal oxide (sodium, potassium, magnesium, barium and zinc oxide), plus other additives (boron trioxide, aluminum oxide). We distinguish between the following types of glass, depending on the composition:

soda-lime silicate, soda-lime, crystal, lead crystal, borosilicate, sodium-potassium-lime and boron-aluminum oxide glass.

How glass behaves in the conditions created by mechanical dishwashing

Despite its chemical resistance, glass can be affected over time by water on its own, as well as watery solutions, becoming weathered and looking tired. This process is further accelerated by constantly alternating between periods spent in damp and dry conditions.

Although it can sometimes take quite some time for the effects to be visible under the conditions of mechanical dishwashing, the shine and transparency of glass means that any irregularities soon become conspicuous. The advent of mechanical dishwashing therefore meant that people soon became aware of potential changes in the surface of glass items.

Potential corrosion damage includes:

- **Scratches and chatter marks** (Fig. 1)
- **Changes resembling scratches, pinpricks and lint** (Fig. 2)
- **Cracks**
- **Streaks**
- **Clouding (irreversible, full-surface, partial, symmetrical)** (Fig. 3/4)
- **Opalescence** (Fig. 5)
- **Unpleasant smells**

While **scratches** can appear individually or scattered across the surface of the glass, they can also appear in such numbers that they create white patches or rings. Referred to as chatter marks, these scratches are not visible to the naked eye. Viewed through a microscope, however, you can see densely packed fractures along the scratch, like scales.

Fig. 1

All scratches are caused by a mechanical action on the surface of the glass, so very few drinking glasses in daily use will not have any scratches. Mechanical dishwashing is most likely to cause scratches and chatter marks if

- glasses are bumped against each other or other hard objects when they are arranged in the dishwasher,

- or glasses come into contact with each other in the dishwasher rack. Ring-shaped abrasion points are frequently the result of glasses also rotating during the dishwashing process.

Any areas resembling scratches (Fig. 1) on glasses will be worsened by mechanical dishwashing. They may not be visible to the naked eye initially, but will become clearly visible as they undergo increasing numbers of cycles in the dishwasher. This is because water and watery solutions penetrate the scratches and fine cracks, forcing out glass particles that have already been loosened. This process is accelerated in particular by the significant temperature differences between dishwashing cycles.

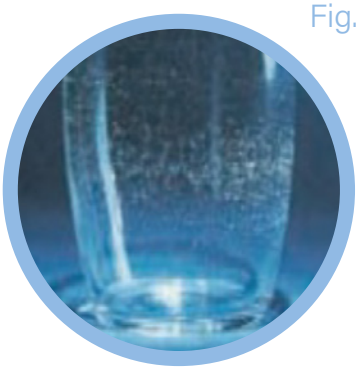
Tip

To avoid scratches and other physical damage as much as possible, glasses should be washed in special baskets designed to fit that specific size of glass.

If you want more details about our range of baskets, call us or ask **your consultant!**

Unlike scratches and chatter marks, which occur under very specific conditions, **changes resembling scratches, pinpricks and lint** involve an accumulation of small marks that look like scratches, countless needle-shaped dots and damage to the surface of the glass that seems like lint residue. These irregularities typically occur in conjunction with each other. They are often visible to the trained eye on glasses before they have been washed and can be clearly seen after just a few washing cycles – and usually after the very first one. It can therefore be concluded that these marks are also caused by damage to the glass surface, in this case damage that was caused during the manufacturing process or during transport to the end user. The conditions inside a mechanical dishwasher then quickly accelerate this damage.

Fig. 2



Cracks are also created when the glass is manufactured due to stresses that are "frozen" into the glass. Again, this damage appears after just a few washing cycles on glasses that initially appeared to be visually free of defects.

Streaks indicate irregularities when the glass was being melted; they occur when the glass melt has not been melted and blended properly.

Hidden defects

This refers to all effects – such as clouding and opalescence – that sometimes only occur after repeated washing cycles. The manufacturing process is the crucial factor in these cases. One example is cooling cracks; stresses that occur in glass that has not gone through a slow and defined cooling process after being shaped. These defects are "frozen" into the glass and are only noticed when it is in everyday use. They often result in a narrow ring of glass suddenly flaking off the rim of what initially appears to be a fully intact glass when it is being used, for example, or a glass dish abruptly cracking into two clean pieces, or the thick base of a drinking glass shattering without warning.

Fig. 3

Symmetrical clouding

The process of creating blown glass produces a cap, which is incised with diamonds and then split off, creating a sharp edge that has to be rounded off. This is done either by melting as it rotates through a hot gas flame or by mulling, where the edge is ground and then smoothed with a polishing agent. This process and the machining method it involves is what determines how the glass reacts down the line to mechanical dishwashing. When the rim has been rounded by melting, symmetrical clouding may occur below the rim, while rings do not form when the rim has been rounded by grinding. Although being able to spot these on an unused glass is very rare, symmetrical clouding is typical glass damage that can appear as a result of mechanical dishwashing. Where a handle has been added to a glass, inadequate thermal treatment can also cause symmetrical clouding. The chemical resistance of the glass is impaired at these points, increasing the amount of alkalies that can leach out of the glass, which becomes visible in the form of the characteristic clouding.

Fig. 4

Opalescence

In most cases, opalescence appears as a pearlescent play of colors, although it can also create purely brownish, greenish or blueish tints. The glasses are still perfectly transparent, although they often look as if they are darker. These changes are caused by very thin layers that have formed very slowly during mechanical dishwashing. These layers are rich in silica, although we don't yet know whether this silica comes from the glass mass itself, from cleaners, or from both sources.

Many years of experience indicate that opalescence only occurs when low-alkaline cleaners with a high silica content are used. Fig. 6 shows potassium crystal and soda-lime glasses that have been washed a thousand times. Even after frequent washing for this length of time, there are no signs of any corrosion.

Fig. 5

Decorated glasses

Valuable glasses are often adorned with gold, while simpler ones tend to be decorated with colored designs. These decorations are usually less durable than those on porcelain items, as they are melted onto the glass surface at relatively low temperatures. Frequent washing will fade the colors in the decorations or wear them off altogether.

Tip

Wash the glasses separately in special glass dishwashers using gentle glass washing agents designed to protect decorations.

Ecolab's **Star Glass** range is designed with the particular requirements of mechanical dishwashers in mind and maximizes hygiene and material conservation.

WASHING STAINLESS STEEL

Stainless steel refers to all steel alloys that do not rust, unlike iron and "ordinary" steel. It is created by alloying iron with specific additional quantities of metals, primarily chrome and nickel.

The iron and its alloys all have a particular crystalline structure; that of iron and low-alloy steels is ferritic and is also magnetic, while stainless steels alloyed with chrome and nickel form what is referred to as an austenitic crystal structure and can no longer be magnetized. This allows end users to determine for themselves whether a steel item is made from a low-alloy steel that is less resistant or a high-alloy steel that is resistant to corrosion.

The chrome or chrome/nickel blend in non-rusting steels reacts with the oxygen in the air to produce the corresponding metal oxides, forming a thin protective layer on the surface of the steel. This layer is transparent, very impermeable and adheres closely to the metallic surface, which means that the steel reacts passively to chemical influences. It will not rust and is resistant to pitting and other corrosive agents.

The longstanding convention is for **dishwashers** to be manufactured solely from high-alloy, non-magnetizable 18/8 or 18/10 chrome nickel steel; steel that contains 18% chrome and 8 to 10% nickel. This kind of steel is resistant to pitting, which is primarily caused by table salt from food residue and the regenerating salt used in dishwashers.

Nowadays, stainless steel **items for dishwashing** such as cutlery, pots, pans and utensils including spatulas, meat forks, ladles and sieves, as well as chargers and dishes are usually made from chrome nickel steel with the above compositions. The manufacturing processes for items of cutlery and cookware involve significant mechanical stresses, which must not be allowed to impair the quality of the material. This means that careful handling and processing during production in order to protect the material again guarantee adequate resistance to external influences when items are put into use.

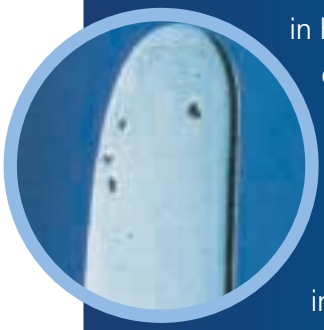
Most **blade steel** consists of low-alloy magnetizable chrome steel with the addition of 1 to 2% molybdenum, although vanadium is also used. Provided they are handled and processed properly, these blades are then stable enough to resist the conditions in a mechanical dishwasher.

The cutlery industry was the first manufacturer of items for dishwashing to establish a test standard for the resistance of its products to mechanical dishwashing. This test method was developed in conjunction with the RAL (the German Institute for Quality Assurance and Certification in Bonn). Unlike conventional hollow handle knives, where the handle and blade are manufactured from different materials, both parts in **monoblock knives** are made from the same material. The grade of steel and material processing techniques are crucial factors here, which means that no generalized statement can be made about corrosion resistance. However, monoblock items manufactured from 12/14 chrome steel are extremely vulnerable to pitting and are only suited to mechanical dishwashing to a limited extent. The most important factor is that the blades are hardened carefully and properly during the manufacturing process.

TYPE OF STEEL	INTENDED USE	PROPERTIES/ CORROSION BEHAVIOR
18/8 and 18/10 chrome nickel steel	Components in dishwashers; cutlery, pots, pans, bowls, dishes, chargers, etc.; spatulas, meat forks, sieves and other cooking utensils	High-alloy steel that is non-rusting, non-magnetizable and protected against pitting, **entirely suitable for dishwashers**, provided that coatings are not used to prevent the access of atmospheric oxygen for repassivation purposes
12/14 chrome blade steel	Knife blades	Low-alloy hardenable chrome steel that is non-rusting and not adequately protected against pitting, only **suited to dishwashers to a limited extent**
14 chrome steel with 1–2% molybdenum, possibly with the addition of vanadium	Knife blades	As above, but the addition of molybdenum gives good resistance to pitting, so they are **suitable for dishwashers**
Monoblock items in 12/14 chrome steel	Cutlery (knife blade and handle made from one piece, hence “monoblock”)	Strongly magnetizable, low-alloy, non-rusting steel that is extremely vulnerable to pitting and therefore only **suited to dishwashers to a limited extent**

PITTING

The most common form of corrosion is pitting corrosion, also referred to simply as pitting because – as the name suggests – it destroys the material it attacks.



Knife blades are particularly prone to this form of corrosion. Pitting only occurs in high-alloy steels if the material has not been handled and processed correctly. It normally starts as tiny pinprick holes that are not visible with the naked eye and can progress to create areas of destruction measuring 2 cm. Signs of pitting are recessed surfaces that are dark gray to black in color, with a granular structure. This form of corrosion is always the result of damage to or destruction of the protective coating; in other words, the passivated stainless steel surface. It is mainly caused by acidic food residue – fruit, vegetables, fruit juices and milk products – left on the surface of the steel, but acids are not the only threat. Table salt can also cause damage and is almost always present in tap water as well as in the food residue. That is why it is important to make sure that regenerating salt is not left for extended periods on the base of the tub or in other areas of the dishwasher after refilling the salt reservoir in the water softening unit. Unlike acids, alkaline products like cleaning agents or their alkaline solutions do not cause pitting on stainless steel surfaces.

Proper handling is essential to prevent pitting on low-alloy steel and extend the service life of cutlery; in other words, items that need washing must never be left for extended periods in a dirty condition.

EXTRANEOUS RUST/FLASH RUST

This refers to rust particles from external sources that have settled on the surfaces of non-rusting steel.

This form of rust occurs in particular where grips and handles on pots and pans are attached using screws made from a material that can rust. Hidden areas where screws are attached to pots and pans and are no longer visible on the finished item are particular susceptible. The items are hung from these lugs when they are enameled, so they do not receive a protective layer of enamel and then rust during use.

If enameled cooking pots and pans made from sheet steel have spots where this enamel layer has flaked off, rust can settle here and then spread further.

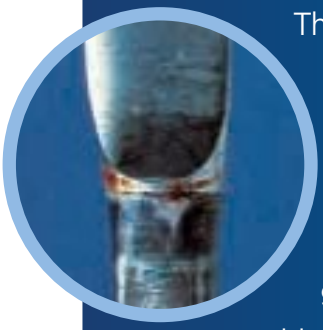
RUST IN CONJUNCTION WITH PITTING

Rust often causes complaints in conjunction with pitting, particularly on knife blades –

and that includes problems as minor as rusty dots and small rings (approx. ø 1 mm). You may not be able to see them yet with the naked eye, but if you looked through a magnifying glass you would see small black dots or pinpricks in the center of these rust rings, which are the initial stages of pitting.

CREVICE OR CONTACT CORROSION

This refers to corrosion that occurs in the crevices and cracks in materials, but particularly in gaps where two different materials come into contact with each other.



The classic example of this during mechanical dishwashing is the gap on a knife where the stainless steel blade meets the handle – in other words, where the blade and handle join (Fig. 9). This means two different materials can potentially come into contact with each other: a blade made of low-alloy steel and a handle made of nickel silver – a copper/nickel/zinc alloy plated with 90 or 100 silver (silver: table 2 and 3) – or a handle made of a high-alloy 18/10 chrome nickel steel. Each material has different electrochemical properties, which means that a galvanic cell can be created and this electrochemical reaction attacks the less pure metal at the point of contact. Again, chloride ions have an extremely adverse effect Contact corrosion is often triggered by damage to the passivation coating or oxide film. The initial indications of all forms of crevice corrosion are dark discolorations and rust patches at the point of contact.

STRESS OR HARDENING CRACK CORROSION

Intercrystalline corrosion and deformation corrosion are caused exclusively by defects in how the steel is processed.

In most case, these defects impact the metal matrix structure of the material. In resistant steel alloys with an austenitic matrix, this creates areas with a martensitic or ferritic structure that is less resistant to corrosion. In this context, stress corrosion is caused solely by table salt, which is also the classic example in conjunction with mechanical dishwashing. Stress or hardening cracks are most common in knife blades around the serrated teeth (Fig. 10) and running from the back of the knife toward the cutting edge Generally speaking, alkaline cleaning agents help to reduce corrosion.

DISCOLORATION

THIS PARTICULARLY AFFECTS STAINLESS STEEL COOKING POTS.

Cooking certain foods (cauliflower, celery, kohlrabi, mushrooms, potatoes, pasta, boiled fish and savoy cabbage) leads to discoloration of the steel surface in the form of brownish, blueish or pearlescent opalescent shading. This discoloration is created by thin coatings on the steel caused by a reaction between hydroxide ions (OH– ions) and minerals including magnesium, silica and phosphor compounds. Physiologically, it is completely harmless.

Tip

Dirty cutlery should be presoaked in an alkaline cutlery presoak product from the **Tensil or Assure ranges** before washing, as the alkalinity will counteract the corrosion and the growth of microorganisms. Presoaking in plain water, a hand dishwashing liquid solution or even vinegar diluted in water will actually encourage pitting and should never be done.

WASHING SILVER AND PORCELAIN

Most silver items that require dishwashing are items of cutlery. Other everyday items such as chargers, bowls and dishes, tea glass holders, salt and pepper shakers, sugar bowls and so on tend to be plated with significantly thinner silver coatings than cutlery and are usually sealed with clear lacquer, so they are not suitable for mechanical dishwashing.

Genuine silver is always hallmarked and German manufacturers all have their own hallmarks. As well as a crescent and a crown, these hallmarks show the maker's mark and the fine content of silver for the item bearing that particular hallmark.

Tarnishing on silver

Most people are aware that silver will also discolor – or tarnish – if it is not being used. It is only a matter of time until it starts to show dark patches, ranging from brownish and blueish through to blue-black, or discolors completely, which is commonly referred to as tarnishing. This happens because the surface of the silver is particularly sensitive to sulfurous gases present in ambient air. Although the air we breathe only contains traces of hydrogen sulfide in concentrations that we cannot even smell, they are enough to discolor silver. This is because the hydrogen sulfide reacts with the silver, even at room temperature, creating silver sulfide – which then produces the above-mentioned dark discoloration.

Similarly, silver also tarnishes when it comes into contact with food residues containing sulfurous substances like egg yolk, mayonnaise, mustard, onions, pulses and fish, particularly pickled fish and marinades. That is why you shouldn't use a silver spoon to eat a boiled egg, for example.

The high copper content in 800 silver (200 parts in 1000) means that this silver can tarnish in colors ranging from gold to light brown, so it is less suitable for mechanical dishwashing. However, if it has subsequently been electroplated, it behaves in the same way as 90 or 100 silver plating.

The above-mentioned highly sensitive reaction between silver and sulfurous compounds means that tarnishing is unavoidable. Even silver care products containing substances that claim to offer chemical protection can only delay the risk of tarnishing slightly, if at all, if the level of alkalinity is high. These protective coatings are only ever very thin, so the protective effect can only ever last for a very limited period.

Silver in the dishwasher

Generally speaking, the conditions for washing silver in a dishwasher are less favorable than for washing by hand. The following influences will accelerate tarnishing of silver here:

Food residue

The above-mentioned sulfurous food residue can sometimes have quite a long time to work on the surface of the silver before mechanical dishwashing, as we tend to wait until the dishwasher has a full load of dirty items before washing, unlike washing by hand, when we tend to do the dishes straight after meals.

Cleaning temperatures

Even during the dishwashing cycle, the contaminated washing water is in contact with the silver for much longer periods and also at much higher temperatures (50 to 65°C) than when washing by hand. The higher temperatures during mechanical dishwashing make the silver more reactive, boosting the chemical processes that result in tarnishing.

Cleaning time

The intensive cleaning process in a dishwasher fully degreases the surface of the silver, making it more vulnerable to external influences.

Oxidation agents in cleaners

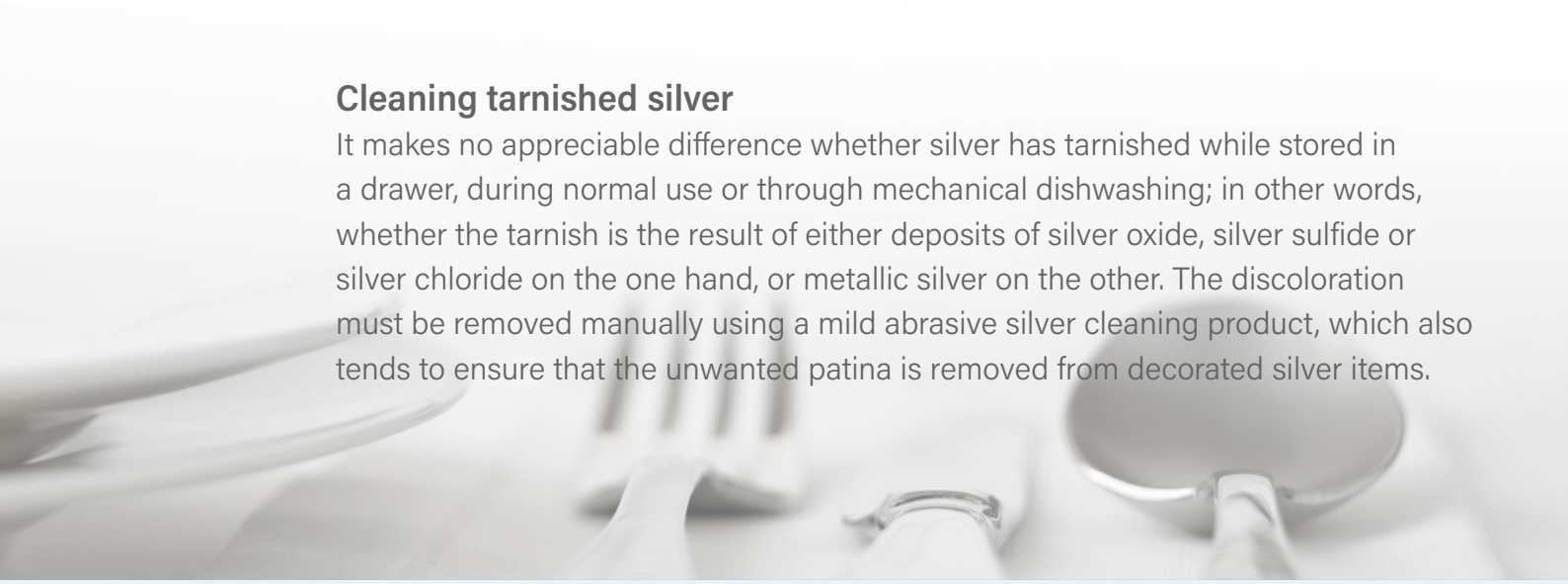
Oxidation agents based on active chlorine or oxygen bleaches are also culprits, with findings indicating that cleaners containing active oxygen are more strongly tarnishing than those containing active chlorine.

Alkalinity (pH value) of cleaning products

Physicochemical investigations show that higher levels of alkalinity reduce the risk of silver tarnishing caused by the corresponding food residues in the washing water, e.g. mustard. With washing by hand, the final stage of drying the items also polishes them to some degree – obviously, this is not the case with mechanical dishwashing. Whatever the circumstances, cleaning products should never be allowed to come into direct contact with silver items that require washing. Unless these items are washed immediately, the cleaning products will adhere to the surface for some time, causing patches ranging from blue to black discoloration to form, which are very difficult to remove and usually only through mechanical processing.

Cleaning tarnished silver

It makes no appreciable difference whether silver has tarnished while stored in a drawer, during normal use or through mechanical dishwashing; in other words, whether the tarnish is the result of either deposits of silver oxide, silver sulfide or silver chloride on the one hand, or metallic silver on the other. The discoloration must be removed manually using a mild abrasive silver cleaning product, which also tends to ensure that the unwanted patina is removed from decorated silver items.



Tip

Discoloration or unwanted patina can usually be removed from silver cutlery and decorations using Assure or Tensil and aluminum foil in an immersion bath. If this method does not produce the desired results, the silver items can be polished with **Copper Shine non-ferrous metal cleaner**.

Washing porcelain

Porcelain is the most sophisticated fine ceramic form of clay pottery and is translucent when it is thinner. The decoration on porcelain crockery is part of the standard overall finish.

Underglazes and overglazes are two different ways of decorating porcelain. With **porcelain underglaze decoration**, the colorful decoration is covered by a protective layer of glaze, so the designs cannot be damaged by the washing water. The surface of underglaze decoration feels smooth and even and most forms of it are dishwasher-safe.

In contrast, conventional **porcelain overglazes** are painted or applied directly onto the surface of the porcelain and fired at relatively low temperatures (around 800°C), so they do not have a protective layer of glaze. Generally speaking, porcelain overglaze decoration is not as dishwasher-safe as underglaze decoration, as the designs are simply melted onto the surface of the glaze, so they are directly exposed to the influence of the detergents.

With **inglaze decoration**, the glaze is applied after the decoration is painted on and fired at a high enough temperature (firing temperature > 1300°C) that the glaze melts again and the colored designs sink into the glaze. Although this technique ensures that the decoration is dishwasher-safe, the high firing temperature limits the range of colors that can be used for inglaze decoration to not much wider than for underglaze decoration.

Fast-firing decoration is also dishwasher-safe. The firing temperature is around 1300°C and the short firing time means the range of colors is wider than for inglaze decoration.

Opal glass

As well as porcelain, crockery can also be made up to 100% from what is referred to as opal glass – glass that is hardened using a special production technique and is more resistant to mechanical influences that normal glass crockery.

Opal glass is available both decorated and undecorated; the decoration is printed onto the surface and then fired. Generally speaking, opal glass is easy to clean.

However, if the water contains a high level of solids, evaporation residue may remain visible on items after washing, especially on dark colors. An appropriate water treatment product can help to resolve this issue. As with porcelain, metal abrasion marks can be left on crockery when the items for washing are handled – and discoloration caused by this can no longer be removed by dishwashing.

Metal abrasion marks

Tip

Ecolab provides tried-and-tested water treatment systems that can be either purchased or rented.

Metal abrasion marks on crockery can be removed effectively using extremely gentle polishing agents such as **HELIOS Brillant stainless steel and ceramic hob cleaner** from Ecolab.

WASHING PLASTIC

Plastics are either thermoplastic or thermosetting, depending on their physical properties.

THERMOPLASTIC plastics have a linear or slightly branching molecular structure, depending on their strength, and this structure means that they can be shaped at high temperatures. If the manufacturer's temperature recommendations are observed, the initial malleable form becomes a rigid and stable molded piece after cooling.

THERMOSETTING PLASTICS are rigid and have a cross-linked and branching molecular structure. They are hardened during shaping and can then no longer be reshaped through heating. The following types of plastic are primarily used for manufacturing items for use:

Thermoplastic plastics

- ABS (acrylonitrile butadiene styrene)
- ASA (acrylonitrile styrene acrylate)
- PA (polyamide)
- PC (polycarbonate)
- PE (polyethylene), as well as LDPE = low density and HDPE = high density
- PES (polyethersulfone)
- PET (polyethylene terephthalate)
- POM (polyoxymethylene)
- PP (polypropylene)
- PSU (polysulfone)
- PTFE (polytetrafluoroethylene)
- SAN (styrene acrylonitrile resin)

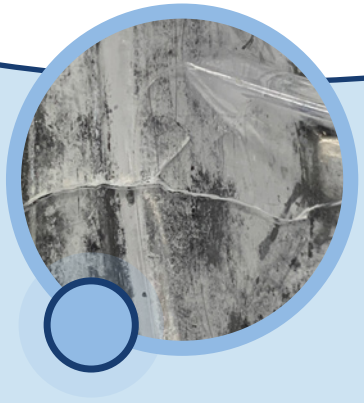
Thermosetting plastics

- GRP (glass fiber reinforced plastic)
- MF (melamine), e.g. Resopal®, Ricolit®

Compared to porcelain and glass, plastics are significantly lighter and more resistant to scratching, as well as more resistant to impact and breakage, quieter to use and having a greater heat storage capacity.

As a whole category, plastics cannot be described as dishwasher-safe, as problems occur with some plastics because they are less resistant to heat and others because of a lack of chemical resistance. Higher temperatures (>65°C) and longer application times (>2 minutes) – during thermal disinfection, for example – may mean a shorter service life for the item being washed.

IMPAIRMENT of appearance and hygiene



Material-induced **STRESS CRACKS**

Surface damage causes **DISCOLORATION** through contact with food

Mechanical strains during use causes damage to the surface (scratches, frosting, lightening, etc.) that impair appearance and hygiene.

Typical examples of this are plastics made from acrylonitrile butadiene styrene (ABS), glass fiber reinforced plastic (GRP) and polyamide (PA). These plastic items are also alkali-sensitive and using intensive cleaning agents may affect them, so they cannot cope with the conditions created by highly alkaline deep cleaning.

Depending on the type of material, some plastics – such as polycarbonate or polysulfone – may be prone to stress cracks. If the surface of plastic crockery is damaged, the material can discolor when it comes into contact with food. Melamine items in particular can be expected to be discolored with yellow patches if cleaning agents containing chlorine are used. **Generally speaking, the low heat capacity and conductivity mean that drying plastics is more difficult and takes longer.**

Poor wettability means that suitable rinsing agents – in appropriate dosages, if necessary – must be used during fresh water rinsing. Brand-new items for washing that are made from plastic have poorer wettability than items that have already been in use for longer periods. Care should be taken to ensure that items are only stacked once they are completely dry, in order to prevent residual moisture harboring germs. If items do not dry sufficiently at ambient temperatures, appropriate drying systems may be necessary.

Information from the manufacturers of the items for washing and the detergents should always be observed.

Tip

Clear Dry PL rinse aid for difficult drying conditions.

ECOTEMP® – THE INTEGRATED RENTAL CONCEPT FOR HYGIENIC, CLEAN CROCKERY

EcoTemp® offers an integrated concept for hygienic, clean crockery at low operating costs and with no long-term capital commitment, repairs or downtime – all on a rental basis.

From powerful dishwashers through water treatment, products, dosing technology, range of racks and baskets, and regular servicing to training kitchen staff, everything is covered in the **EcoTemp® concept**.

If you want more details , call us or ask **your consultant**!

Ecolab Institutional – your partner for mechanical dishwashing.
If you want more details about our products and systems, please ask your consultant or call us.

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