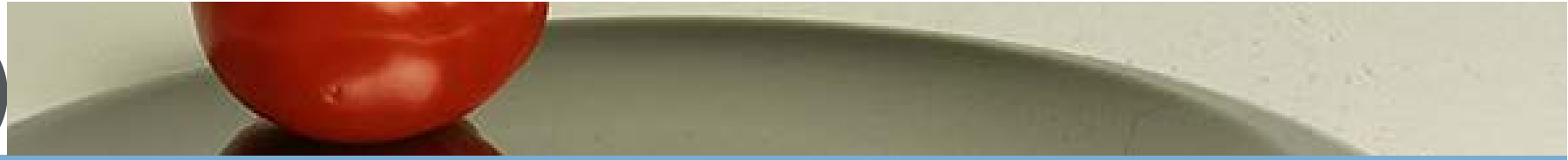
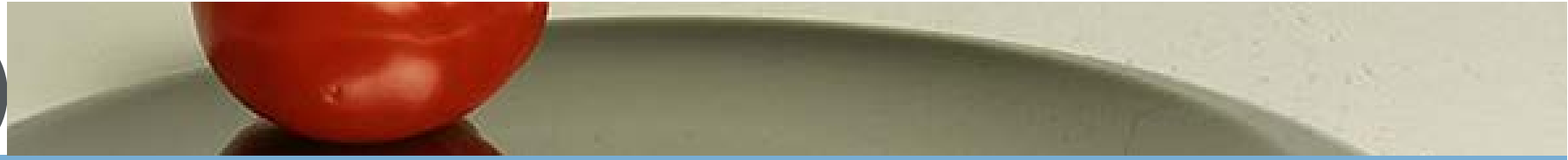


Stainless Steel for Hygiene

Stainless steel is a standard material for the most demanding hygienic applications - in the home, in industry, in healtcare.

This presentation provides an overview of

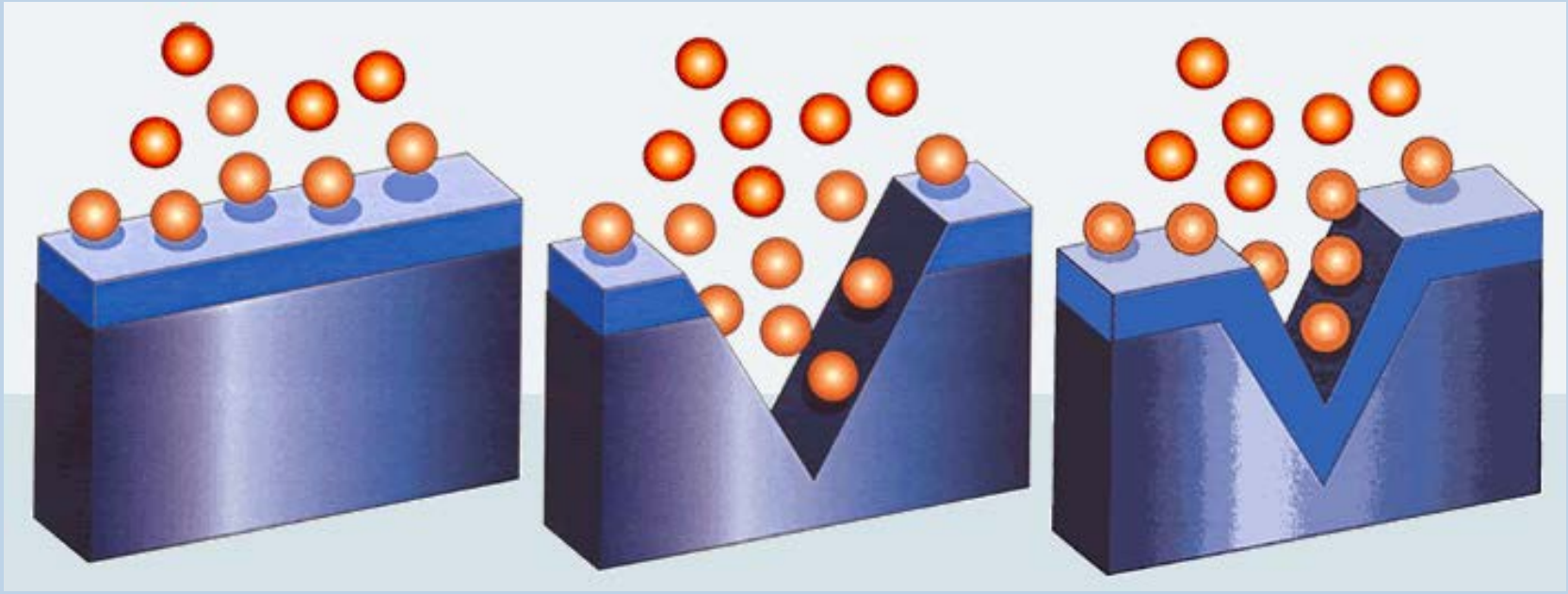
- why stainless steel is so hygienic and
- where it is typically used.



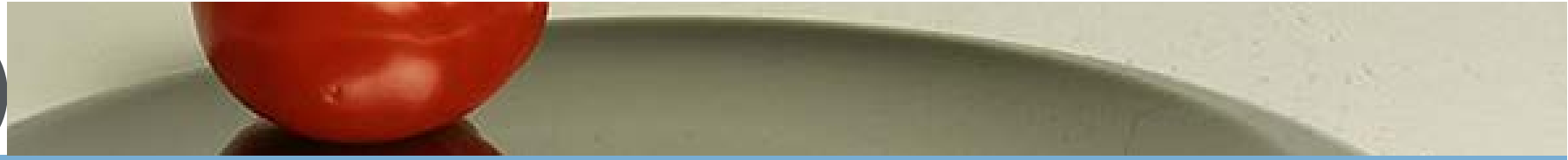
Stainless Steel for Hygiene

Why stainless steel is corrosion resistant

The secret behind stainless steel is an invisible "passive layer". It develops naturally on the surface from the iron and the chromium contained in all stainless steels. If damaged, this microscopic layer will instantaneously reform. It makes stainless steel a "self-repairing" material, which dispenses with any external surface protection: the material remains corrosion resistant as it is.



Picture courtesy of Euro Inox

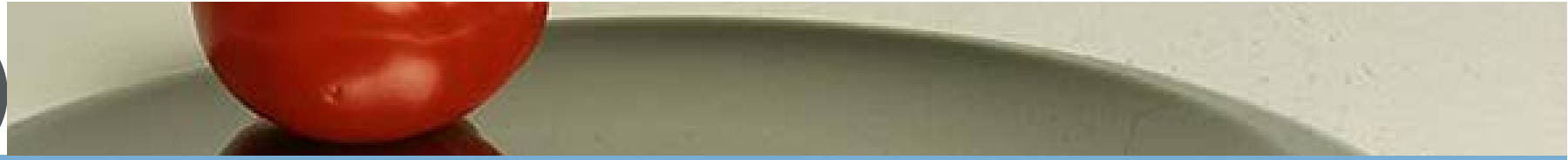


Stainless Steel for Hygiene

Why stainless steel is hygienic

Stainless steel is also exceptionally wear resistant. It has hard, smooth surfaces, which are easy to clean, making it difficult for germs to adhere and grow.

Picture courtesy of ThyssenKrupp Nirosta



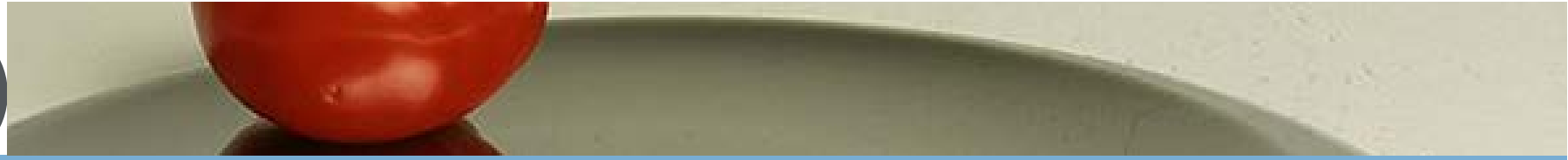
Stainless Steel for Hygiene

Cooking utensils

Stainless steel cooking utensils are a good investment. Because of their cleanability, mechanical resistance and non-aging properties, they can last for decades.
Grade 304, a type of steel containing about 18% chromium and 10% nickel, is the most common material for this application.

Although most stainless steels are non-magnetic, composite bottoms make it possible to use many stainless steel saucepans also on induction cookers.

Picture courtesy of Rösle



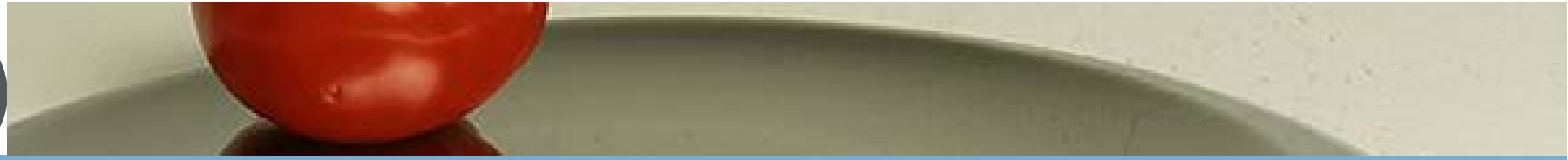
Stainless Steel for Hygiene

Domestic appliances

Dish washers and washing machines are typical examples: after each washing cycle, the surfaces are clean and shiny again - even after many years of daily use.

For the drums of washing machines and the lining of dishwashers, grade 430 - an iron-chromium alloy - has proved to be cost effective, while complex parts like the inner lining of the doors are often made in chromium-nickel grade 304, whose excellent formability is an asset.

Pictures courtesy of Miele

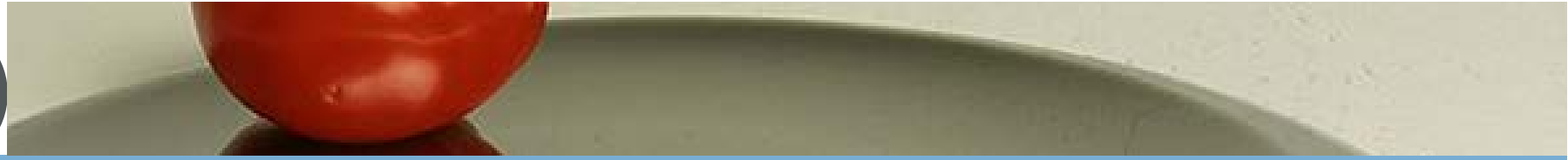


Stainless Steel for Hygiene

Kitchen sinks

Kitchen sinks get into contact both with dishes and food and must therefore fulfil the highest hygienic standards. The material does not develop cracks, is corrosion resistant and cannot absorb acids or colorants.

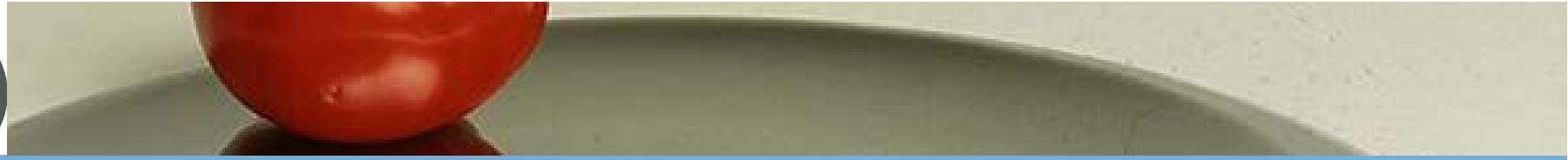
Different designs are available: one piece models drawn from a single sheet or material typically show rounded edges. The more complex, welded two- or three piece designs can also have sharper edges - according to the preference of the customer.



Stainless Steel for Hygiene

Barbecues

Barbecues must be easy to maintain. Even if left outside or in the garage, they must be easy to clean within minutes. When burnt-on meat is removed e.g. with scouring pads, metallic coatings may come off from other, plated metals, allowing the grill to rust. As stainless steel is corrosion resistant throughout, even robust cleaning practice will not lead to any deterioration. However, bleach and other chloride-containing cleansers should be avoided.

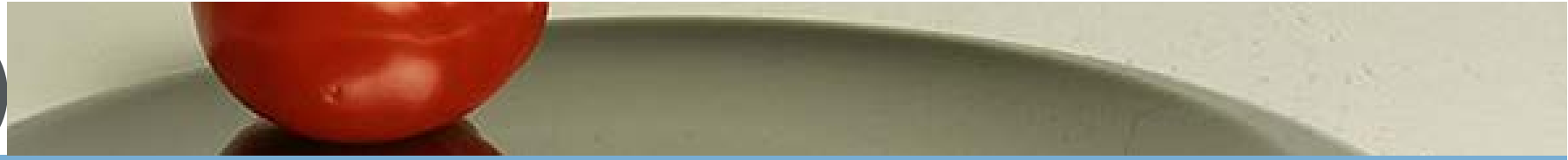


Stainless Steel for Hygiene

Bathrooms

Stainless steel sanitary equipment is also available for the home. The thin material can be an advantage where space is an issue: for the same inner diameter of a washbassin, the outer diameter can be much smaller than in conventional ceramic solutions.

Pictures courtesy of Acorn

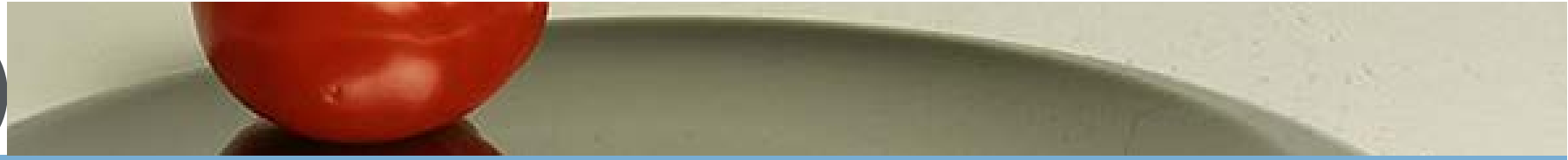


Stainless Steel for Hygiene

Restaurant kitchens

In restaurant kitchens, stainless steel worktops defy the daily attack by knives and sanitising cleansers. This is another area of application, where standard grades like 304 are dominant due to their versatility, i.e. their ideal combination of high corrosion resistance, formability and weldability.

Pictures courtesy of ThyssenKrupp Nirosta

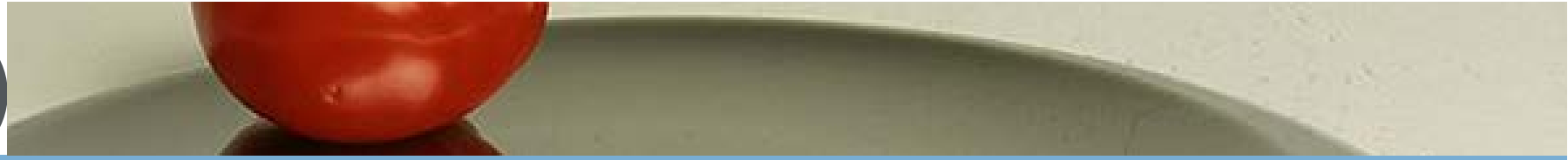


Stainless Steel for Hygiene

Floor drainage

Floor drainage can be a weak point in the hygiene concept: it may partly be difficult to access for cleaning. Stainless steel provides a surface, which is naturally smooth, the material is corrosion resistant to disinfection procedures, and the welded technique produces smooth joints. Where stronger disinfectants are used, a higher alloyed, molybdenum containing grade like 316 should be considered. Otherwise, it has the same excellent forming, welding and surface finishing qualities as 304.

Pictures courtesy of NIROTEC Aschl GmbH

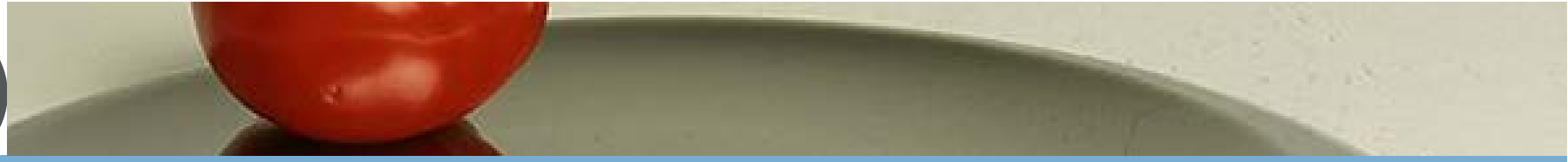


Stainless Steel for Hygiene

Fume extraction

In professional kitchens, the ventilation system must extract grease-containing fumes. As their deposits can create hygienic problems in the long run and are also a fire risk, all-stainless steel filters have been developed. The filters consist of stainless steel woven metal and can be cleaned thoroughly by simply putting them into the dishwasher.

Pictures courtesy of Veritec/SASSDA



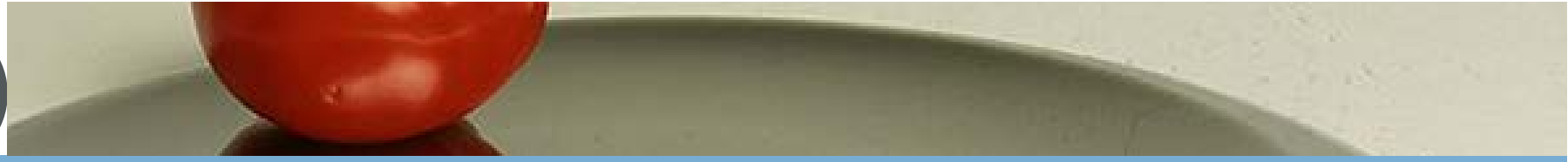
Stainless Steel for Hygiene

Food service equipment

Dining out is a daily reality for many people at work. Especially in warm climates, stainless steel is the ideal material to ensure food safety and freshness.

Austenitic stainless steels have a lower thermal conductivity than other materials and keep the food warm longer.

Pictures courtesy of YUSCO

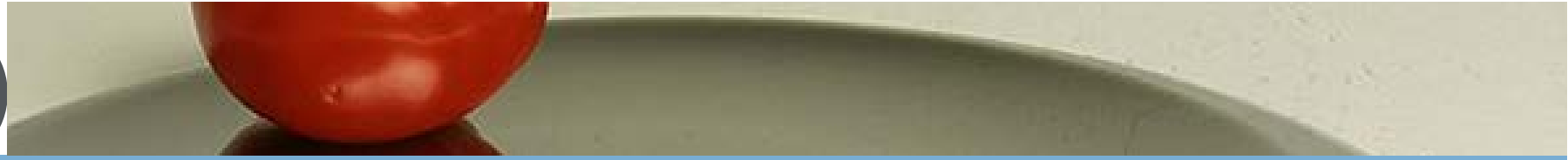


Stainless Steel for Hygiene

Food processing industry

In hardly any other industry is stainless as present as in the food industry, where it has largely replaced other materials. Legislation in many parts of the world acknowledges the neutrality of stainless steel, which does not alter the taste and the look of the foodstuffs and creates the conditions for perfect cleaning and sanitisation.

Pictures courtesy of ThyssenKrupp Nirosta

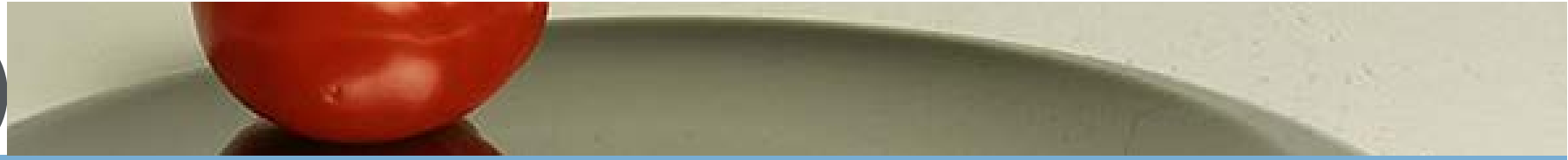


Stainless Steel for Hygiene

Meat and fish processing

In the meat and fish industries, where hygienic standards are extremely demanding, stainless steel is the normal choice.

Pictures courtesy of the Nickel Institute



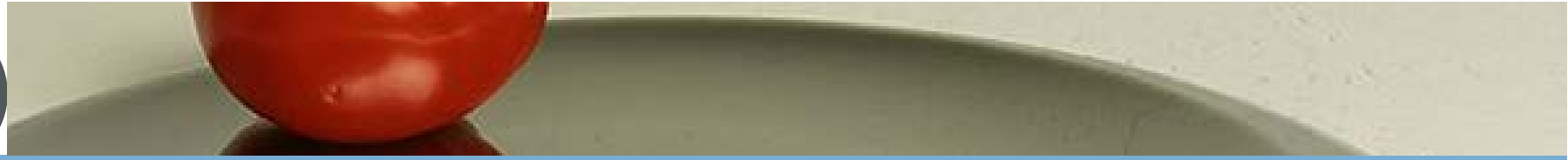
Stainless Steel for Hygiene

Vegetable preservation

Many types of fruit and vegetables are a challenge to metallic materials in that they have high acidity e.g. tomatoes. The contact materials undergo high corrosive stress and must still be durable, even if the acid medium is in permanent contact with the equipment 24 hours a day.

Excellent long term service experience has been made with stainless steel type 316.

Pictures courtesy of Centro Inox and Euro Inox



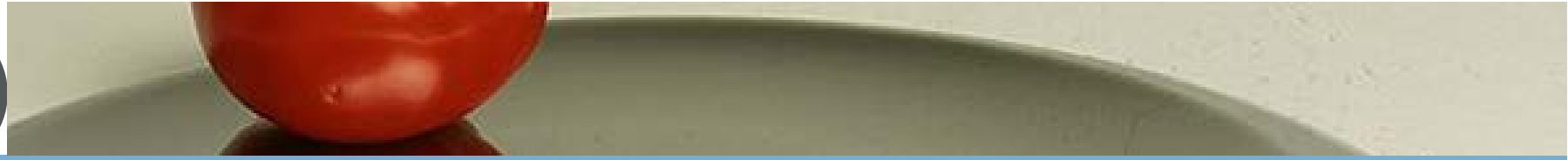
Stainless Steel for Hygiene

Soy sauce

Soy sauce, although healthy for man, is extremely corrosive to materials. Requiring months of fermenting, it is among the greatest challenge of all for materials used in food processing.

But even for extreme conditions, the large family of stainless steel has solutions to offer: typical examples are grade AISI 904L, which has molybdenum content of over 4%, and grades like 254 SMO molybdenum which contain more than 6% Mo.

Pictures courtesy of Nippon Yakin Kogyo



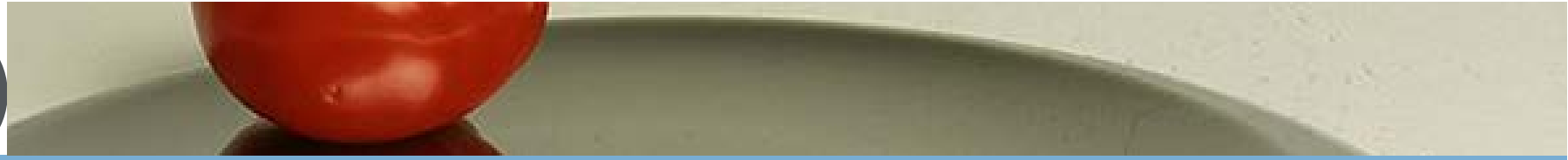
Stainless Steel for Hygiene

Dairy

Dairies rely on stainless steel, because they have extreme hygienic requirements. Even the slightest contamination can be detrimental to the product. Germ-free cleanability is a must.

Further reading.

Pictures courtesy of Raiffeisen-Genossenschaft, FH Hannover, Südwestdeutscher Rundfunk (SWR)

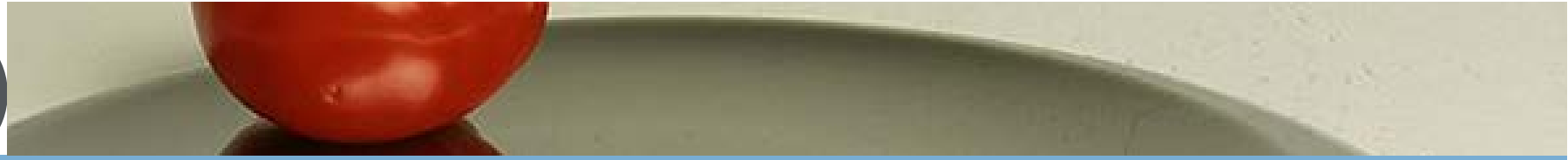


Stainless Steel for Hygiene

Wine production

To maintain the complex natural taste of the wine, extraneous factors must be strictly controlled. Stainless steel is today the preferred material in all stages of the production process.

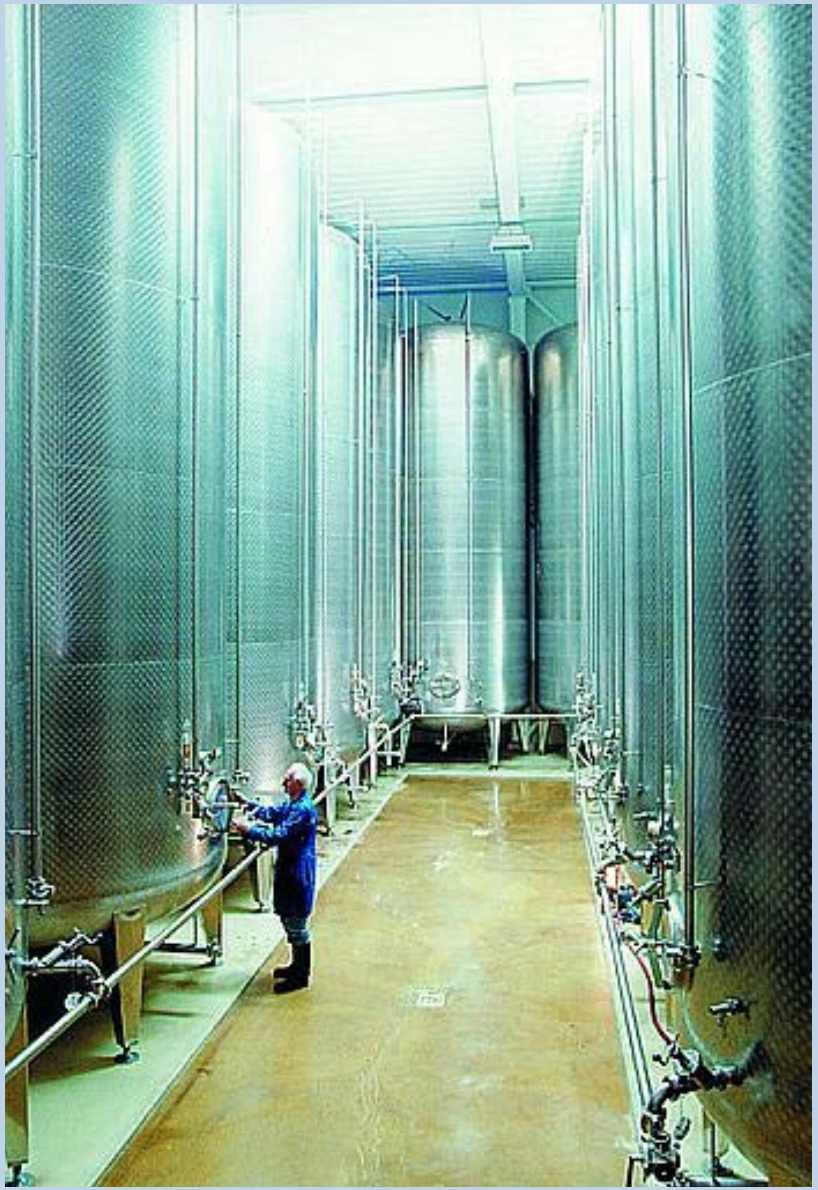
Pictures courtesy of ThyssenKrupp Nirosta



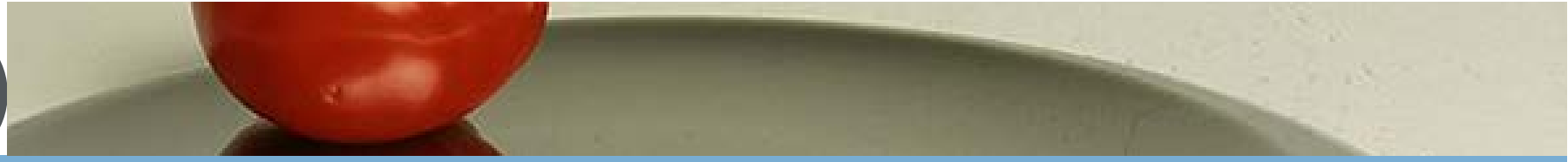
Stainless Steel for Hygiene

Wine storage

Especially red wine contains strong natural colorants. Unlike other materials, stainless steel does not develop permanent discolorations and remains visibly hygienic.



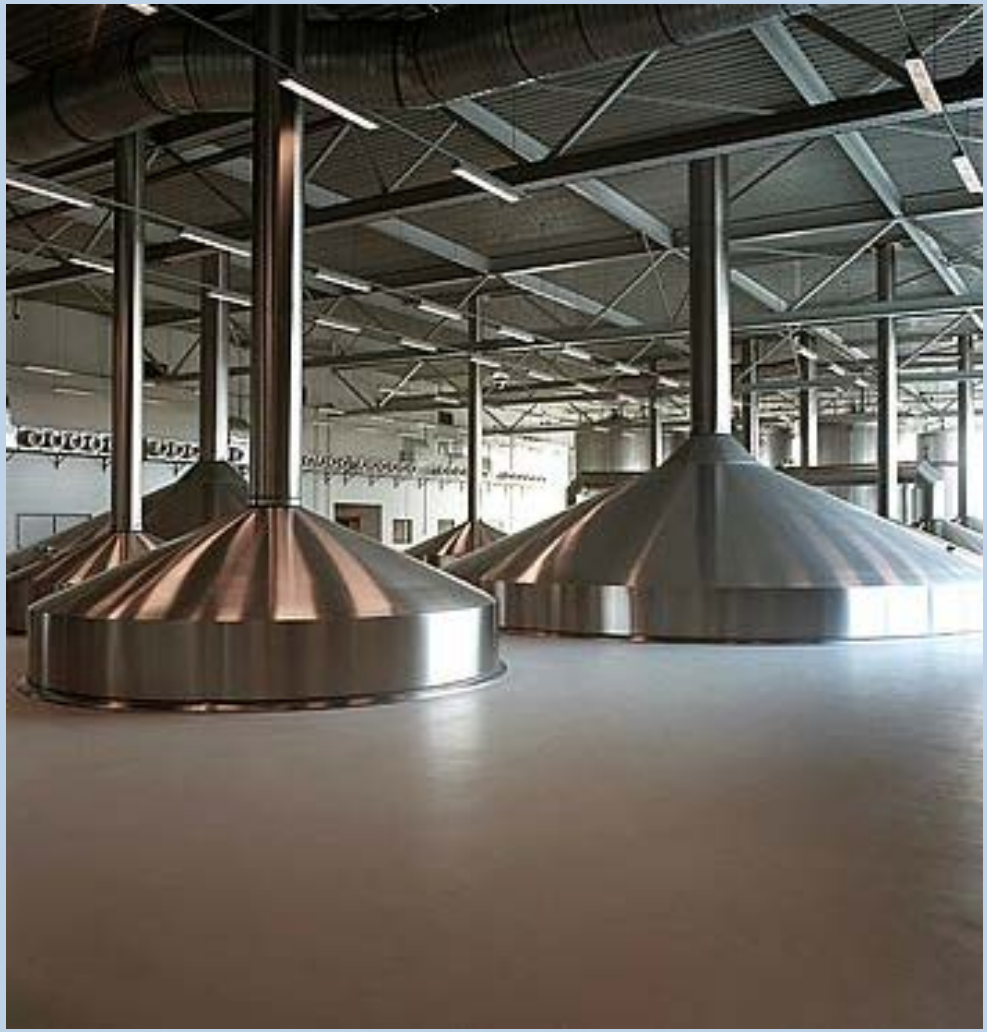
Pictures courtesy of ThyssenKrupp Nirosta



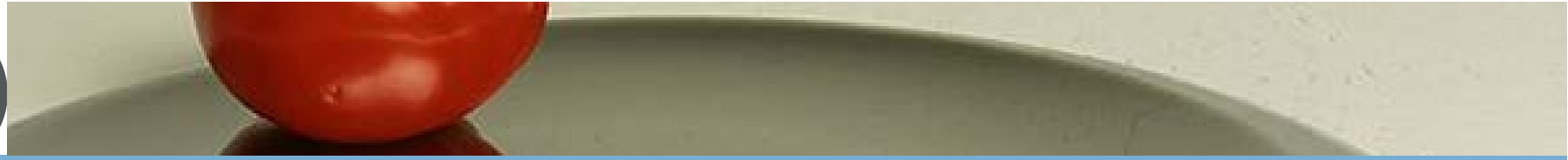
Stainless Steel for Hygiene

Brewing

Beer brewing involves complex biochemical processes. For consistency of quality and taste, a perfectly cleanable and neutral material is required. Furthermore, the fermentation process sets free corrosive gases, which can be devastating for less corrosion resistant metallic materials. Today, stainless steel is the normal material in breweries.



Pictures courtesy of Inbev

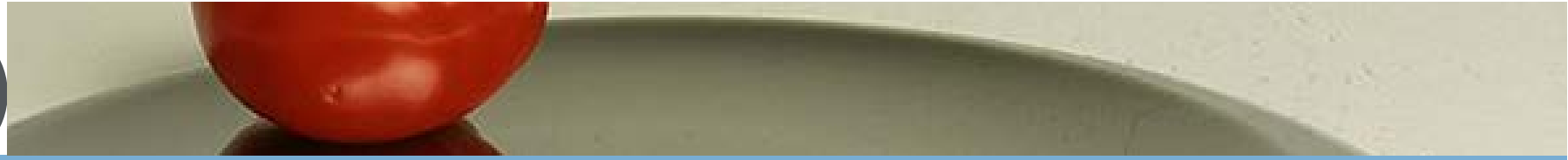


Stainless Steel for Hygiene

Beer kegs

In beer kegs, stainless steel has largely replaced other metallic materials. The reason: its high mechanical resistance gives stainless steel kegs a much longer service life than, e.g. lighther metal counterparts and makes them a cost effective solution.

Pictures courtesy of Ugine&ALZ, Franke

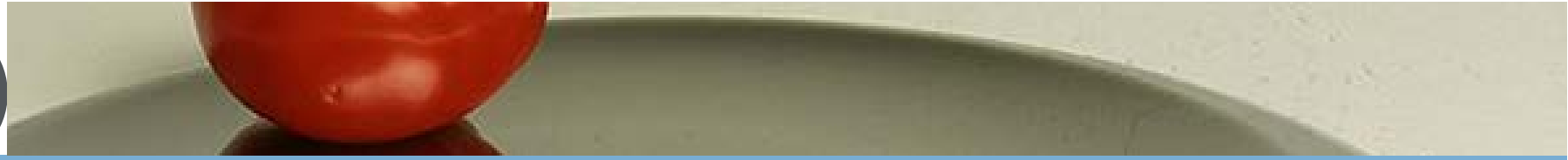


Stainless Steel for Hygiene

Bulk food transport

Road tankers for foodstuffs are a good example of the excellent cleanability of the material: although they may contain different foodstuffs every day, standard cleaning processes make it easy to avoid cross-contamination.

Pictures courtesy of the Nickel Institute

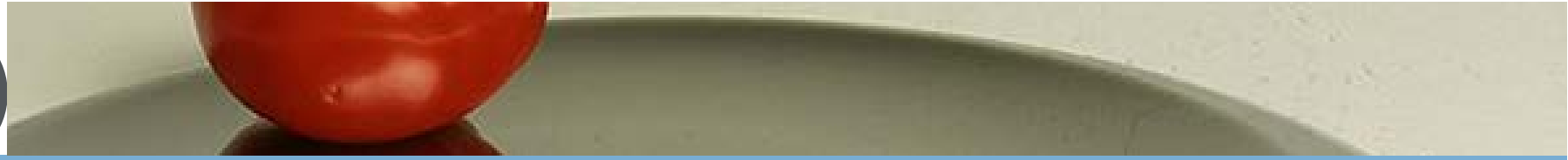


Stainless Steel for Hygiene

Kiosks

Kiosks must be easy to keep tidy also from the outside, although they may be exposed to the weather and soiling. Stainless steel expresses the hygienic awareness of the owner.

Pictures courtesy of Thomas Pauly

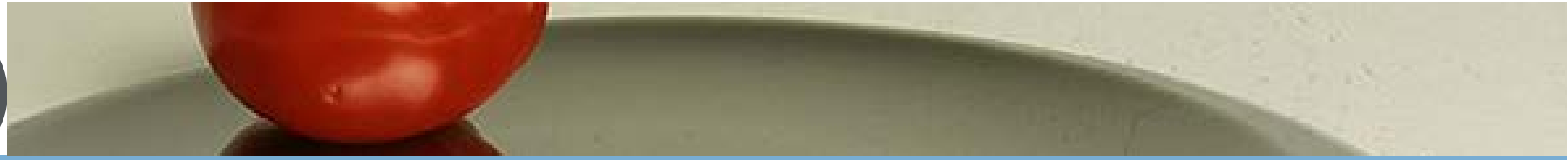


Stainless Steel for Hygiene

Waste disposal

Waste food and packaging can be unsightly and attract rodents. Easy, thorough cleaning of the waste bins is imperative. Stainless steel is a good option as even with mild detergents and a minimum of maintenance, it allows waste bins to be kept in good condition - both from a hygiene and a visual point of view.

Pictures courtesy of Thomas Pauly

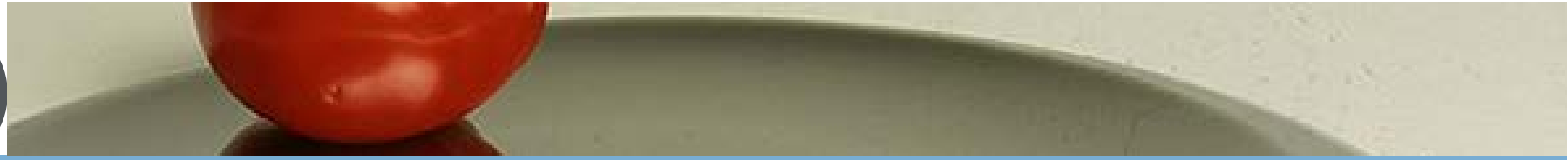


Stainless Steel for Hygiene

Waste collection

Waste collection also requires equipment, which must be resistant to robust, daily practice and thorough cleaning. Stainless steel solutions can be simple, efficient and cost-effective.

Pictures courtesy of Thomas Pauly, City of Ponferrada (León)



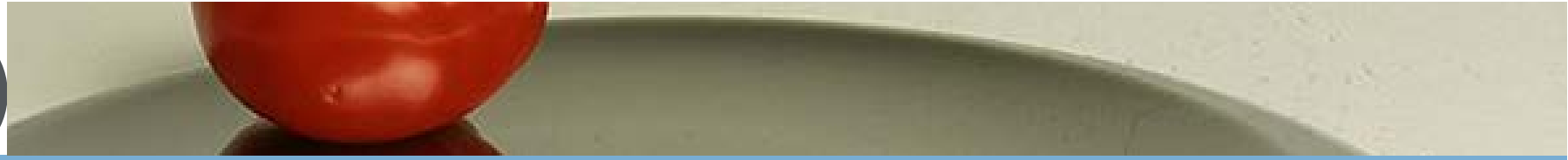
Stainless Steel for Hygiene

Sanitary equipment

In sanitary equipment, stainless steel also conveys an impression of hygiene and cleanliness. Cities can make stainless steel toilets part of their public design concept.

Patterned finishes are often used for this purpose, because the surface treatment confers to its mechanical resistance. Patterns also mask accidental damage.

Pictures courtesy of Martina Helzel, Intra AS

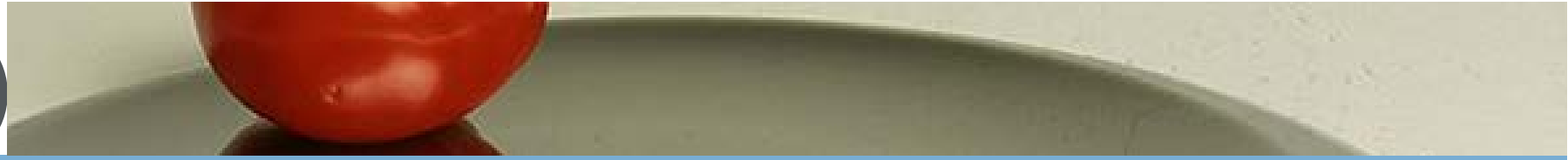


Stainless Steel for Hygiene

Public swimming pools

The absence of porous mortar joints, where algae can adhere and germs may be trapped, makes stainless steel the ideal solution both for the initial erection and the renovation of public swimming pools. Having been used for decades in pool linings, grade 316L has demonstrated its suitability in over a thousand pools world-wide.

Pictures courtesy of HSB

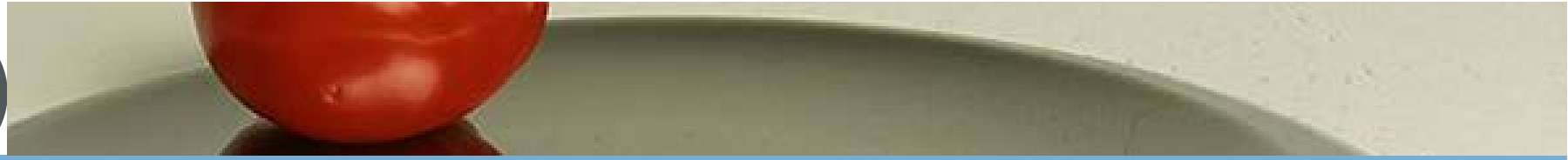


Stainless Steel for Hygiene

Operating theatres

The extensive use of stainless steel in operating theatres show how well the material performs when cleanliness and even sterility are essential.

Pictures courtesy of ThyssenKrupp Nirosta

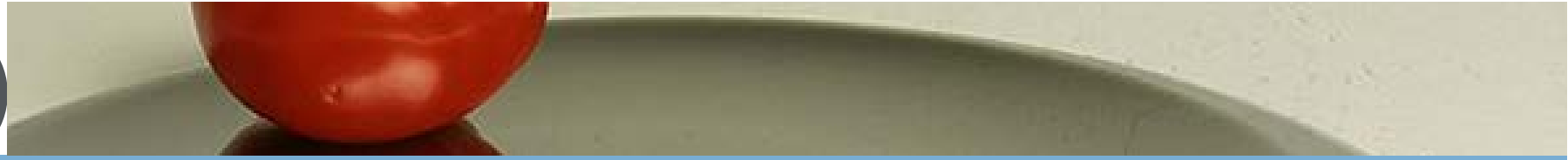


Stainless Steel for Hygiene

Surgical instruments

Surgical instruments are typically made of stainless steel.
They are exposed to aggresive disinfectants.
The most common “surgical steels” are austenitic 316 stainless and martensitic 440 and 420 stainless steels.

Pictures courtesy of ThyssenKrupp Nirosta

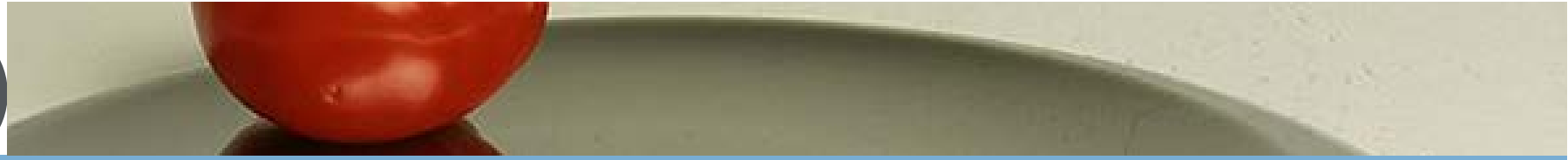


Stainless Steel for Hygiene

Therapeutic pools

In medical pools, the risk of bacterial growth is higher because of the elevated water temperatures involved in the therapeutic use of water. Higher levels of chlorination are needed, and still stainless steel - typically grade 316L is a preferred material.

Pictures courtesy of Berndorfer Bäderbau, Francesconi



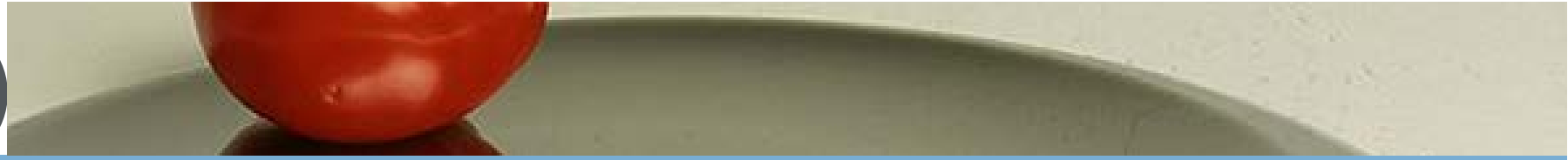
Stainless Steel for Hygiene

Water treatment

UV and Ozone treatment are technologies, which dispense with chlorination for the disinfection of water. The reactors are of stainless steel, which resists both to the aggressive ozone and the substances contained in the water.

Further reading.

Pictures courtesy of ThyssenKrupp Nirosta

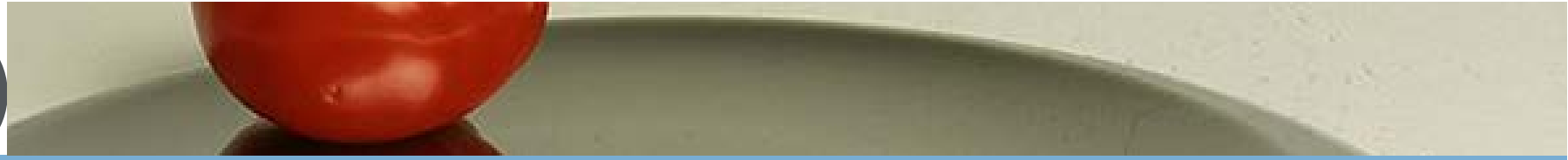


Stainless Steel for Hygiene

Water storage

The same technique which is used for swimming pools, can also be applied to water reservoirs. Here, also duplex stainless steel with a mixed austenitic and ferritic metallurgical structure has been used successfully. Originally made for immersion into sea water, it has an even higher corrosion resistance than the standard grades. Due to its high mechanical strength, very thin sheet can be used to withstand the water pressure. Pressed patterns enhance the structural stability further.

Pictures courtesy of POSCO



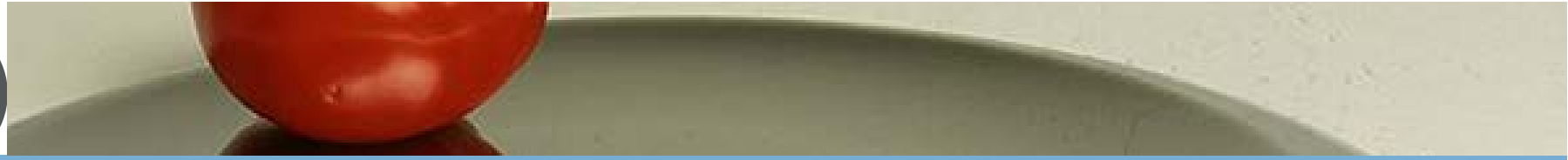
Stainless Steel for Hygiene

Potable water distribution

The safety of our most important food item - drinking water - is protected by stainless steel. It is neutral and neither influences its taste nor its quality. Its pore-free, non-ageing metallic surface is also part of strategies against bacterial growth.

Rinsing with hot water of about 70°C is an effective and environmentally friendly method of sanitisation to avoid the proliferation of legionellae. Unlike some synthetic materials, this level temperature is not a problem for stainless steel. Further reading.

Pictures courtesy of Geberit Mapress, Miguel Carulla



Stainless Steel for Hygiene

Making available to everybody a high level of hygiene in

- people's personal environment
- food preparation
- medical services
- public infrastructure

has been a big achievement. Stainless steel has played a significant role in this process. The bright and shiny surfaces make it quite obvious that stainless steel is a material for a healthier life.