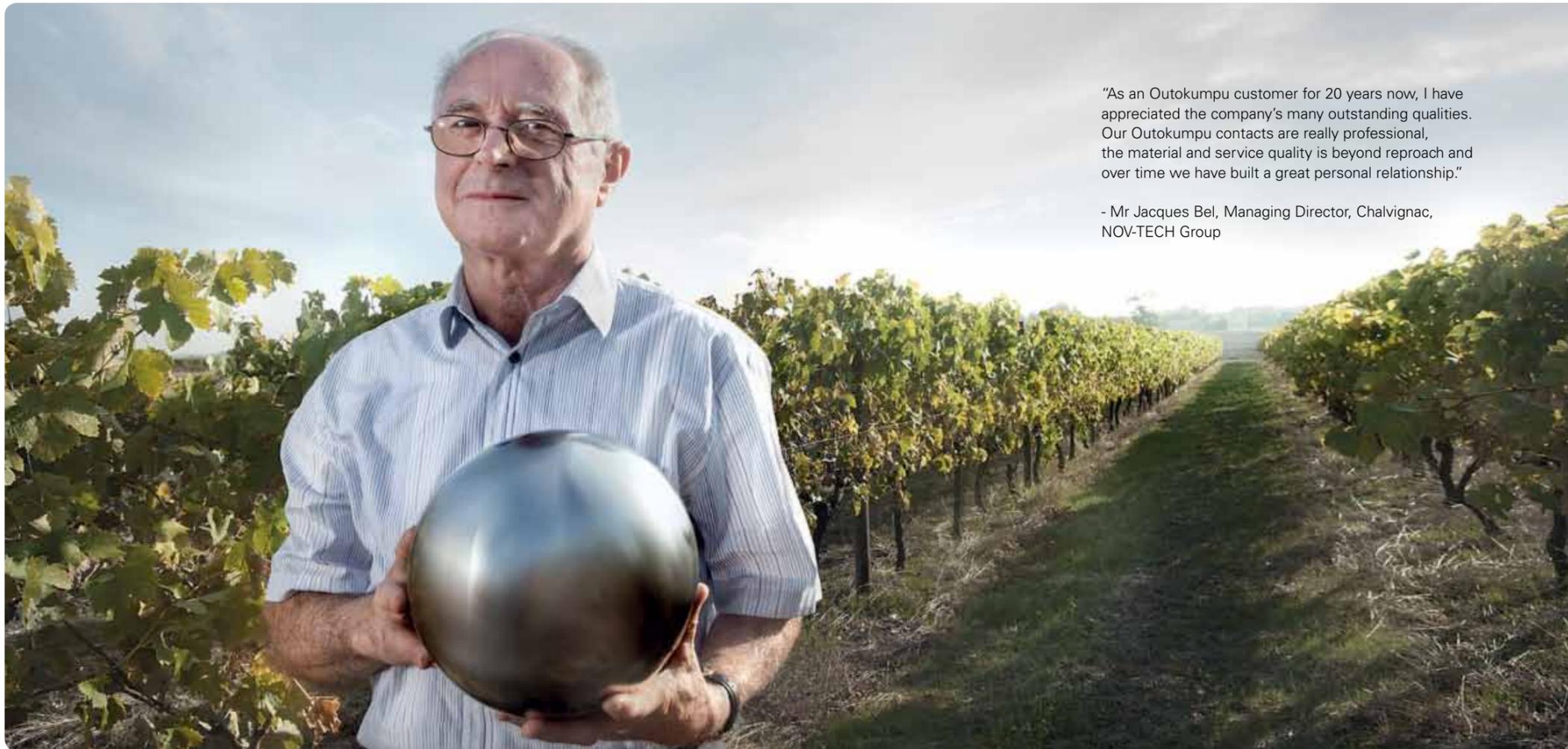




Activating Your Ideas

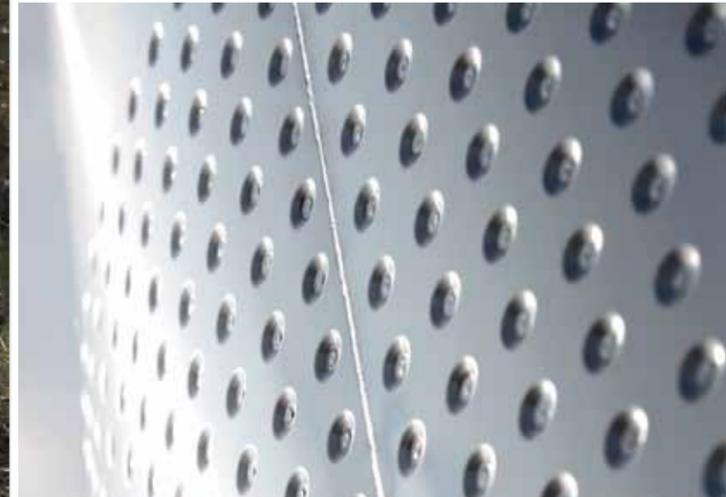
Stainless steel for the food & drink industry

**OUTO
KUMPU**



"As an Outokumpu customer for 20 years now, I have appreciated the company's many outstanding qualities. Our Outokumpu contacts are really professional, the material and service quality is beyond reproach and over time we have built a great personal relationship."

- Mr Jacques Bel, Managing Director, Chavignac, NOV-TECH Group



Let us inspire you ahead. We have been serving the food & drink industry for decades.

Exceptional hygiene, safety, strength and formability. These are some of the properties that have made stainless steel the material of choice for a wide range of food & drink applications. When it comes to the supply of stainless steel, you will find that our expertise and resources are unmatched in the industry. Welcome to the world of Outokumpu, and all that we can do for you.

We are here to activate your ideas

When you team up with Outokumpu, you will have an industry-leading partner that is with you every step of the way, from grade selection advice and material testing through to the timely delivery of world-class stainless steels to match

your needs. We are here to activate your ideas – and ensure you have the support you need to find the optimal solution.

Why stainless steel

The widespread use of stainless steel in the food & drink industry reflects the fact that stainless steel resists corrosion by most food and beverages. The product is not contaminated by stainless steel, and consequently no flavours or discolouration is imparted to the food and drink. In addition, stainless steel is readily cleaned, providing hygiene in food processing and handling. Stainless steel is also strong and can be formed into necessary shapes for food processing, handling and storage. Stainless steel is the ideal material to use in the food & drink industry!

Offering the widest selection of stainless steel grades and surface finishes

There is no match to our global expertise. For an exceptionally wide range of process conditions, we can provide you with the stainless steel you need. Our offering covers one of the widest ranges of austenitic, duplex and ferritic stainless grades, in many different surface finishes, available directly from our mills or tailor-made from our service centres.

Expertise you can count on, whatever your environment is

Just like food & drink processes differ greatly, so do stainless steel grades. Each process sets its own requirements on the corrosion resistance, formability and other properties of the stainless steel, and we have the product range and expertise to help you arrive at the best solution, also when properties

beyond those of standard austenitic grades are required. Our dedicated experts are here to assist you and help you achieve the lowest possible life-cycle cost.

Duplex is increasingly the answer

Duplex stainless steel is increasingly the material of choice for a wide variety of food & drink applications. Its high strength makes it especially suitable for storage tanks due to the thickness and cost reductions it enables, while its corrosion resistance, which is similar or better than for corresponding austenitic grades, has made it the economical choice for processes from mustard and vinegar making to cheese dairies and fish-canning plants. The resistance of duplex to stress corrosion cracking is much better than that provided by standard austenitic grades, making duplex the perfect choice whenever steam is present.

Real services to ease your life

All our operations are geared to maintain close contact with our customers and make the process of purchasing stainless steel as simple as possible. This includes studying your needs on the spot, professional help in material selection, planning, logistics advice and adapted service – for optimal products, cost-efficient operations, and well-planned deliveries.

Materials testing for optimal grade selection

We have extensive experience in testing stainless steels in many food & drink environments. The results of several of these tests, covering the most common foodstuffs from starch and syrup to acetic acids and ethyl alcohol, are handily available to you in our Corrosion Handbook. In specific cases, we can also offer testing of different

stainless steel grades in your own processes at your premises, supported by testing and evaluation by our specialists in our corrosion laboratory. These tests, together with Outokumpu's long experience in the food & drink industry, ensure that the grade you finally choose is the optimal solution.

E-tools for product selection and more

We have introduced several easy-to-use online tools for your benefit. Our product tool, for example, allows you to quickly search through our products and learn about their material properties, while our tank calculation tool is especially helpful when you look for possibilities to achieve weight savings and a competitive edge when designing and building tanks. The tools, of course, are available 24 hours-a-day.

We are just around the corner

Outokumpu is one of the leading producers of stainless steel and is widely recognised as a world leader in technical support, research and development. We serve our customers from our main production facilities in Finland, Sweden, UK and USA, supported by operations in some 30 countries around the world. Wherever in the world you may be, we are just around the corner.

To learn more, visit Outokumpu.com:
Industry offerings.

We are here to make the process of procuring stainless steel as easy as possible



"Our cooperation with Outokumpu has been built not just on superior quality and timely deliveries, but also on a shared philosophy. We, too, believe that success in today's competitive environment is all about initiative, enthusiasm and genuine customer support. It is therefore no surprise that our relationship with Outokumpu has lasted for more than 20 years."

– Mr Ton van Loon, Purchase Manager, Holvrieka Holding B.V.



Palm oil tank farm, photo courtesy of Loders Croklaan

Offering you a full palette of innovative stainless steels

New grades for the extra edge

We have decades of experience in developing stainless steels for the most demanding process environments. An excellent example is our proprietary high-strength duplex grade Outokumpu LDX 2101[®], which can offer substantial cost cuts due to the thickness reductions it enables. We are continuously developing new stainless steel grades for applications from wine tanks to process piping. We can supply all our grades with a surface finish that fulfils hygienic requirements with Ra 0.8 or less.

Certified quality documented in detail

In the food & drink industry, there is no substitute for achieving the highest levels of hygiene and safety. That is why we take pride in our state-of-the-art production

plants, which comply with the strictest quality, safety and environmental standards, including 3-A sanitary standards and relevant national authorisations. We produce steel with industry-leading tolerance accuracies, with every batch documented in detail.

Our food & drink offering in a nutshell

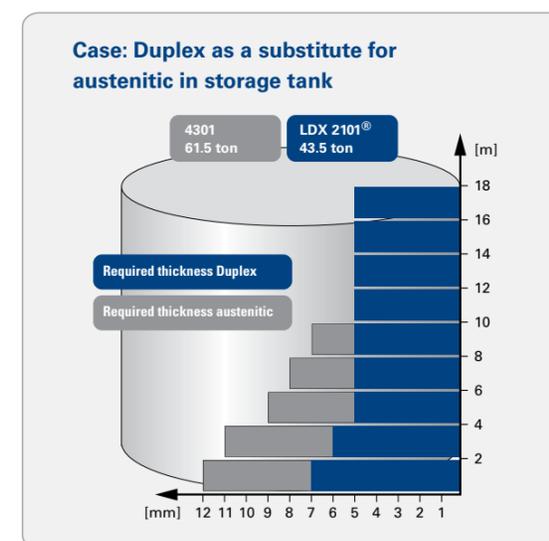
Our offering for the food & drink industry covers a full-range of austenitic, duplex and ferritic stainless steel grades. This includes coils, strips, sheets and plates, as well as process tubes, pipes and fittings and also bars. We have strong capability for delivering tailor made parts, and offer a wide range of options for polished and brushed surface finishes, plasma, laser and water-jet cutting, as well as sawing, press braking and edge preparation for welding.

CASE HIGHLIGHT:

Duplex brings major savings for tank farm

Storage tank builder Emypro of Spain was putting finishing touches to 13 large storage tanks in the Port of Barcelona when the customer, the bulk-liquid storage company Relisa, gave green light for an additional 9 tanks. The new tanks, like the first 13, were built entirely out of Outokumpu's proprietary duplex LDX 2101[®]. The total saving achieved was about 350 tons, or 16% of the total weight.

Emypro's cooperation with Outokumpu dates back 15 years and includes the largest ever duplex tank made out of duplex 2304. As noted by Emypro's Managing Director: "LDX 2101[®] and 2304 are very good alternatives for the traditional austenitic grades in large volume tanks due to the material thickness reduction and, consequently, a large reduction in cost." He also mentions good collaboration with Outokumpu in deliveries and technical assistance as a factor in the success of the joint projects.



From wine storage to making ice-cream. Ideas to stir your appetite.

Each food & drink process sets its own special demands on the materials used and therefore it is important that they are chosen with care.

We provide here some examples to illustrate which grades can be used for key food & drink industry applications. For more specific information, we invite you to get in touch with an Outokumpu sales representative near you.

Evaporator tubes

Grade: 254 SMO®
Size: 42.4 x 1.0 mm
Shell side: Steam
Tube side: Water solution with max. 2.9% Cl⁻, pH 5–8, O₂ = 5 ppm, some % of Na, Ca, NH₄⁺, organic and mineral material. Temperature up to 104°C

Comment:
254 SMO® is ideal for evaporation applications due to its excellent resistance to corrosion and stress corrosion cracking.

Flour silos

Silo walls: 180 tons LDX 2101®
Other sections: 80 tons 1.4301
Wall thickness: 4-5 mm (EN 1.4301 would have required 6-9 mm)
Process conditions: Electrostatic induction can cause problems if coated carbon steel is used.

Comment:
Pioneering stainless steel concept avoided electrostatic induction, brought weight savings estimated at 125-150 tons, eased fabrication, and was also maintenance free.

Syrup tanks

Grade: 2205
Process conditions: Cl⁻ 10,000 ppm
pH 5
Temperature 80°C

Comment:
Tanks of 316/316L were attacked by stress corrosion cracking. New tanks made of 2205 have been in service for more than 10 years without corrosion attack.

Beer kegs

Main structure: 1.4307 (304/304L)
Neck and bottom: 1.4318 (301LN), temper rolled

Comment:
Beer keg service life has been limited when made solely of 1.4307. Using 1.4318 in the neck and bottom improves toughness and allows loading of several kegs on top of each other.

Ice-cream moulds

Grade: 254 SMO®
Process conditions: CaCl₂ as refrigerant
Heating with steam

Comment:
Moulds of 316L were attacked by pitting and stress corrosion cracking. The problems disappeared with new moulds made of 254 SMO®.

Tanks for low-fat milk

Grade: 2304
Process conditions: Chlorides present, pH 6
Temperature: 70°C

Comment:
Tanks of 1.4301 (304/304L) suffered from stress corrosion cracking. With new tanks of 2304 the problems disappeared.



Photo courtesy of TetraPak.

Selected stainless steel grades for the food and drink industry

Outokumpu steel name	International steel designation		Typical chemical composition, %					PRE ¹⁾ values,	EN 10088, min. values, RT			Micro structure
	EN	ASTM	Cr	Ni	Mo	N	Other		Rp _{0.2} MPa	R _m MPa	A ₅ %	
4318	1.4318	301LN	17.7	6.5	-	0.14		20	350	650	40	Austenitic
4307	1.4307	304L	18.1	8.1	-	-		18	200	500	45	Austenitic
LDX 2101®	1.4162	S32101	21.5	1.5	0.3	0.22	5Mn	26	450 ²⁾	650 ²⁾	30 ²⁾	Duplex
4404	1.4404	316L	17.2	10.1	2.1	-		24	220	520	45	Austenitic
2304	1.4362	S32304	23	4.8	0.3	0.10		26	400	630	25	Duplex
LDX 2404®	1.4662	S82441	24	3.6	1.6	0.27	3Mn	33	540 ³⁾	740 ³⁾	25 ³⁾	Duplex
904L	1.4539	904L	20	25	4.3	-	1.5Cu	39	220	520	35	Austenitic
2205	1.4462	S32205	22	5.7	3.1	0.17		35	460	640	25	Duplex
254 SMO®	1.4547	S31254	20	18	6.1	0.20	Cu	43	300	650	40	Austenitic
2507	1.4410	S32750	25	7	4	0.27		43	530	730	20	Duplex

LDX 2101®, LDX 2404® and 254 SMO® are trademarks owned by Outokumpu.

¹⁾ PRE = %Cr + 3.3x%Mo + 16x%N

²⁾ According to ASTM A240

³⁾ According to ASTM A240, plate, coil and strip, t < 10 mm. For t ≥ 10 mm, Rp_{0.2} min. 480 MPa, and R_m min. 680 MPa.

Outokumpu – Activating Your Ideas

We are committed to excellence every where. Not just in product development and customer service, but also in logistics and the development of new technologies for the environment.

What distinguishes Outokumpu is our total customer commitment in all that we do. You have the idea. We offer the world's best stainless steels to meet your needs.

We sustain value by continuously developing our people and putting the customer at the heart of everything we do – let us activate your ideas.

Our global network supports you all the way from studying your needs on-the-spot to providing professional help in quality and production planning.

Our technological leadership allows us not only to tailor solutions to meet your specific needs, but also to work with you to provide the ultimate solution.



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This document does not constitute a recommendation or a contractual commitment on the part of Outokumpu. Product selection is the responsibility of the specifiers, designers and builders, who are solely responsible for rendering the finished unit suitable for the use for which it is intended. It is the customer's sole responsibility to ensure that the product is suitable for the use for which it is intended. Outokumpu shall not provide any guarantee in this respect.

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Activating Your Ideas

Outokumpu is a global leader in stainless steel with the vision to be the undisputed number one. Customers in a wide range of industries use our stainless steel and services worldwide. Being fully recyclable, maintenance-free, as well as very strong and durable material, stainless steel is one of the key building blocks for sustainable future.

What makes Outokumpu special is total customer focus – all the way, from R&D to delivery. You have the idea. We offer world-class stainless steel, technical know-how and support. We activate your ideas.

