



Activating Your Ideas

Stainless steel for desalination processes

**OUTO
KUMPU**



A refreshing attitude

Water for food, industry and life. With the world's consumption of water doubling every 20 years, desalination is increasingly becoming the answer to ensuring fresh water supplies. As a world leader in stainless steel, we are proud to have served this growing industry from the very beginning. Not just with the best stainless steels, but also with expert advice, services and project knowhow. We provide you with stainless steels that make your visions a reality.

We activate your ideas

We recognise that few environments are more aggressive than those found in desalination plants, with even the smallest leakages leading to considerable losses. That's why we consistently develop ever better steels to meet specialist requirements, and also focus on providing you with valuable services to make your life easier. Whether it be testing a new idea and sharing the results, or inspecting plants and proposing solutions, we activate your ideas.



Helping you make the right choices, for reduced lifecycle costs

Stainless steel is corrosion resistant, strong, hygienic and recyclable, which makes it an ideal choice for demanding desalination applications. Each application places unique demands on the steel's properties, and as a result we invest time and effort to help you choose your grade with care. We help you achieve world class innovativeness, quality and cost-efficiency.

Embracing the duplex revolution

Over the past 35 years, our duplex grades have made a breakthrough in many industries due to their excellent corrosion resistance and mechanical properties, as well as the material thickness reductions they provide. As in the pulp & paper industries, desalination has witnessed the move from stainless steel lining to cladding, and also austenitic to finally duplex, albeit at a much faster pace. Our duplex grades offer the right ferrite-austenite balance for the most challenging desalination industry applications.

With you every step of the way, from material selection to project completion

We have recognised the need to be close to our customers to ensure that the process of purchasing stainless steel is as simple as possible. We meet this need through a responsive supply chain, the provision of comprehensive services and advice, and through service centres located in the main markets. In addition, our experience of multicultural and governmental projects ensures streamlined actions, leaving you more time to focus on your core business.



When making that big investment, it is good to rely on experience

The desalination industry has gone through the same material selection process as the pulp & paper industry, but in a much shorter time. As a result of our long experience in both industries, we have refined our stainless steel grades for many years, and continue to develop our grades to serve your ideas for fresh processes and innovative equipment. Our materials can handle rough conditions, but are also resilient enough to meet latest environmental legislation.

Materials testing on your site

Few industries are more vulnerable to corrosion than desalination. For example, the risk of pitting, crevice corrosion and stress corrosion cracking (SCC) place ever greater demands on a number of applications. Therefore,

we not only provide you with help and advice in choosing the best and most competitive material, but can also offer the possibility to test candidate materials on your own premises, complete with evaluation and help from our R&D department.

The customer is at the heart of everything we do

We serve our desalination customers in a very special way, by providing a dedicated team including representatives from our main business units and R&D. This includes assessing your needs, providing professional help with quality and production planning, as well as logistics advice – for optimum product selection, cost-efficient operations, and on-time delivery. In addition, through our local representatives, your case is handled directly and with minimum fuss.



Real services to make your life easier

E-tools for product selection and more

In order to further streamline the ordering process, we have introduced easy-to-use online tools for your benefit. The tools allow you to search and select from our wide range of products, learn about their material properties, and also send in any questions and enquiries that you may have. The tools, of course, are available 24 hours-a-day.

We are just around the corner

Outokumpu is one of the largest 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, supported by our sales operations in some 30 countries around the world. Wherever in the world you may be, we are just around the corner.

Dual duplex – for more than double the benefits

We have an excellent track record in developing excellent materials for demanding process applications for desalination and other industries. In our ‘dual duplex’ concept, for example, we suggest the highly corrosion resistant 2205 for parts exposed to more hostile environments, and the lower-alloyed LDX 2101® for less hostile conditions. Our duplex grades are increasingly capturing market share in a range of applications.

Testing tailored to your needs

To further help our customers to choose the best and most competitive material, we have offered them the possibility to test candidate materials on their own premises. This work is supported by extensive testing in our state-of-the-art laboratory. The tests are performed in either standard environments or in environments specially made for, or

Supplying a steady stream of innovations



provided by our customers in order to find the best suitable stainless solution.

Materials choice and production technologies for the environment

We recognise that no product is without environmental impact. Because of this, we help our customers choose the right materials, while also actively developing our own production technologies. Our Tornio Works stainless steel plant, for example, is the most integrated single-site operation in the world and most of our sites are ISO 14001 certified.

Support from Outokumpu R&D

We have always invested heavily in R&D. This covers everything from product and application development to process development and improving the quality of our production processes. Our R&D operations not only help

us to develop ever better steel grades with leading cost-efficiency and environmental sustainability, but also play a key role in customer support.

Outokumpu's offering in a nutshell

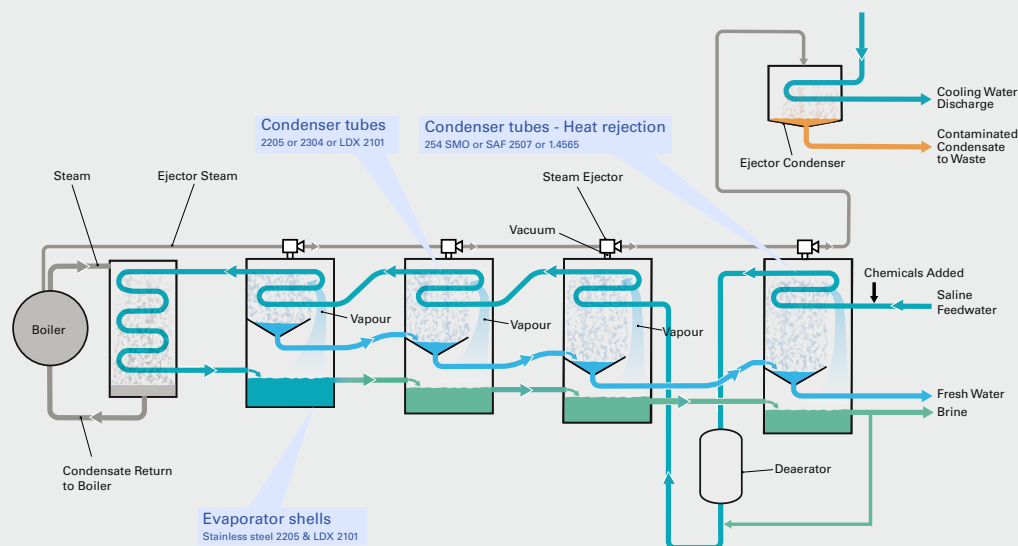
Outokumpu's offering includes cold and hot rolled stainless steel coil, sheet and plate. We also make billet, wire rod and bar, as well as welded pipes, tubes, elbows, fittings and suction roll shells. We can also offer tailor made solutions for our customers.

These products are delivered to equipment suppliers, end users and projects in diverse industries, including desalination, oil & gas, pulp & paper and other applications. In addition, we have the most up-to-date downstream processing centres in all key markets.



Fresh ideas for achieving competitive advantage

Each stage of the process sets its own special demands on the materials used, and for this reason it is important materials are chosen with care. Here we provide some guidance as to which grades are suggested for the key desalination processes. For more specific information, we invite you to get in touch with our Outokumpu Dedicated Team or a sales representative near you.



For the Multi-Stage Flash (MSF) process

Avoiding release of copper ions in condensers

Condenser tubes made of copper-base alloys have the drawback of releasing large amounts of copper ions into the environment. Stainless steel meets this challenge. LDX 2101[®], 2304 and 2205 can be used for heat recovery stages, while higher alloyed grades, such as SAF 2507[®] are recommended for heat reject stages.

Cost-effectiveness in flash chamber shells

2205 allows for reduced material thickness compared to 316L, and also eliminates the need for external painting and shell maintenance in comparison with other grades that require painting. Cost-effectiveness is further boosted by using LDX 2101[®] or 2304 in less hostile areas.

Durability in once-through plants

254 SMO[®] has proven itself in the most hostile internal environments, despite the presence of oxygen and residual chlorine. SAF 2507[®] could be an alternative.

Extra corrosion resistance for internal components

The same grade as used for shells is suggested for internals in contact with flashing brine, e.g. 2205. The selection of material for other internal components should be based on environmental conditions.

Combating severe pitting and SCC in vent systems

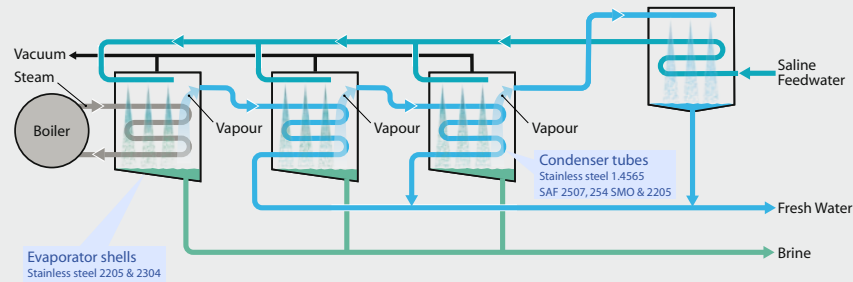
Higher alloyed grades like 2205, SAF 2507[®] or 254 SMO[®] are far more reliable than 1.4404/316L in vent piping.

Strength for fresh water handling

Although 1.4307/304L or 1.4404/316L may be appropriate depending on the chloride content of the water and the desired safety margin, LDX 2101[®] is a better alternative if the design calls for strength.

Duplex also for auxiliary systems

Duplex has also proven itself as suitable for other components in MSF plants, e.g. carbon dioxide absorbers, carbon dioxide filters and deaerators.



For the Multi Effect Distillation (MED) process

Quality for feed water piping

Experience has shown that 254 SMO[®] and SAF 2507[®] are excellent for piping, including sealing surfaces in connection with the flanges.

Alternatives for feed water heaters

254 SMO[®] and SAF 2507[®] could be good alternatives for tubes and tube sheets.

Strength for evaporators, demisters and spray systems

A dual duplex solution, consisting of 2205 and 2304, is suggested due to its combination of superior strength and cost-efficiency. The more highly alloyed 254 SMO[®] and SAF 2507[®] are also good choices for particularly hostile conditions.

The final touch for cell condensers

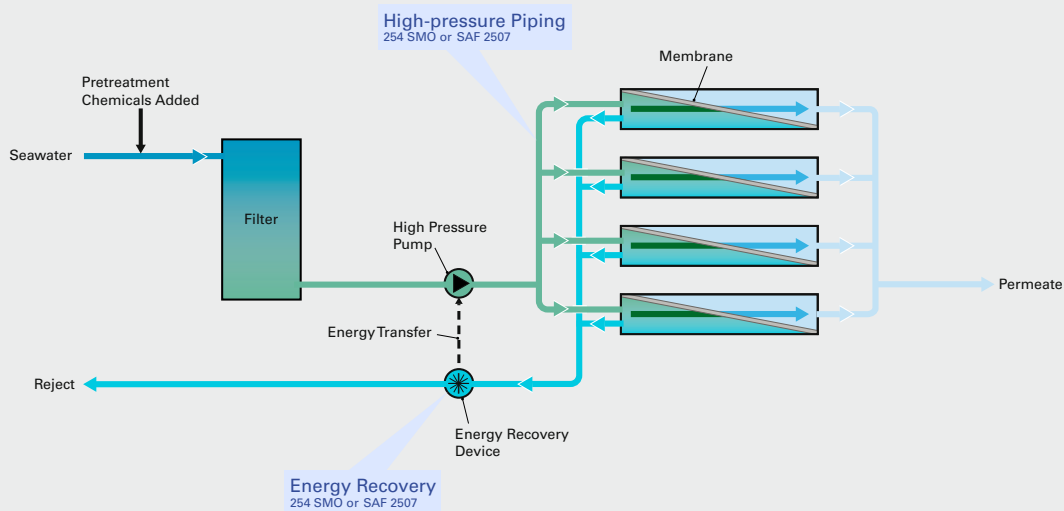
254 SMO[®] and SAF 2507[®] offer the best choices for tubes and tube sheets.

Combating severe pitting and SCC in vent systems

Higher alloyed grades like 2205, SAF 2507[®] or 254 SMO[®] are far more reliable than 1.4404/316L in vent piping.

Strength for fresh water handling

Although 1.4307/304L or 1.4404/316L may be appropriate depending on the chlorine content of the water and the desired safety margin, LDX 2101[®] is a better alternative if the design calls for strength.



For the Seawater Reverse Osmosis (SWRO) process

Coming to terms with chloride in high-pressure pumps

254 SMO[®] or SAF 2507[®] are our recommendation. For BWRO plants with feed water with modest chloride content 2205 may be the optimal choice when strength, corrosion resistance and cost are key factors.

Corrosion resistance for high-pressure piping

We recommend SAF 2507[®] or 254 SMO[®] in general, but given high pressures SAF 2507[®] may be the most cost-effective choice.

Coming to terms with brine in energy recovery

Because brine is just as corrosive as feed, we recommend limiting your choice to 254 SMO[®] or SAF 2507[®]. The latter is best due to high strength and better corrosion fatigue properties.

Strength for fresh water handling

Although 1.4307/304L or 1.4404/316L may be appropriate depending on the chloride content of the water and the desired safety margin, LDX 2101[®] is a better alternative if the design calls for strength.

Outokumpu – Activating Your Ideas

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

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

Our technical leadership allows not only to tailor solutions to meet your specific needs, but also to work closely with you for a host of services on top of the product.

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

And above all, we are fully committed to sustaining value by continuously developing our people and putting the customer at the heart of everything we do.





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Outokumpu is a global leader in stainless steel. Our vision is to be the undisputed number one in stainless, with success based on operational excellence. 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.

