

## New Application Awards 2017



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## Message of the Secretary-General



Dear Members,

Investments into new production facilities since the year 2000 have resulted in a significant increase in production capacity for stainless steel. This

has added urgency to the need to make efficient use of the creativity, innovation, initiative and resourcefulness of our industry to defend existing markets against competing materials and to create new markets in order to boost the demand for stainless steel.

The Market Development Committee (MDC) has access to a robust set of partners among the members of the ISSF and also the members of the Stainless Steel Development Associations (SSDAs) around the world, which provides an impressive set of resources to create new markets around the world. This can be achieved by creating entirely

new markets, or by sharing good ideas which may have worked well in one market with other markets. In this regard the SSDAs are now regular attendees at our Annual Conferences, where they participate in very thorough Workshops to present their individual projects or ideas and to hear about the projects and ideas of the others.

To extend this principle, the MDC invites all members to submit examples of their own creative new applications for stainless steel to us and, an Award is given to the first, second and third submissions which have been judged to be the best in the two categories – the Award for the Best New Application featuring New Market Development and the Award for the Best New Application featuring new Technology.

Each of the submissions which we have received have been of a very high standard and the judges' decisions were not easy. Nevertheless, in order to spread this valuable information as widely as possible, we have published all of the ideas in a

new brochure which will be made available on our Extranet and will also be distributed as booklet during the Annual Conference.

This Award Program will be repeated annually to encourage our members to sustain the high quality of the entries. You are encouraged to continue to submit new ideas to us as soon as they become available and we will keep them on file for the next Awards Competition, in 2018.

We encourage you all to read this brochure very carefully, because there may just be one or two ideas which could work perfectly in your own market.

John Rowe  
Secretary-General  
International Stainless Steel Forum  
Brussels  
May 2017



## Kyoto National Museum, Heisei Chishinkan Wing (structural components for interior and entrance)

<b>Name of Member:</b>	Nippon Steel & Sumikin Stainless Steel Corporation/ Nippon Yakin Kogyo
<b>Manufacturer:</b>	Tokyo Stainless Grinding Niitakaseisakusyo
<b>Field:</b>	Art and Street Furniture Architecture, Building & Construction
<b>Location:</b>	Kyoto, Japan
<b>Environment:</b>	Indoor/Outdoor
<b>Grade/Surface:</b>	SUS304
<b>Quantity:</b>	Appr. 20 tonnes



The stainless-steel plates, which are finished with extraordinarily high-grade polishing and bead blasting for a deep tone mirror appearance, were adopted for the interior and entrance of the Kyoto National Museum, Heisei-Chishinkan Wing, opened in September 2014. This wing, designed by an internationally acclaimed architect Yoshio Taniguchi known for the redesign of The Museum of Modern Art in New York, incorporates a modernistic sense and traditional Japanese feeling into the simple atmosphere. Therefore the stainless steel also needed a finish surface harmonizing with the very unique design.

The requested quality was successfully achieved by developing consistent elaboration and

integrated teamwork from base material to finish surface. For base material, flat stainless steel plates were produced by NSSC homogenizing the residual stress that causes color shading in the blasting process. Tokyo Stainless Grinding Co., LTD. then surface-processed with EGR (Electrolytic Grinding Reducing) and finished it with mirror polishing into a highly accurate and shiny surface. Lastly, the contractor in charge of the final phase, Niitaka Seisakusho Co., Ltd., created an aesthetic appearance suitable for a museum representative of Japan called "deep tone mirror," which reflects light evenly and softly by bead blasting, with an expression in perfect harmony with the special structure.

This great achievement has the high potentiality to spread the design property of stainless steel and to further expand usages of it by making its aesthetic appearance appeal to many people.



## EGR Coolers for Gasoline-Powered Vehicles

**Name of Member:** Nippon Steel & Sumikin  
Stainless Steel  
Corporation

**Manufacturer:** Maruyasu Industries,  
T RAD  
Denso Corporation  
Tokyo Radiator MFC.  
Tokyo Roki

**Field:** Automotive

**Location:** Japan, North America,  
Europe

**Environment:** Outdoor

**Grade/surface:** SUS430J1L, SUS444

**Quantity:** Appr. 6,000 tonnes/year

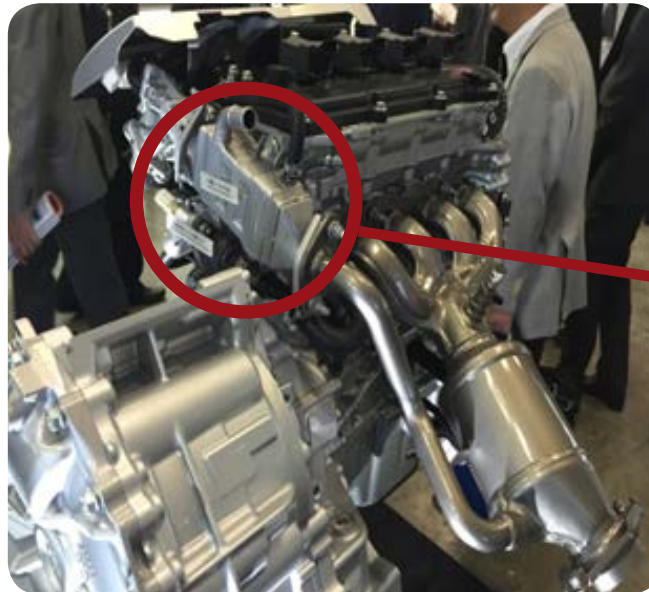
steels are preferred.

NSSC developed suitable ferritic stainless steels for EGR coolers, with better heat resistance, corrosion resistance, and brazing, which have been adopted in gasoline engines since 2009.

EGR coolers improve fuel efficiency and reduce NOx emissions, by cooling and recirculating emission gas to engine cylinders.

EGR coolers previously were installed only in diesel engine vehicles, not in gasoline engine vehicles. However, due to an increase in the demand of fuel efficiency and regulation of exhaust emissions worldwide, applications of EGR coolers for gasoline engines began.

The temperature of exhaust gas in gasoline engines are higher than in diesel engines. Therefore austenitic stainless steel cannot be used for gasoline engines' EGR coolers, because of the sensitization. As a result, ferritic stainless



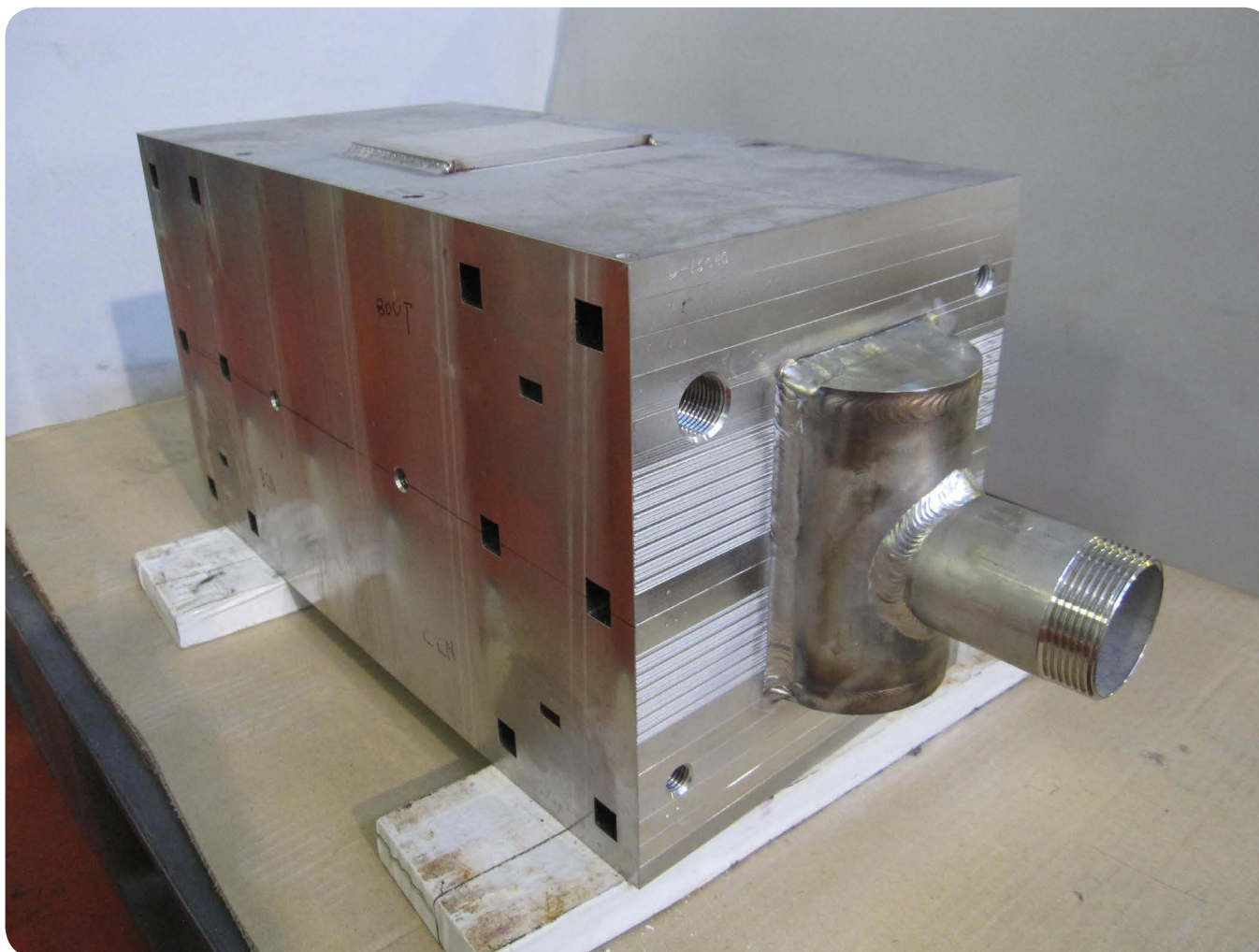


## Diffusion Bonded Compact Heat Exchanger made of austenitic stainless steel

**Name of Member:** Nippon Yakin Kogyo  
**Manufacturer:** Kobe Steel Ltd.  
**Field:** Automotive  
**Location:** Japan  
**Environment:** indoor/outdoor  
**Grade/surface:** modified type 316L  
**Quantity:** 150 kg per unit

DCHE (Diffusion Bonded Compact Heat Exchanger) is a compact heat exchanger with excellent heat transfer performance and high pressure resistance. One of the applications is a hydrogen station, which supplies hydrogen gas to FCVs (Fuel Cell Vehicle). DCHE is used for a cooler of compressor, and for a cooler of hydrogen dispenser.

One of the important factors is an efficient cooling hydrogen of approximately 80 MPa with water and coolant. The other important factor is compactness because this equipment is installed in the premises of a gasoline station. In addition, this equipment must have a higher resistance against hydrogen embrittlement since this equipment is exposed to high pressure hydrogen. Therefore, a modified type 316L having higher Ni content with excellent hydrogen embrittlement resistance is selected as a material. DCHE has created new demand for stainless steel and is considered to be a device contributing to hydrogen society.



## Bionic lightweight structure for battery vehicles

<b>Name of Member:</b>	<b>Outokumpu</b>
<b>Manufacturer:</b>	<b>PEM (Production Engineering of E-mobility Components)/ Chair of RTWH Aachen University and e.GO Mobile</b>
<b>Field:</b>	<b>Automotive</b>
<b>Location:</b>	<b>Aachen, Germany</b>
<b>Environment:</b>	<b>Outdoor</b>
<b>Grade/surface:</b>	<b>Outokumpu Forta H1000, 2H</b>
<b>Quantity:</b>	<b>demonstrator</b>

The lightweight structure primotype (meaning a rapidly created prototype) for battery electric vehicles (BEV) is a crash-safe, high stiffness car body using bionic elements to conquer the contradiction between lightweight and passenger safety for electric vehicles. Outokumpu's new fully austenitic nickel-free ultra-high-strength steel Forta H1000 (Rp0.2 = 1000MPa) has been used as the material. The car body fulfils the requirements of a L7E-category lightweight electric vehicle (under 450kg including battery components) as a 2+1 seater.

The benefits of the structure include easy way of construction: only laser processing and bending operations are needed, no investment for tools, repair-friendliness, combined with cost benefits for small batches and ramp-ups: low investment,



nearly no cutting waste. Outokumpu's new fully austenitic high-strength grade Forta H1000 support these benefits with lower alloying costs (nickel-free material). Further, the construction design is optimally coordinated with the physical material properties of the austenitic stainless steel: Thermal distortion and stresses because of welding can be successfully avoided by using this innovative modular design. The construction as

well as the high strength material used enable a significant lightweight potential with at the same time a high energy absorption potential during a crash combined with a high structural stiffness of the body. Passengers as well as the electric components are perfectly protected. Further, the body and material are 100% recyclable.

The target of the manufacturers was to increase the return on engineering by improving the ratio of customer value to effort. Another goal





was to reduce time-to-market. Therefore, so called “scrum” method was used. Scrum is an innovative procedure for project management and product development, so-called lean development. Originally developed for agile software development (IT), the scrum method was successfully used in the manufacturers’ car body development. The scrum approach is empirical, incremental and iterative, by which primotypes are created very rapidly to have a fast experience ramp-up and to avoid overloaded development processes.

With the new innovative combination of the right material, design, manufacturing and an innovative procedure model behind, the bionic lightweight structure fulfils the challenges of the future mobility. The number of people living in urban agglomerations will further increase, whereby over 80% of all car trips have a distance shorter than 25 kilometers. Therefore, stainless steel solutions can support significantly the implementation of sustainable transportation. Bionic lightweight structure for battery vehicles







## Intermediate Bulk Container Mixer Systems

**Name of Member:** SASSDA  
**Manufacturer:** Afromix  
**Field:** Industrial Machinery and Equipment  
**Location:** South Africa and Africa  
**Environment:** Outdoor  
**Grade/surface:** 304, 316 and duplex depending on the product

“This range of Intermediate Bulk container (IBC) MIXERS (also known as TOTE or Flow Bin Mixers) are specifically designed to handle mixing duties within the container. The main feature of the design is found in a range of folding impellers. These impellers are based on a range of high efficiency hydrofoils that are able to fold in to facilitate fitting through the limited container opening, without the need for any modification to the container. Once a collapsed impeller is inserted into the container, with the folded diameter typically being half that of the whole diameter, the centrifugal forces on start-up force the impeller open. The stainless steel impellers are available in varying diameters from 132mm (5,2”) up to 435mm (17,1”) which allows for most application requirements.”

With the impeller being a hydrofoil the design offers the efficiencies of a fixed bladed impeller system. The design results in lower power consumption whilst maintaining the same

results. This improves the process efficiencies and reduces the mechanical loading on the agitator, reducing mechanical loading allows the agitator to be lightweight and durable.

All mixers are manufactured to ISO 9001 standards and are CE certified.



## Anderson Contramix

**Name of Member:** SASSDA  
**Manufacturer:** Anderson Engineering  
**Field:** Industrial Machinery and Equipment  
**Location:** South Africa  
**Environment:** Indoor  
**Grade/surface:** 304 polished

“Anderson Engineering is well recognized for its range of innovative mixing solutions. It is an integral part of all our turnkey project work. We conceptualized, designed and manufactured mixing vessels for a range of clients and industries. The “Rolls Royce” of our mixing vessels is the Anderson Contramix. It is a highly innovative and efficient mixer for a range of mixing combinations of liquids and solids. It is used for the agitation of mainly viscous products by combining slow movement (with scrapers) close to the tank wall with faster or slower movement at the center of the tank (mixing elements), together with a high shear emulsifier at the base of the vessel.”

“The Anderson Contramix offers the ultimate solution in high viscosity mixing. It is a low shear, high product turnover mixer designed specifically for emulsions, suspensions and pastes such as creams, syrups, ointments and sauces, which achieves the high shear requirements from the emulsifier during the critical stage of



product manufacture. These products, by their nature, contain basic ingredients which are normally miscible (such as water and oil). This is

however achieved with the Contramix during the emulsification phase. A vacuum is used to successfully introduce smalls (such as small



amounts of powders and solutions) into the mixing vessel and a recirculation process is used to improve the dispersion of ingredients.”

The Anderson Contramix offers a number of features and innovations over other

Contramix designs. Most notable, and perhaps what the Anderson Contramix has become most known for, is the “Raise Lower Lid” technology. Conventional sealing of the lid of the vessel is achieved through hand nuts onto swing bolts which are used to secure the top lid of the vessel to contain the pressure rating. Anderson Engineering a highly advanced automated sealing system of securing and releasing the lid. This uses locking blocks mounted to a band which together secure or release the vessel top from the shell, when rotated (using a pneumatic system). The great benefit to the client of this system is the ease and time saving when opening. Many

industries now require more regular opening of the mixer for checks as part of their audit and operating standards. The opening time for checks is greatly reduced compared to the conventional sealing method, improving operational efficiency and output capacity. The ease and speed of opening of the raised lower lid also enables more regular product recovery at the end of manufacture which in turn also improves output capacity and reduces waste of material and product. The design is also such that it can be incorporated into any CIP (Clean in Place) system for cleaning and hygiene.

Secondly, Anderson Engineering has improved the framework design of the mixer. The framework has been simplified utilizing polished pipes which leave a small footprint on the factory/ manufacturing floor. This allows complete visibility of the support structure and no areas underneath where contaminants can be trapped. This design change has greatly improved the hygiene of the mixer and the ease of cleaning underneath where it stands in the manufacturing environment.

The Anderson Contramix can be manufactured in sizes of as small as a 20 liters up to a 6,000 liters mixing vessel (using up to 1,5tons of stainless steel). It can be used at a temperature of up to 90OC Shampoos and conditioners, hand washes, and a range of food products. As one of key products and one which is regularly incorporated



into bespoke turnkey project work, we continue to innovate and draw in new technology into the design of our Contramix based on the client’s unique requirements and challenges.



## Anderson and Pure Magnetic Mixer

**Name of Member:** SASSDA  
**Manufacturer:** Anderson Engineering  
**Field:** Industrial Machinery and Equipment  
**Location:** South Africa  
**Environment:** Indoor  
**Grade/surface:** 304 Polished

Our extensive range of customized mixing equipment is a core strength of Anderson Engineering and an integral part of our project turnkey work. We have conceptualized, designed and manufactured mixing vessels to exacting standards, over many decades. The design and engineering of the highly innovative and unique Anderson Magnetic Mixer came about due to our need to find a solution for ultra-hygienic mixing for the pharmaceutical industry.

“The conventional method of mixing is to utilize a shaft driven impeller / mixing blade which protrudes out of the vessel. This is normally supported with a bearing on the outside of the vessel and sealing at the point of entry to the vessel is achieved utilizing mechanical seals. Mechanical seals by their nature consist of various components including pressure faces, stainless steel backing flanges and springs. These, together with locking screws, as a set provide the sealing. To achieve an ultra-hygienic design with mechanical seals is



extremely difficult and invariably requires compromise on the hygiene aspect of the process. Failure of the mechanical seals (which commonly

occurs), results in product loss and / or batch contamination. In certain circumstances this is not tolerable and this was an area that we identified



our clients were experiencing challenges.”

“The magnetic driver system utilizes a stainless steel fabricated and fully welded casing, through which the mixing element is driven on the inside of the vessel however utilizing the magnetic fields from the outside rotor. This system therefore has no crevices or potential leakage points, solving the need for a completely sterile and ultra-hygienic mixer. It also improve operational efficiencies

because there is less maintenance and upkeep of the system compared to the high maintenance mechanical seal system. The mechanical seals also inevitably get discarded and replaced periodically, while the Magnetic Mixer produces no waste and needs no replacement parts. The magnetic mixer system enables the client to manufacture products such as intravenous medications and others products which require such high standards of hygiene.”

Another great benefit to the client of this mixer is the easy disassembly for cleaning and auditing purposes. The product can be disassembled in less

than three minutes and the mixing element can be removed while the motor geared drive is detachable from the vessel allowing the mixing element and the vessel to be fully sterilized using autoclave technology. The components may be reassembled after sterilization.

“As a locally manufactured mixing vessel, the Magnetic Mixer offers “European technology” at local prices and allows the local manufacturing

industry to take advantage of the most cutting edge, ultra-hygienic, mixing solution. We are the only manufacturers of this technology in South Africa. We have adapted the design and brought in new innovations depending on the clients individual requirements. We have recently introduced a high shear version. Our Magnetic Mixer is the most advanced mixer for all dissolvable products for industries and products requiring the highest level of hygiene. The leading-edge design has no seals ensuring there are no areas where product can be trapped and as a result offers the most ultimate solution for ultra-hygienic conditions.”

It is an extremely versatile mixer performing mild to rigorous mixing (a so can mix a very wide range of ingredients and products) and it can be used to mix volumes of between 30 – 1,000 liters so can be used for small and large volumes.

## 3CR12 Substations

**Name of Member:** SASSDA  
**Manufacturer:** Efficient Engineering  
**Field:** Electrical Machinery and Equipment  
**Location:** South Africa and Africa  
**Environment:** Outdoor  
**Grade/surface:** 3CR12 HRA

These modular sub stations used to be made of carbon steel but since 2011 they have been manufactured from painted 3CR12 HRA to address the needs for longevity, off-site credibility and potential corrosion resistance.

3D modelling is used to design each bespoke unit – each unit must be ‘a fit’ for the expensive equipment that it is going to contain and therefore the unit is modelled as a ‘solution’ for the particular project. The content are a huge capital expense and the unit needs to be designed to protect these assets.

For this application they have moved away from welding (less likely to fatigue or crack) and now use a hydraulic swaged bolting system. This system cuts down on the labour requirement as it is a far quicker process, however, extensive preparation of the individual components is required.

The unit is built, tested and signed off at Efficient Engineering in a conducive environment and them

shipped to site. The unit is extremely waterproof, air-conditioned with a “safari roof” which is sealed and guttered.

They are superior to any other offerings of their type and can be up to 40 meters long, 6 meters wide, with a internal height of 3.5 meters and a total weight of 90tons. If a larger sub stations is required they can add on to this with modular solutions.

Environmentally friendly, once one project has been completed the unit can be uplifted and move to the next project – they are 100% mobile.

The units have an explosion rating for Oil and Gas or Petrochemical applications, the units are positively pressurized, and they need no crane to lift them – they operate with hydraulic lifting.

Currently Efficient are building 13 units for mines in Botswana as well as for local Petrochemical company.



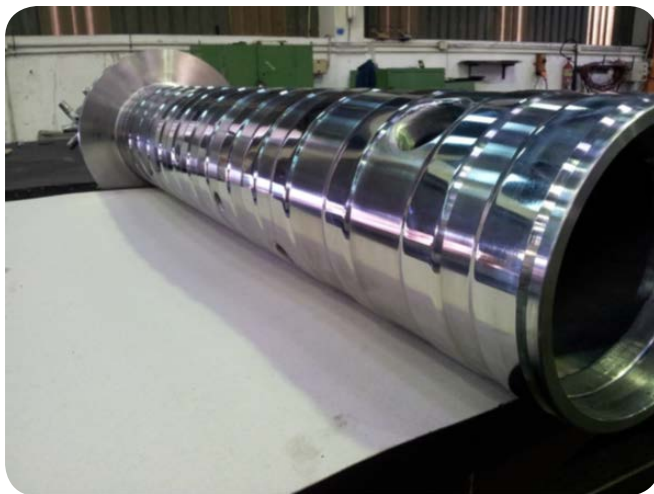
## Stainless Steel RDA Units

**Name of Member:** SASSDA  
**Manufacturer:** ND Engineering  
**Field:** Food and Beverage  
**Location:** South Africa and Africa  
**Environment:** Indoor  
**Grade/surface:** 316L, 2205, 254MO, 904L

This RDA Valve technology has many varying applications.

Not only is it used extensively in the food industries it is also used in applications with chemicals at high temperature making stainless steel the natural choice.

ND Engineering as a company has almost 40 years



of experience when it comes to the fabrication and welding of highly alloyed materials.

This experience has allowed us to meet the special welding and fabrication needs of this exciting new technology.

ND Engineering has been able to retain the manufacturing of the new valve technology in South Africa through a combination of cost competitiveness and manufacturing quality.

Considering that we have been involved in the development process from the initial concept Valve units, through to the pilot valves and finally the production valves, it is most rewarding to have maintained our partnership with Ionex as a strategic partner.



Even under great pressure to manufacture this technology in China, Ionex Separations Technologies has given ND Engineering their full support in retaining the manufacturing in South Africa for the RDA units which has seen the market expand into Europe with our latest order for Hungary requiring the CE marking.



## Manufacture of Biomass Stoves and Potskirts

**Name of Member:** SASSDA  
**Manufacturer:** Rocket Works  
**Field:** Cookware, Hollowware and Cutlery  
**Location:** South Africa and Africa  
**Environment:** Indoor  
**Grade/surface:** 430

In 2013 Rocket Works has sold over 4000 stoves, in 2014 it entered into the global market and added several new innovative cook-stoves to its range. It has now manufactured and sold over 44000 clean cook-stoves.

Thanks to the strong engineering influence in the business, the production lines are able to produce 1500-2000 stoves per day. That equates to 45000 clean cook-stoves per month, and that number can be doubled every year.

The main difference is that it is designed to be shipped in high volumes and assembled on location. The stove is sold in component form or complete knockdown (CKD) form. The significantly reduces the shipping costs and enables large numbers of stoves to reach hard-to-reach areas. Where a 40ft/12m shipping container would accommodate 2880 assembled stoves, it will now accommodate 10000 in component form.

The stove has very quickly become our most

popular item as aid organisations see the value and far reaching benefits of shipping in high volume and assembling locally. Over the years Rocket Works has sold stoves to customers in South Africa, Zambia, Mozambique, Zimbabwe, Botswana, Australia, UK, Europe, US, Canada, Nigeria, Uganda, Malawi and Madagascar.

On the second half of 2014 Rocket Works exported nearly 31000 stoves to Juba in South Sudan. In



the second quarter of 2015 Rocket Works exported 15000 potskirts to Malawi and another 15000 potskirts to Zambia.





## Shark Rover submersible

**Name of Member:** SASSDA  
**Manufacturer:** Seascope Stainless Steel Services  
**Field:** Water Equipment  
**Location:** South Africa and Africa  
**Environment:** Outdoor  
**Grade/surface:** Grade 316

Seascope was commissioned to manufacture the two-person cage in June 2015 and it was specifically designed to film great white sharks. It weighs about 90 kg, is 1.3 m in diameter and 3.3 m long and is manufactured from grade 316 steel tubing and sheetmetal. The design for the shark cage was done by a UK based company, Marine Imaging Technologies. At the stage of order, Seascope was the only South African company that could complete the project in the time allowed.

The stainless steel tubing of the cage allows for large open spaces between it to accommodate the cameras, which allows for a 360° view for undisturbed footage underwater. The cage's rudders and tillers enable it to move forward, sideways and in an upward and downward motion.

Polyvinylchloride tubes were added to act as buoyancy members.

The project was completed in a month and all tests went well. The cage has been used for local shark filming and is currently deployed off the coast of Mexico.

Good design, stainless steel combined with skills and commitment, showed a truly world-class product as result. This product can be seen as that what the South African stainless steel industry stands for in terms of world-class quality.

Seascope now ranks as the prime supplier of stainless steel components to the South African marine industry and is currently Africa's biggest supplier of stainless steel products to the global marine industry. Seascope is currently also a finalist in the Cape Chamber of Commerce's Exporter of the Year competition.





## Municipal water storage tanks manufactured in 3CR12 instead of concrete

**Name of Member:** SASSDA  
**Manufacturer:** Skyhill Heavy Engineering  
**Field:** Water Equipment  
**Location:** South Africa  
**Environment:** Outdoor  
**Grade/surface:** 3CR12 No. 1

Sky Hill Heavy Engineering specified 3CR12 to be used for Municipal water storage tanks rather than concrete tanks in rural areas. The innovative design, using an inverted bottom cone, allows drainage of sludge and cleaning without emptying the tanks. Sky Hill specified 3CR12, designed the innovative tank and fabricated these tanks.

3CR12 is the ideal material of choice in ambient temperature water applications where there are no stagnant conditions and crevice conditions are avoided, such as prolonged sludge build-up. Sky Hill has promoted stainless steel by convincing the provincial government to accept 3CR12 rather than the traditional concrete tanks. Sky Hill Heavy Engineering also recognised the need for an easy and efficient method of removing sludge without the need to empty the tank. The innovative design has allowed 3CR12 to be used, with confidence in this application.





## Ferrochromium Fines Treatment Centre

**Name of Member:** SASSDA  
**Manufacturer:** Tugela Mining and Minerals  
**Field:** Industrial Machinery and Equipment  
**Location:** South Africa and Africa  
**Environment:** Outdoor  
**Grade/surface:** 3CR12

Tugela mining and minerals wanted the structure of the plant to be fabricated from painted steel and approached NSSC. They sold the idea of using 3CR12 to Tugela mining and minerals as the lower cost solution if one considers LCC.

The award entry is important in that structural applications are the biggest potential growth area for stainless steels, globally. Also this is a classic example of where, using LCC, it can be demonstrated that stainless steel can be specified with resultant cost savings over the long-term.





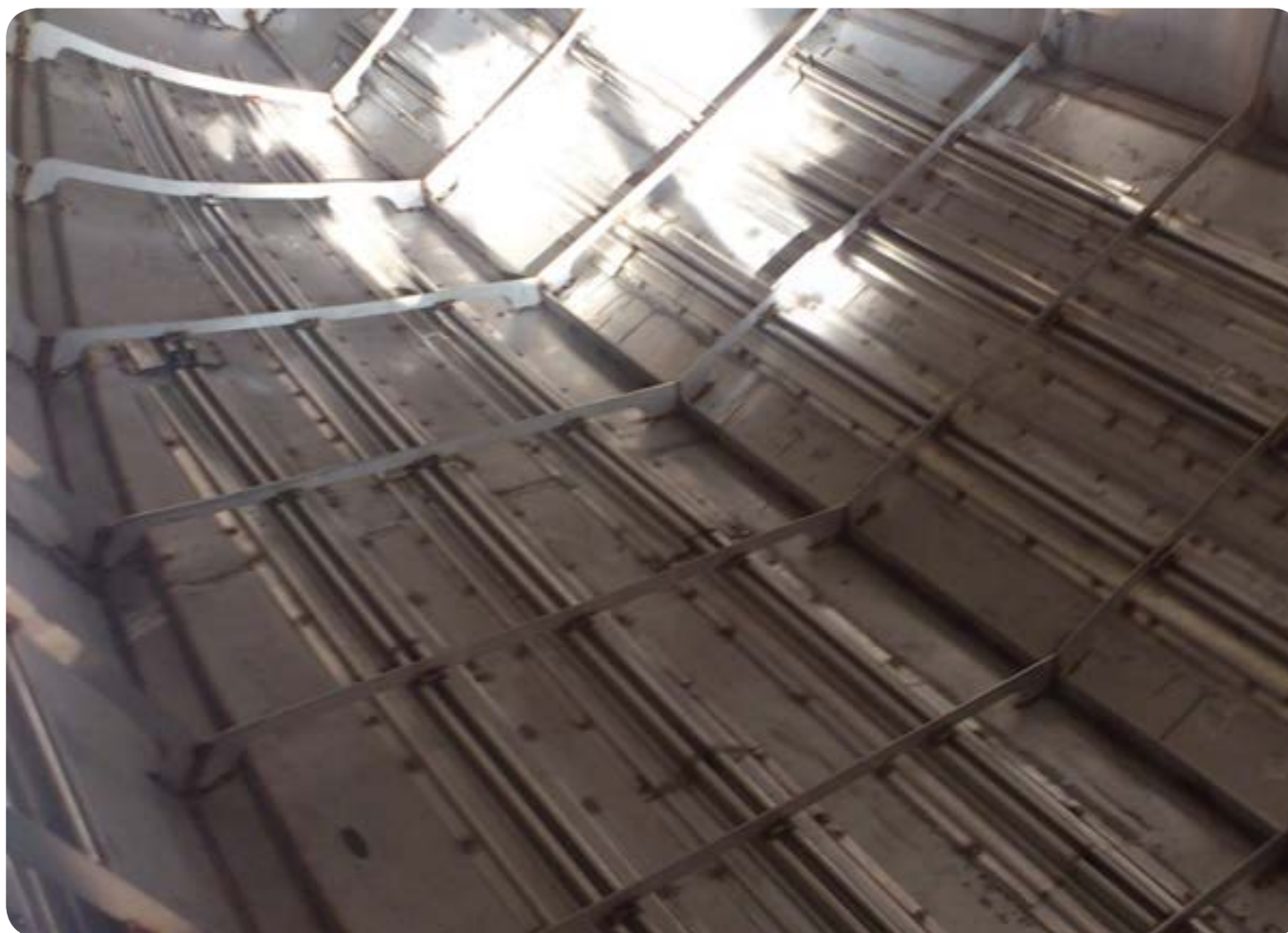
## Stainless Steel Yacht

<b>Name of Member:</b>	<b>Outokumpu</b>
<b>Manufacturer:</b>	<b>Swedish Steel Yachts</b>
<b>Field:</b>	<b>Transport</b>
<b>Location:</b>	<b>Gävle, Sweden</b>
<b>Environment:</b>	<b>Outdoor</b>
<b>Grade/surface:</b>	<b>Super Duplex 2507 from Outokumpu and Sandvik</b>
<b>Quantity:</b>	<b>One built. One under construction</b>

The concept for building boats, developed by SSY, is a breakthrough in light weight, durable and environmentally friendly technology. It opens up a totally new application area/market for stainless steel - boats and smaller ships for the Police and Coast guard or for transportation.

The design utilizes the properties of the stainless steel super duplex 2507 in the hull and stiffeners. The alloy is extremely resistant to corrosion caused by saltwater. All metal under the waterline is mirror polished, which ensures that marine organisms that have attached to the hull are removed either with a low-pressure hose or at speeds as low as 5 kn. This therefore avoids the need for environmentally hazardous and expensive anti-fouling paints!

The world patented light weight hull design utilizes the mechanical properties of the steel and allows the boats to be built with much



*Ship hull with stringers - all in Super Duplex 2507.*

thinner sheets than is required for conventional steel boats. This allows a significant reduction in weight and results in significantly reduced fuel consumption.

All sheet metal is joined together with laser welding.



The steel hull retains its mechanical properties despite tough conditions over a long period of time. This is a major advantage compared with plastic, carbon fiber and aluminum boats, which deteriorate over a number of years.

The hull is built in two meter wide Forta SDX 2507 sheets from Outokumpu and the stiffeners are delivered by Sandvik.

For additional information, see: [www.ssy.se](http://www.ssy.se) and: [https://www.facebook.com/ssyab/?ref=page\\_internal](https://www.facebook.com/ssyab/?ref=page_internal)



*The first boat, "Elvira", at sea.*



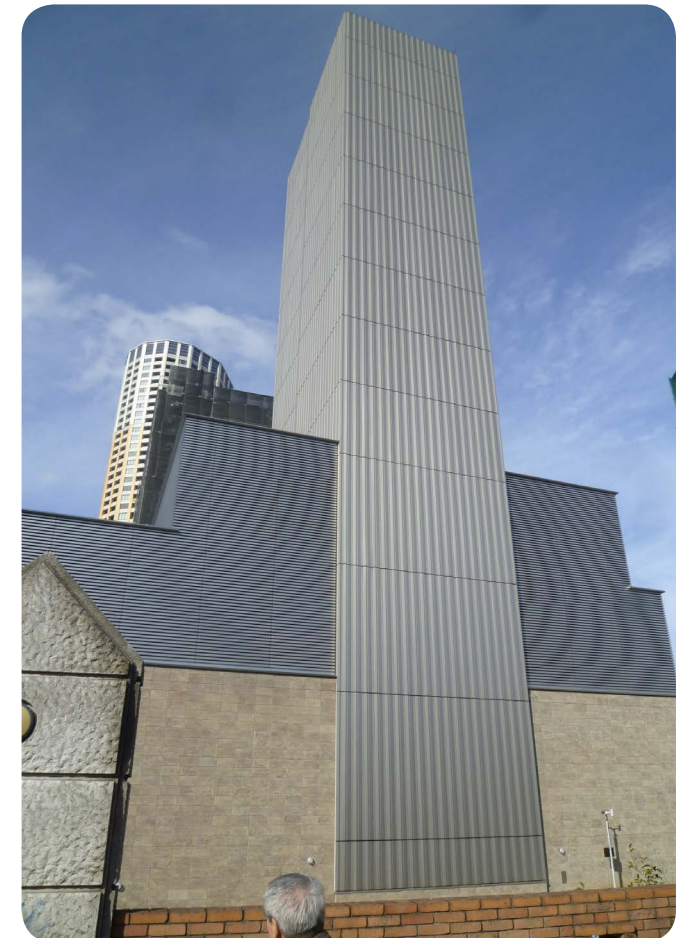
## Nakameguro Ventilation Plant Installed along the Chuo Loop of the Tokyo Metropolitan Highway

<b>Name of Member:</b>	<b>Nisshin Steel</b>
<b>Manufacturer:</b>	<b>Kajima Corporation, Sanwa Shutter Corporation, Kikukawa Kogyo</b>
<b>Field:</b>	<b>Architecture, Building and Construction</b>
<b>Location:</b>	<b>Tokyo</b>
<b>Environment:</b>	<b>Outdoor</b>
<b>Grade/surface:</b>	<b>SUS445J1</b>
<b>Quantity:</b>	<b>31 tons</b>

environment. The shutters need to be reliable and fully operative all the time, and cannot fail due to rust or other causes in case of emergency. The City's infrastructures built half a century ago are now antiquated and repair and renewal works are under way so as to complete their improvement in time for the 2020 Tokyo Olympics/ Paralympics. The adoption of stainless steel for this Plant will serve as an empirical proof of the metal's aesthetic and durable aspects and contribute to upgrade social infrastructures.

Nakameguro Ventilation Plant of the Tokyo Metropolitan Highway is installed over the tunnel running under the Meguro River and the Yamate Street – a chic section of the City. Since the material for the Plant was required to be aesthetic and durable, a weather-resistant ferritic stainless steel grade was selected. Particularly for louvers and fixtures which are placed at lower parts of the Plant and visible to the public, sand blast-finished SUS445J1 with excellent designability is used and satisfies local residents' request that "the Plant should be harmonious with the surrounding buildings" and "the Plant should also be harmonious with the strolling path along the Meguro River".

In addition, SUS445J1 is adopted for the shutters for the Plant's emergency exits. Nakameguro Ventilation Plant is located close to Tokyo Bay and therefore exposed to a severely corrosive





## Application of Alloy-Saving Duplex Stainless Steel Plate for Dams/Floodgates

**Name of Member:** Nippon Steel & Sumikin  
Stainless Steel Corporation

**Manufacturer:** IHI Infrastructure systems,  
Hitachi Zosen Corporation,  
HOKOKU KOGYO, Marsima  
Aqua System Corp. ,  
NISHIDA TEKKO Corp.,  
HOKOKU KOGYO,  
Nitto kasen industries

**Field:** Architecture, Building and  
Construction

**Location:** All over Japan

**Environment:** Outdoor

**Grade/surface:** NSSC2120 (SUS821L1),  
SUS323L

**Quantity:** Appr. 1,000 tons (since  
2011)



After the Great East Japan Earthquake in 2011, alloy-saving duplex stainless steel (ASDSS) has been used in many projects aiming to improve the resilience of infrastructure facilities against natural disasters.

For example, ASDSS is applied to floodgates used for coastal dike countermeasures against Tsunamis. In addition, it is applied to mechanical facilities in dam upgrade countermeasures against heavy rainfalls and electrical power shortages.

Coated carbon steels have been conventional materials for these parts to keep the initial cost down. However, NSSC offered ASDSS because its higher strength enables thickness reduction, which leads to dramatically reduced weight, and a huge cost savings. Moreover, the higher corrosion resistance of stainless steel eliminates the painting cost completely. As a result, we have finally started replacing conventional materials with stainless steels. Furthermore, the lightweight design of structures using ASDSS

can reduce initial cost by simplifying the lower sections of concrete structures and open/close devices.



## Application of Lean Duplex Stainless Steel for Solar Panel Frames

<b>Name of Member:</b>	<b>Nippon Steel &amp; Sumikin Stainless Steel Corporation</b>
<b>Manufacturer:</b>	<b>CO-MAX COMPANY LIMITED</b>
<b>Field:</b>	<b>Architecture, Building and Construction</b>
<b>Location:</b>	<b>All over Japan</b>
<b>Environment:</b>	<b>Outdoor</b>
<b>Grade/surface:</b>	<b>NSSC®2120 (SUS821L1)</b>
<b>Quantity:</b>	<b>Appr. 5,500 tons</b>



While painted or coated steels have been conventional raw materials for solar panel frames, stainless steel were considered for use of coastal areas, because of their high corrosion resistance.

Initially, common stainless steels such as SUS304 were considered, however their cost were too high.

To solve this problem, we offered NSSC®2120 (SUS821L1), a new lean duplex stainless steel which has the same corrosion resistance as SUS304. Due to its high strength and hardness, it enables thickness reduction, reducing the weight and saving cost. In addition, the lighter product is easier to work with, and reduces the transport cost. As a result, the total cost to install solar panel frames of NSSC2120 is less than coated

or painted steels. In conclusion, the application of NSSC2120 has been widespread even in areas where high corrosion resistance is not necessary.



## Application development of stainless steel in reservoir

<b>Name of Member:</b>	<b>POSCO</b>
<b>Manufacturer:</b>	<b>Geum Kang</b>
<b>Field:</b>	<b>Water Equipment</b>
<b>Location:</b>	<b>Changwon, South Korea</b>
<b>Environment:</b>	<b>Outdoor</b>
<b>Grade/surface:</b>	<b>STS304, STS444, STS329J3L / 1D, 2B</b>
<b>Quantity:</b>	<b>160 tons</b>

An in-depth analysis of Korean water reservoir industry has shown that the main issue of material application in this field is “Sanitization” and “Enlargement”. In the case of conventional concrete reservoir, maintenance requirement due to surface degradation such as blisters and defects upon aging has to be treated regularly from a sanitization standpoint. Whereas, stainless steel is insensitive to wet conditions that not only water contact side but rear of the stainless steel skins which is in contact with the concrete and exposed to a poorly ventilated space between the two materials. Considering that it requires a high level of corrosion resistance, the life-cycle-cost of stainless steel is expected to be lower than the integrated concrete design.

On the other hand, due to a rapid increase of urban area population, large-scale of water consumption regions have steadily been increased. In line with this, new & renovated reservoirs in Korea also require bigger and safer



*Changwon*

structures. Here, the structure has to be strong enough to meet a safety requirement upon natural disasters such as snowfall, earthquake and typhoon. In this sense, high strength stainless steels with excellent corrosion resistance can be a good candidate material for light-weight solution.

The current example demonstrates how the demo project is pushed forward in this field from the viewpoint of sanitization and enlargement. Demo projects have been cooperated with domestic water tank manufacturers and municipal corporations in Korea in view of enhancing

sanitization and enlargement requirement. The targeted tank structure has been designed with circular-shape reaching its volume up to 3,000~20,000m<sup>3</sup>. In line with its massive scale and endurance requirement, POSCO promoted high strength corrosion resistant stainless steels, i.e., duplex stainless steels, in diverse ways; products briefing such as either to the municipal cooperation, water tank vendors and construction companies or demonstration of numerical analyses showing bead strengthening by wall elements of stainless steels. Lean and standard duplex stainless steels, i.e., STS 329LD, 329J3L, have been finally designated as competitive and suitable materials.

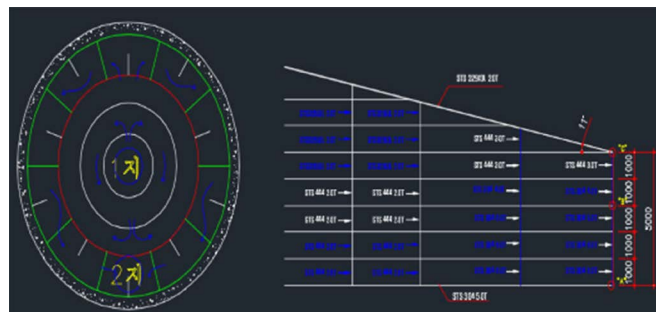


*Naju*



In order to meet safety concerns, structural analysis with numerical method has been performed taking into account such as fluid sloshing and suitability of roof connections during earthquakes. According to this simulation, construction cost of newly designed stainless steel water reservoir structure is at least 10% lower than the concrete one. This is related with the savings of construction expenses by minimizing earth work and also combined with light-weight solution.

Water quality of tap water in Korean municipal area is expected to be improved with these efforts. In this structure, residual chloride gas in the tanks which is known as harmful to the human body is also reduced because of smooth water circulation due to inserted walls. From the current demo projects, it is proved that as a food-safe material duplex stainless steels are safe enough for drinking water quality and provide light-weight solution for this kind of massive structure. Also,

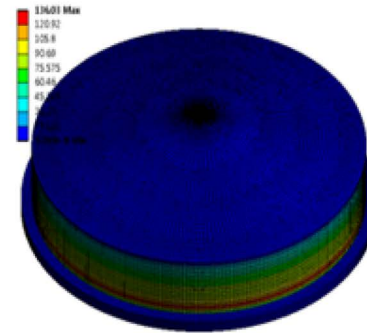


Floor plan

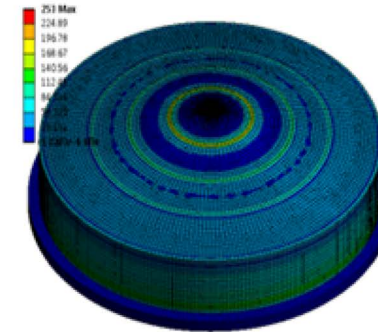
Across

### Total Stress Analysis

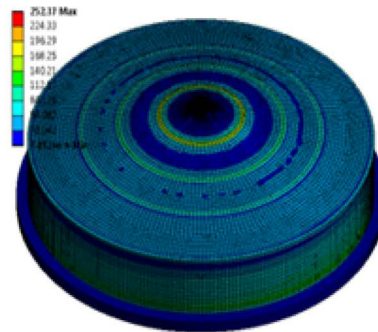
• Case1 : Self load + hydraulic pressure



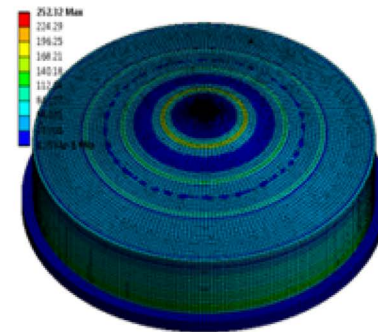
• Case2 : Self load + hydraulic pressure + snow load



• Case3 : Self load + hydraulic pressure + wind load + snow load



• Case4 : Self load + snow load + hydraulic pressure while clean up



having long-term hygiene features, stainless steel surface ensure sanitation of drinking water. According to statistical estimation by assuming to renovate 250,000m<sup>3</sup> reservoirs through 2020,

stainless steel demand in this field would be reached 10,000ton/year (i.e., 400 tons of stainless steel per 10,000m<sup>3</sup> tank volume).

## Tidal Sluice Gates at Mont-Saint Michel

**Name of Member:** Industeel  
**Manufacturer:** CM Paimboeuf  
**Engineering:** BRL ingénierie - Luc Weizmann Architecte - SPRETEC - ANTEA - Bertrand Lanctuit  
**Field:** Architecture, Building and Construction  
**Location:** Normandy, France  
**Environment:** Outdoor  
**Grade/surface:** UR 2205+ (UNS S32205, EN 1.4462)

Located in Normandy, Mont Saint-Michel is an island, 100 hectares in size. Accessible during the low tide and easy to defend during high tide, the island is known to have been inhabited since the 8th century. 400 years later, monks constructed an abbey and eventually a cathedral was built which attracted increasing numbers of pilgrims. In the late 19th century, with the beginning of modern tourism, a tidal causeway was built to facilitate access. The closed structure of this causeway interfered with the natural flow of water, which caused the bay to silt up gradually. To solve this problem, the construction of a hydraulic dam was initiated in 2006, to allow the water of the nearby Couesnon River to flush away the accumulated silt. With the completion of this

project in 2015, the original character of Mont Saint-Michel was restored, without the need for a more conventional bridge. The gates that swing into position to regulate the exchange of water between the Couesnon estuary and the sea include duplex stainless steel floodgate plates with a carbon steel supporting structure. The exposed surface is resistant to the abrasive effect of the sand and is capable of withstanding the high water

pressures where the bay opens to the Channel, with a tidal range of up to 14 meters. A tidal barrage regulates the water exchange between the Couesnon estuary and the bay of Mont Saint-Michel. High levels of abrasive stress require a material whose corrosion resistance does not depend on applied surface layers. The duplex stainless steel plates of the floodgates are welded to a carbon steel structure. Photo courtesy of © Daniel Fondimare



## Ceramic textile: an Innovative Tile Suspension System

**Name of Member:** Acerinox  
**Manufacturer:** Techidos Metálicos Estruch  
**Field:** Architecture, Building and Construction  
**Location:** Barcelona  
**Environment:** Outdoor  
**Grade/surface:** 316 (EN 1.4401)

Ceramic tiles are a traditional material for roofs and façades in the sunny and hot climate of Spain. They buffer heat, absorb humidity during the night and evaporate it again during the day, producing a cooling effect. A new façade system called **Flexbrick®** involves ceramic tiles which have tubular channels to reduce their weight and enhance their temperature-regulating capability. Lateral grooves make it possible to insert them into a grid of woven stainless steel. The staggered arrangement leaves 50% of the surface open which is an ideal proportion to allow air and daylight in but keep excessive heat out. Potentially high wind loads and demanding durability requirements call for an intrinsically corrosion resistant material like stainless steel. The coastal atmosphere made higher-alloyed grade 316 the most appropriate option. This is another example of stainless steel bringing out the best in partner building materials.



Picture courtesy of **Flexbrick®**

## Walkway Suspension in an Underground Station

**Name of Member:** Acerinox  
**Manufacturer:** Gramometal, Ortuella  
**Field:** Architecture, Building and Construction  
**Location:** Bilbao, Spain  
**Environment:** Outdoor  
**Grade/surface:** 316 and 310S/2B

In the underground stations across Bilbao, the capital of the Spanish Basque region, stainless steel grade 316 is a common feature for stairwells and claddings, where its aesthetic qualities and proven low-maintenance properties are an asset. But an additional feature makes some of them quite special: the walkways seem to hover above the platforms and rails. Filigree stainless steel suspension bars make this elegant construction possible. As the stairs and elevated access paths are part of the escape route, they must meet high fire resistance requirements. So stainless steel AISI 310S (EN 1.4845) is a 24-26 % Cr, 19-22 % Ni austenitic grade has been specified. The structural engineers used the mechanical and physical properties to translate the architect's daring concept into a technical solution.



## Stainless Steel Containment Solution for Chernobyl

**Name of Member:** Aperam  
**Field:** Architecture, Building and Construction  
**Location:** Chernobyl, Ukraine  
**Environment:** Outdoor  
**Grade/surface:** 316L

meters thick. The total weight of the materials is 31,000 metric tons. Stainless steel was a natural material of choice because of its durability, high corrosion resistance and mechanical strength. The stainless steel was delivered by Aperam. It is difficult to imagine a more demanding application

than this new enclosure for the aftermath of the Chernobyl meltdown and it is noteworthy that molybdenum containing stainless steel has been selected as a solution.

Story and picture courtesy of the MolyReview.

In a catastrophic failure in 1986, the nuclear reactor at Chernobyl suffered a meltdown which resulted in a wide-spread distribution of radio-active contamination. The risk of further contamination was initially limited by the construction of a large concrete enclosure around the reactor, but after thirty years the combination of time and weather had begun to degrade the concrete structure and a fresh solution became critical. With a design life of 100 years (to allow for the development of new technologies to provide a long term solution) and the required capability to withstand severe temperature ranges, a class 3 tornado and an earthquake up to class 6 on the MSK64 scale, the new structure had to be erected on-site. To meet the indicated design criteria, the engineers specified grade 316L stainless steel. The final structure stands 108 meters high by 162 meters long and has a width of 257 meters, giving a final volume of 3 million cubic meters, equal in size to the O2 Arena in London, but the walls are 12





## Stainless Steel Core for Automobile Fuel Pumps

**Name of Member:** Aperam  
**Manufacturer:** Bosch  
**Field:** Automobile  
**Location:** Brazil  
**Environment:** Outdoor  
**Grade/surface:** DIN 1.4512 -  
UNS S40920/2D

Ferritic grade 1.4512 (equivalent to 409) stainless steel is now being used to manufacture the core of fuel pumps which have historically been made from tin plated steel. The advantage of using stainless steel is that the fuel pump cores no longer need the extra surface treatment that was necessary when using tin plated steel, resulting in a saving of time, logistics and cost. Being a ferritic stainless steel, the cost structure is relatively stable.





## PHYTHERM Nickel Alloys - for Induction Cookware

**Name of Member:** Aperam  
**Manufacturer:** Aperam Alloys Imphy  
**Field:** Cookware, Holloware and Cutlery  
**Environment:** Indoor  
**Grade/surface:** PHYTHERM Ni50Fe30Cr

Phytherm is a trade mark of Aperam for a range of high nickel and chrome alloys which are used in pots and pans to make them suitable for induction cookers. In order to stabilise the heat, pot and pan manufacturers apply a layer of this material to the underside of the utensil. In simple terms, as a specific temperature – known as The Curie Point ( $T_c$ ) – approaches, this nickel alloy base stops getting hotter (practically zero permeability). The material, with its Curie point set at the ideal level, allows for precision temperature control. Furthermore, its patented chemical composition makes it possible to limit the mechanical constraints imposed by the expansion of the other materials used in the utensil. The result is a safe and convenient method of cooking food with a product that is long lasting.







## Stainless Steel Floor Panels for Refrigerated Trucks

**Name of Member:** POSCO  
**Manufacturer:** Otech  
**Field:** Automobile  
**Environment:** Outdoor  
**Grade/surface:** PosSD (KS STS329FLD,  
ASTM S82013)/2B900 t

Modern transport logistics make more use of refrigerated vehicles to keep food-stuffs fresh across short and long range delivery zones. Repeated use by handlers, whose primary objective is speed of loading and unloading, carries an ever present risk of damage due to wear and tear.

The damp conditions inside the units also carry a risk of corrosion. Stainless steel is both resistant to corrosion and tougher than comparable materials and provides an ideal solution for this application. POSCO produces a lean duplex grade, PosSD, which has similar corrosion resistant properties to the austenitic grade 304, but offers twice the strength. Utilising this type of material allows the manufacturer to reduce the gauge significantly, bringing savings in material costs and as well as reducing the weight of the trucks, and therefore allowing for increased pay-loads.





## Stainless Steel Heat Exchanger Fin Tubes for Chillers

**Name of Member:** POSCO  
**Manufacturer:** LG Electronics  
**Field:** Electrical Machinery and Equipment  
**Environment:** Indoor  
**Grade/Surface:** 430J1L /BA

POSCO has developed a ferritic grade 430J1L for the manufacture of heat exchanger fin tubes for industrial absorption chillers. The liquids used in the fin tubes may cause pitting corrosion and stress corrosion cracking, but this material has been found to be particularly well suited to resisting these forms of corrosion. Welding and annealing conditions have been optimized to make it easier to form the fins on the surface of the tubes. Being a ferritic grade, the material has a relatively stable price structure.





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## About ISSF

The International Stainless Steel Forum (ISSF) is a non-profit research and development organisation which was founded in 1996 and which serves as the focal point for the international stainless steel industry.

### Who are the members?

ISSF has two categories of membership: company members and affiliated members. Company members are producers of stainless steel (integrated mills and rerollers). The association has 56 members from all over the world and currently represents approximately 90% of the total production of stainless steel.

### Vision

Stainless steel provides sustainable solutions for everyday life.

### More information

For more information about ISSF, please consult our website [worldstainless.org](http://worldstainless.org).

For more information about stainless steel and sustainability, please consult the [sustainablestainless.org](http://sustainablestainless.org) website.

## Contact us

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[worldstainless.org](http://worldstainless.org)