AUSTRALIAN STAINLESS

SPECIALISING IN STAINLESS STEEL AND ITS APPLICATIONS

#47
SPRING
2010

Coloured facade
Maximum impact two years on

Stunning stainless
Strength and corrosion resistance vital

Hydrostatic testing
Guidelines to ensure long service life

Water farming
Stainless technology essential

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ASSDA

COLOURED FACADE

MAXIMUM IMPACT TWO YEARS ON

Coloured stainless steel has helped revitalise what has become one of Victoria's largest and most recognisable shopping precincts – Westfield Doncaster.

In late 2008 Westfield completed a major redevelopment and refurbishment of the Doncaster shopping centre (located 20 minutes east of Melbourne's CBD), doubling the complex's size.

Central to the centre's new look and feel is the building's ultra contemporary and striking cladded facade that features coloured and patterned stainless steel supplied by Steel Color Australia Pty Ltd.

Steel Color Australia owner Vince Araullo said more than 600 square metres of grade 304 stainless steel were used to construct the eye-catching "Red Wall".

The "Red Wall" during installation (left) and on completion (below).

"The brief from the designers, Westfield Design and Construction, was to deliver a contemporary looking facade that not only provided the Doncaster shopping centre with plenty of colour but would also be hard wearing against Melbourne's diverse weather conditions," he said.

"Our coloured stainless steel, which we import from Italy and distribute exclusively in Australia and New Zealand, is manufactured by Europe's leading specialist in coloured stainless steel and special metal finishes – Steel Color S.p.a."

The stainless sheeting was fabricated and installed by Melbourne-based Barden-Steeldeck Industries. Manager and part-owner Michael Shacklock said this was the first time his company had worked with coloured stainless steel.

"By attaching the sheets to a sub-frame we were able to make certain that all 300 sheets of coloured stainless steel were accurately positioned to deliver the distinctive looking facade," Mr Shacklock said.

Mr Araullo said the colour refraction from the Rosso (Italian for red) stainless steel provided a changing colour palette depending on the time of the day and viewing angle.

"The unique movement of colour across the stainless steel clad entrance is a major shift forward from traditionally sterile looking facades that appear on many shopping centres," he said.

To avoid the potential reflectivity of the facade hindering nearby traffic safety, a Perla pattern was specified. The indentations of the pattern diffuse light and provide an optical flatness, which effectively eliminates reflections.

The pattern also provided improved strength, allowing for a lighter gauge of 1.2mm instead of, typically, 1.5mm or more.

WANT TO STAY INFORMED?

ASSDA NEEDS YOUR EMAIL ADDRESS

Since 1993, *Australian Stainless* has been a high-quality, full colour magazine mirroring the qualities of stainless steel — in particular, its elegance and durability.

Since establishing an online presence in late 2009, new articles are now posted to the magazine online (with subscribers informed via email when there is new material to view).

Both formats of the magazine provide an informative reference tool and news about the stainless steel industry.

While ASSDA still intends to print occasional copies of *Australian Stainless* (such as this edition), **the best way to stay informed regularly is to be on our email mailing list.**

To receive email notification when new articles are posted to *Australian Stainless* online, **subscribe for free** in one of the following ways:

> visit **www.assda.asn.au/blog**

> email your contact details to Siri Grabski at **siri_g@assda.asn.au**

> fax back the flysheet that came with this magazine

STUNNING STAINLESS

STRENGTH & CORROSION RESISTANCE VITAL

As wild fish stocks decline globally, the spotlight is increasingly being shone on humane stun and slaughter methods in the rapidly growing aquaculture industry. Stainless steel components fabricated by Pryde Fabrication (ASSDA Accredited) are an integral part of a Brisbane innovation that is leading the way internationally in a shift towards faster and more humane automated percussive stun methods.

Seafood Innovations International Group Pty Ltd has spent around 10 years developing fish harvest technology which enables fish to swim naturally until the second they are stunned, reducing stress on the fish and improving flesh quality.

They have collaborated extensively during this period with Pryde Fabrication to develop the system, which incorporates a base, ramp and trigger plate made from grade 316 stainless steel.

Up to 400 of the units are being produced each year, of which around 98 per cent are for export.

Pryde Fabrication General Manager Darren Newbegin said grade 316 stainless steel was chosen for the components primarily due to its corrosion resistance and strength.

Mr Newbegin said other design and fabrication requirements included:

> no bacterial traps

> robust enough to withstand the harsh environment and repetitive shock loading

> light enough to enable easy handling of the modules for cleaning

> configured to enable easy dismantling for cleaning

There is about 15kg of stainless steel in each machine, which is laser cut, enabling a high level of accuracy for both cutting and fold marks. The rest of the procedure is performed manually, including welding, polishing and glass bead blasting to provide a pleasing surface appearance.

Seafood Innovations' Business Manager Noel Carruthers said the patented system represented an enormous change to the industry, with a single unit processing 15-20 fish per minute automatically, compared with other processes such as electrocution, carbon dioxide gas, and the use of wooden clubs.

In addition to improved flesh quality, the automated system means fewer operator injuries and immediate bleeding, resulting in improved appearance of fillets when fish are processed. The ability to slaughter at the point of capture means fish potentially carrying diseases will not contaminate other waters in transit.

For the full article, visit www.assda.asn.au/blog

TECHNICAL ARTICLE

HYDROSTATIC TESTING OF STAINLESS STEELS

GUIDELINES TO ENSURE LONG SERVICE LIFE

DESIGN ENGINEERS FREQUENTLY SPECIFY STAINLESS STEEL IN INDUSTRIAL PIPING SYSTEMS AND TANKS FOR ITS EXCELLENT CORROSION RESISTANCE. WHILE STAINLESS STEEL'S UNIQUE CHARACTERISTICS MAKE IT A STANDOUT LEADER IN THE DURABILITY STAKES OF ALLOYS, IT IS NOT COMPLETELY IMMUNE TO CORROSION.

Premature failures of the stainless steel can occur due to Microbiologically Influenced Corrosion (MIC). This corrosion phenomenon usually occurs when raw water used for hydrostatic pressure tests is not fully removed from the pipework and there is an extended period before commissioning of the equipment. The result is localised pitting corrosion attack from microbacterial deposits that, in severe cases, can cause failure within a few weeks. MIC is easily prevented using proper hydrostatic testing techniques.

MIC

MIC failures occur by pitting corrosion, often at welds, where colonies of bacteria may form. A number of different bacterial species are known to cause the problem, but the detailed mechanism is not known.

Iron utilising bacteria appear to be the dominating microbial species involved with MIC occurring in stainless steel. Anaerobic sulphate-reducing bacteria pose a greater risk of instigating or accelerating corrosion often under a layer of aerobic slime or microbial deposits. However others, such as manganese utilising bacteria (generally from underground waters), have also been discovered.

MIC is extremely aggressive and difficult to eliminate once established, so it is surprising and disappointing that there is limited knowledge of MIC within the engineering community. Fortunately, MIC is easily avoided by using good practices during the initial hydrostatic testing. Education and promotion of proven hydrostatic testing practices which prevent MIC are vital to minimising its potential impact on the stainless steel industry.

HYDROSTATIC TESTING PRACTICES TO ELIMINATE MIC

In order to eliminate MIC, it is recommended that the following practices are used.

1. Fabrication practices

Crevices should be eliminated or at least minimised during the fabrication process, as they are the preferred sites for attachment and growth of microbial colonies. They also provide traps for chemicals which could concentrate and cause pits.

The likelihood of MIC will also be reduced by:

> using full penetration welds; and

> purge welding to prevent the formation of heat tint; or

> removing heat tint by grinding or pickling.

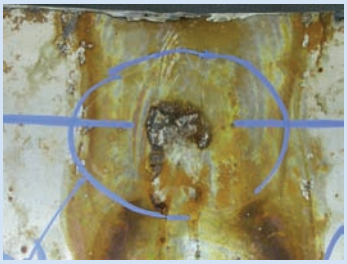
Arc strikes and weld splatter should also be ground off and pickled.

2. Use clean water

The cleanest water available should be used in a hydrostatic test, such as demineralised, steam condensate or treated potable water. Untreated or raw water from dams or bores should be avoided when conducting a hydrostatic test but, where this is not possible, the water should be sterilised (eg by chlorination) before use. If sterilisation is not practical, the requirements for short residence time and subsequent drying of the system are extremely important. The cleaner the water, the less 'food' there is for MIC bacteria to live off and multiply.

It is important to ensure that there is no trace of sediment in the stainless steel system during testing to avoid silting, as the water is normally not circulated during a hydrostatic test. This may require the test water to be filtered to ensure it is free of all undissolved solids. Sediments can provide the conditions for crevice attack.

MIC deposits on surface



Corrosion under deposit

Corrosion pits

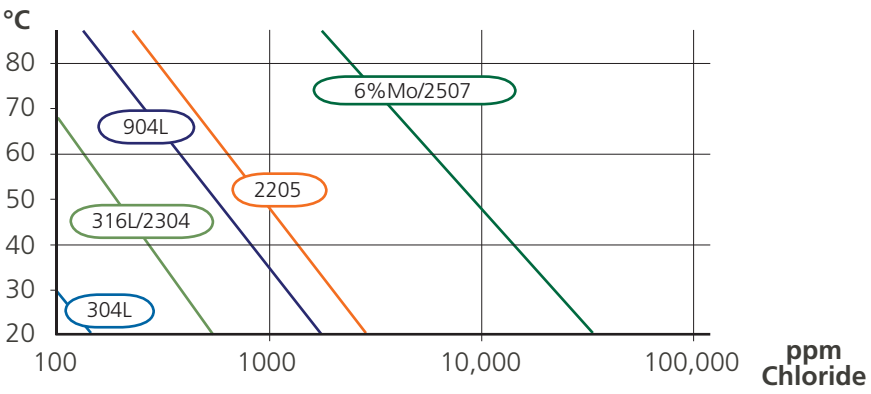


Figure 1 Maximum temperatures and chloride contents to which stainless steels are resistant in water with residual chlorine of about 1 ppm.
Reproduced from data sourced from Outokumpu.

3. Draining and drying

Thoroughly draining and drying the stainless steel system immediately following a hydrostatic test (preferably within 24 hours, certainly within 5 days) will almost certainly prevent the occurrence of MIC.

Horizontal pipelines should be installed in a sloping direction to make them self-draining.

Drying can be achieved by pigging (cleaning with foam or rubber scrapers), followed by blowing dry air through the system. Beware of blowing higher temperature moist air through cold pipework unless the air is dried before being introduced to the system. If warm air is used, it should not be from a gas burner as condensation may occur.

Draining and drying of systems following a hydrostatic test should only be disregarded when the system is placed into service immediately following the test. Partial draining is potentially very serious as subsequent slow evaporation of even clean residual water can produce very concentrated and aggressive solutions.

4. Chloride content and temperature

During hydrostatic testing of stainless steel equipment, the chloride content of the test water must be within the range to which the stainless steel grade is resistant. **Figure 1** shows the maximum temperatures and chloride contents to which stainless steels are resistant in water with residual chlorine of about 1 ppm.

The limits shown in **Figure 1** may be exceeded provided the contact time of the water is brief, ie 24-48 hours.

If the chloride content of the test water is uncertain, the water should be analysed.

5. Standards

NACE and API standards for a number of products and installations provide guidelines for hydrostatic testing, including limits for water quality and contact times. These standards should be consulted for specific details for the fabrication in hand.

CONCLUSION

The benefits of stainless steel's corrosion resistance are well proven in many industrial applications involving piping systems, but failures can occur during hydrostatic testing if care is not taken. Attention to a few simple details will prevent surprises a few months down the track, allowing the long service life available from stainless steel to be fully realised.

Artist's impression of the Southern Seawater Desalination Plant as it will appear with revegetation by 2036

WATER FARMING

STAINLESS TECHNOLOGY ESSENTIAL

Guaranteeing water supply in Australia is thirsty work. Western Australia's new Southern Seawater Desalination Plant, currently under construction north of Bunbury, will help quench Perth residents and businesses with up to 100 billion litres of water a year. In such a highly-corrosive salt water environment stainless steel is a natural fit.

Sea water is pumped from the ocean and its high salinity is extremely corrosive. The desalination plant uses reverse osmosis to purify the sea water, essentially pushing it through a fine membrane at high pressure.

The first pass (first membrane) is the most corrosive environment which is why super duplex stainless steel is essential. Following passes, which have much lower levels of salt and are almost fresh water, require duplex and grade 316 stainless steels.

A collaborative effort of WA stainless steel expertise ensured the best knowledge was applied to the 200-plus tonnes of piping in the plant.

Alltype Engineering was contracted to supply the complete reverse osmosis racks with super duplex, duplex and 316 stainless steels required for all the connecting pipe spooling.

Project Manager Keith Thomas-Wurth said the the energy recovery devices and the pipe spooling connecting the reverse osmosis racks with the pressure pumps were subcontracted to ASSDA Accredited Fabricator Weldtronics Australia.

International Corrosion Services' pickling and passivation treatments were central to ensuring the performance of the stainless steel entering the plant. They use Avesta Finishing Chemicals supplied by Bohler Welding Australia (a division of Bohler Uddeholm Australia).

ICS Business Development Manager Stuart Norton said the opportunity to apply the pickling and passivation processes to 200 tonnes of piping came at the right time.

"We've just developed the largest nitric and hydrofluoric acid tanks in the southern hemisphere, and they've been used to treat the stainless steel to ASTM380-06," he said.

The near 20m^3 tank is a realisation that the industry will move towards longer pieces, particularly in piping, saving on fabrication time and reducing the number of joins - ultimately providing less opportunity for corrosion.

Southern Seawater Joint Venture Mechanical Engineer Juan Jose Perez said that the stainless steel piping in particular is one of the most important elements of the desalination plant's construction.

"The membrane is the core of the plant and, in turn, the core of the filtration process. The salt water is passing through the stainless steel pipes to get to the membrane and any corrosion, any tiny particle, can damage the membrane which is extremely expensive," Mr Perez said.

"Suppliers of the membranes run regular checks to detect for corrosion and, if they detect it, it could potentially affect functionality, even warranty of the membrane. So we rely on the stainless steel, particularly inside the pipes, to be of the highest quality. This is why the pickling and passivation process is so important."

Mr Norton said that ICS heard the industry screaming out for larger tanks for pickling and passivation jobs such as the one undertaken for Southern Seawater and undertook the two-year journey to get the required authorisation.

"Obviously there are some key environmental and waste treatment factors involved in this. Our waste-water process was made easier by constructing an in-house acid neutralisation tank plus a filter press to push heavy metals out of the acid before sending it off to be further treated," he said.

The trend towards desalination as a water supply method is clear: when Southern Seawater comes online in late 2011 desalinated water will account for 30 per cent (up from 16 per cent) of WA's total water supply.

This trend means that further use of large-scale pickling and passivation is likely as stainless steel continues to prove to be an essential and trustworthy component of the desalination plant's construction.

International Corrosion Services' pickling bath

Reverse osmosis racks

WANT TO SEE INSIDE A DESAL PLANT?

Register for **PacRim Stainless 2010** and you can participate in the walking tour of the **Gold Coast Desalination Plant**.

Participants will be able to observe up close the low pressure reverse osmosis membranes and other stainless steel components of the plant and learn:

- how the plant operates
- how stainless steel has been used
- how reverse osmosis membrane technology works
- how the plant delivers pure drinking water to the South East Queensland Water Grid.

Download the PacRim Stainless 2010 registration brochure from www.assda.asn.au

PACRIM STAINLESS 2010

Register now for ASSDA's PacRim Stainless 2010 - Australia's premier event to discuss current and future domestic and international issues affecting the stainless steel industry.

This year's theme 'Fresh focus for industry growth' reflects that our industry is continuing to strengthen and move forward. The event will mark the launch of the Import Displacement Program, which will better position those in the industry to participate in major project work across the country.

A comprehensive line up of speakers will help delegates to examine, understand and take advantage of project work opportunities.

Please be aware that all times are Daylight Saving Time. However, if you are flying into Gold Coast Airport, flight arrivals will be on Australian Eastern Standard Time.

Download the registration and accommodation booking forms at www.assda.asn.au

PROGRAM OVERVIEW

THURSDAY, OCTOBER 21

> 12pm Tee off for PacRim Golf Ambrose, vying for the Barry Durrant Memorial Trophy
> 6.30pm Welcome Cocktail Reception

FRIDAY, OCTOBER 22

> 7am Registration
> 8am ASSDA AGM
> 9am-1.30pm Conference Sessions
> 2.15pm Gold Coast Desalination Plant briefing and walking tour
> 7pm PacRim Dinner

SPEAKER HIGHLIGHTS

> Rowan Murray, Ronstan International
> David Wallis, Mining & Energy Services Council of Australia
> Peter Robinson, Industry Capability Network
> Ross Pritchard, Department of Transport & Main Roads

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