

Guest Editor's choice



REDUCING LIFECYCLE COSTS WITH DUPLEX STAINLESS STEEL FASTENERS

This month's Guest Editor of *Torque Magazine* – BUMAX Managing Director **Lars Holm** – looks at how duplex stainless steel plays a vital role in the efficiency, sustainability and longevity of fasteners...

Sustainability and life cycle analyses are becoming increasingly important in the fastener industry – not only because it is good for the planet but also since customers demand it. Here duplex stainless steel fasteners can play a crucial role. They combine super high strength, excellent ductility and corrosion resistance – to reduce lifecycle costs in demanding applications compared with alloy steel fasteners.

INTRODUCING DUPLEX STAINLESS STEEL FASTENERS

Duplex stainless steel, also known as ferrite-austenitic stainless steel, is a family of stainless steel that has a two-phase microstructure containing ferrite and austenite. The mix of ferritic and austenitic phase is roughly 50/50 to ensure optimal corrosion resistance and mechanical properties.

Duplex stainless steel fasteners are unique as they combine super high strength with excellent ductility. Even at very high strength levels, such as classes 10.9 or 12.9, duplex fasteners offer equally good or better elongation than the A4-80 stainless steel grade. The duplex microstructure together with low inclusion content also offer excellent strength and good corrosion resistance.

Another essential property of duplex stainless steel is that it has excellent corrosion resistance – far better corrosion resistance than A4 (316L). Duplex fasteners are not subject to hydrogen embrittlement, poor ductility, as well as many of the associated quality and performance issues inherent with the use of coated alloy steel fasteners.

ACHIEVING LIFECYCLE COST – AND HUMAN – SAVINGS

The superior properties of duplex stainless steel fasteners ensure they can be a more cost-effective solution than alloy steel fasteners in high-strength applications in corrosive environments. Duplex fasteners can significantly lower total lifecycle costs by reducing or eliminating future maintenance,

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downtime and replacement costs, which can often far outweigh the initial higher cost of the fastener.

Beyond lifecycle cost savings, the failure of an alloy steel 12.9 fastener due to corrosion, hydrogen embrittlement or fatigue can be catastrophic for the application and the associated assets. Such a catastrophic failure can involve massive financial costs and risks to human life – think bridges, vehicles, vessels, skyscrapers, refineries, oil platforms, etc – which can all be mitigated against by using duplex stainless steel fasteners.

APPLICATIONS

Duplex stainless steel fasteners are used for critical applications that demand a combination of excellent corrosion resistance and high strength. Duplex grades are primarily used in the oil/gas, chemical, and pulp and paper industries, and subsea or other applications in highly corrosive environments.

Premium stainless steel fastener specialist BUMAX of Sweden is a company steeped in history that has a long tradition of being at the forefront of fastener innovation and development. A few years back, it developed the world's strongest bolt – the BUMAX Ultra – with three times the strength of a standard stainless steel fastener. Its next generation of very high strength duplex stainless steel fastener is called BUMAX DX (Duplex) 129. With excellent corrosion resistance, BUMAX DX 129 is poised to be the ultimate choice for strength, ductility and corrosion resistance.

BUMAX®



BUMAX DX 129 is the next generation of very high strength duplex stainless steel fastener



Torque Magazine quizzes BUMAX Technical Director **Anders Söderman** on trends, R&D and the future of fasteners...

HOW HAVE FASTENERS IN GENERAL DEVELOPED IN RECENT DECADES?

I think a major trend in the last 30 years is that we have seen an increase in cheap fasteners on the market that might lack the required properties for a particular application – such as strength and corrosion resistance. It may seem to make good business sense when purchasing cheap products, but such fasteners might require regular maintenance or replacement, and even result in catastrophic fastener failure if not properly maintained. This is why it is essential to source high-quality fasteners from suppliers that can help with selecting the best fasteners for a particular application from a lifecycle cost perspective.

At the same time, materials technology has continued to develop – to make high quality fasteners with exceptional properties for extremely demanding applications. Duplex stainless steel fasteners are the latest addition to the list of high-performing stainless steel fasteners on the market, providing excellent strength and corrosion resistance.

IS THERE A SHIFT IN CUSTOMER FASTENER DEMAND?

Yes, we have seen the growing trend of stainless fasteners being used to substitute alloy steel and standard stainless fasteners. Customers are increasingly taking a lifecycle perspective on their fasteners – to reduce overall lifecycle costs and risk. There is also greater appreciation of cold formed high-quality fasteners with excellent properties.

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HOW DO YOU DEVELOP NEW FASTENERS?

We have a structured process when developing new products. It always starts with an idea, either from a customer to solve their particular need or by us anticipating a particular need for better performing fasteners in the market. We create the business case, conduct a feasibility study and eventually initial product trials.

New products are tested by us, third parties and often by our customers. If the samples from the trial are approved, we can move to the last step, which is full-scale production and commercialisation. The entire product development process typically takes between one to two years. Our new range of BUMAX Duplex stainless steel fasteners for example took 18 months to develop and have been tested on extremely demanding customer applications.

WHAT DO YOU THINK IS THE MOST EXCITING DEVELOPMENT IN THE FASTENER INDUSTRY?

Besides high-performing duplex stainless steel fasteners that have the potential to solve many customer application issues in corrosive environments, Smart Bolts are really interesting. Basically, a Smart Bolt is a fastener with a built-in tension sensor, which measures stresses and preload in the bolt over time. They reduce the risk of failure and costly inspections – particularly for critical or difficult to access fasteners.

FOR YOU PERSONALLY, WHAT ARE YOU LOOKING TO IMPROVE IN THE WORLD OF FASTENERS?

At BUMAX, we have always been at the forefront of fastener innovation. Several of our products are unique when it comes to strength and cannot be found anywhere else in the world. We are also actively developing Smart Bolts.

www.bumax-fasteners.com