

High performance steels for sustaining industry

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In the constant battle for higher-performing steel products, strong and thin is the future of steel and that's where our R&D focus is in expanding our extensive portfolio of high-strength, high-performance structural steels.

Researchers are pushing the boundaries of what we imagine is possible, seeking to improve and enhance existing materials and come up with completely new materials that, take us down entirely new technological pathways.

High strength steel is a material of the future, not only offering advantages from which to develop solutions to both every day and difficult or unusual engineering problems, but can also offer environmentally positive benefits such as mass savings, reduced production costs, the possibility of high load or high fatigue operations as well as greater load carrying capacities. The world's leading designers are creating ever more complex structures for cities and increasingly they need stronger, lighter and more sustainable materials to realise their visions. Lighter structures enable savings in greenhouse gases with up to 30 percent reduction in carbon emissions during construction being realised.

To date, Australian engineers have generally not fully exploited higher strength materials and there remains considerable scope for innovative design when you see what has been happening internationally. In some cases, it is likely that the competitive position of a steel solution may be enhanced by the use of high strength steels in combination with normal strength grades.

The use of high strength steels in Australia over the past 30 years or so has predominantly been for mechanical engineering with the recent resources boom providing ample scope for use in equipment such as dump truck bodies, storage bins, hoppers and chutes, where lighter weight, wear resistance and impact resistance combined with straightforward fabrication has facilitated ready adoption. These same benefits can extend to certain applications in the structural engineering space.

While ductility and weldability regularly came at a cost to strength and toughness in the past, modern quenched and tempered steel comes with enhanced fabrication qualities without compromising mechanical properties. While harder steel is highly desirable in a range of applications, especially in mining situations where abrasion resistance is key, the tempering process offered in some BISALLOY® steel grades means less brittle and more ductile steel without sacrificing all of the hardness.

The lower hardness and more ductile variants are ideally suited to structural applications, especially construction and infrastructure. Importantly, high strength quenched and tempered steel plate conforming to the Australian Standard AS 3597 are now included in the recently revised Australian Standard for Steel Structures. They make it possible to build taller towers, span larger areas and specify smaller columns while actually reducing the amount of steel needed.

By substituting common steel with high-strength steel, the weight of steel columns is reduced on average by 32 percent and of beams by

19 percent. The lighter structures enable savings in greenhouse gases, with 30 percent reduction in carbon emissions during construction. And of course, reductions in frame weight lead to savings on foundations, fabrication and construction costs. Importantly, fabrication considerations such as cutting, drilling and forming/rolling are not compromised. With the world's leading designers creating ever more complex structures, increasingly they need stronger, lighter and more sustainable materials to realise their visions.

One such structure is the new One World Trade Center in New York City designed by architect David Childs. The beams for 1WTC are all high strength steel. This steel combines different structural properties that in the past were considered incompatible for complex structural designs such as that of 1WTC and this type of high strength steel has so far been used for hundreds of similar construction projects worldwide.

Asia-Pacific is the largest and the fastest-growing region in the global high strength steels market. The growing middle class population and associated urbanisation drives the demand of high strength steels in this region. The relationships with our customers and key end users are critical to Bisalloy Steel's ongoing successes in both Australia and the broader Asian Pacific market with more emphasis than ever before being placed on customer engagement, customer relationships and the fulfilment of our promises and guarantees.

Being future-oriented also means looking at national defence and Bisalloy is researching innovative defence offerings through close partnerships and technology sharing with major defence contractors.

Already, Bisalloy Steel is accredited with the Australian Defence Forces and continues to be an ongoing supplier. To our credit as a relatively small supplier in the global defence industry, our range of ballistic steels is also accredited and used by the US Army and Marines, the Israeli Defence Forces, the Thai Army, Navy and Police Force, the Taiwanese Army and the Indonesian Army as well as a myriad of private contractors. For instance, on the back of a strong and collaborative working relationship with the key prime contractors to deliver the Bushmaster infantry mobility vehicle, Bisalloy Steel is continuing engagement with key stakeholders in the Bushmaster replacement project, Land 400 Phase 2 and Phase 3.

And through our Technical and R&D Centre, these can lead into new, non-defence related applications requiring the highest level of strength and toughness such as for wind turbine towers as these steel grades can facilitate higher towers or larger generators. Bisalloy Steel Group Limited comprises several joint ventures including operations in China, Indonesia and Thailand. Bisalloy is the only Australian based producer of value added high strength steels including specialty structural, wear and defence steels and has been producing high strength quenched and tempered steels in Australia since 1979.

**Commentary adapted from Mr Albert's plenary presentation at Australian Steel Convention 2016 on 13 September.*