

Vanadium is a key steel additive for sustainable, decarbonised construction

By Terry Perles, Director of US Vanadium, a Vanitec member

Central to the adoption of more sustainable construction practices is the equally important need to maintain the socio-economic growth rates and targets of developing nations. To maintain these sustainable growth trajectories, while also targeting the decarbonisation of the built environment in line with global net-zero carbon objectives, the concept of using less steel of superior quality allows both needs to be met simultaneously.

The unprecedented surge in steel demand in the past three decades has been driven by infrastructure development, industrialisation, and urbanisation within developing countries, in a bid to create economic opportunity and improve the standards of living within these countries.

To support the continued industrialisation of the developing world, steel demand is expected to continue to rise, with the International Energy Agency forecasting a doubling of steel demand by 2050.

One of the ways to optimise the process of infrastructure development to sustainably meet socio-economic development growth targets, is to produce higher strength steels using vanadium as an additive.

Vanadium additions at very low levels increases the yield strength of steel and therefore plays a pivotal role as a critical energy transition metal by enabling sustainable socio-economic development to continue while also helping to reduce the carbon footprint of the built environment.

Substantially less micro-alloyed steel is required in construction to achieve the same structural performance compared with that of carbon manganese steel, owing to the strength and toughness of micro-alloyed steel. This allows infrastructure development to take place using less steel, resulting in consumption of minimal amounts of raw materials and energy. This, in turn, reduces the carbon footprint and enhances the sustainability of the steel industry as well as the construction industry.

Vanitec, the not-for-profit international global member organisation whose objective it is to promote the use of vanadium-bearing materials, points out that the strengthening effect of vanadium makes vanadium micro-alloyed steels particularly suited for high-strength steel applications in the construction sector, such as buildings, industrial infrastructure, rail infrastructure, power and energy infrastructure and bridges.

Vanadium micro-alloying has been used as the primary strengthening mechanism for steel for several decades, with some 90% of the world's vanadium production used within the steel industry. The use of vanadium in the steel industry has gained further traction following the successful adoption of new steel reinforcing bar standards in China, driving further increases in the consumption of vanadium.

Micro-alloying with a relatively small amount of vanadium (typically 0.05% vanadium addition, or 0.5 kilograms vanadium per metric ton of steel) brings about considerable improvements in yield strength of between 30-100% as well as improves the ductility and seismic performance of steel. Producing micro-alloyed steel directly reduces the amount of steel consumption which translates into substantial material savings over carbon manganese steel production, thus reducing the total global fossil carbon footprint.

With only 35% of the steel produced worldwide being micro-alloyed steel, and 20% being special steels, there is a tremendous amount of potential to convert the roughly 45% of carbon manganese steel currently being produced to a higher strength micro-alloyed steel.

This is an important future driver for vanadium demand as the world commits to building greener and more sustainable cities, in line with the United Nation's Sustainable Development Goals.

About Terry Perles

Mr Terry Perles serves as a Director at US Vanadium with more than 30 years of experience in the vanadium industry in roles including sales, marketing, strategic planning, and senior management. Mr. Perles joined US Steel Corporation in 1980 as a Construction Management Engineer and held assignments at the company's steel mills in Homestead and Clairton, Pennsylvania.

About Vanitec

Vanitec brings together representatives of companies and organisations involved in the mining, processing, manufacture, research and use of vanadium and vanadium-containing products. The objective of Vanitec is to promote the use of vanadium bearing materials, and thereby to increase the consumption of vanadium.