

Environmental benefits of high strength stainless steel in tank trailers

Did you know that...

- Through using high strength steel in a tank semi-trailer the load capacity could be increased by 2 tonnes. The number of journeys required to transport a certain volume of cargo is thereby cut by almost a tenth.
- During the tank trailer's lifetime, greenhouse gas emissions are reduced by about 90 tonnes.

The world needs Swedish steel

Steel is the world's most used metallic construction material thanks to the material's strength in relation to its weight and price. During 2013 almost 1.6 billion tonnes of steel were produced globally.¹ Sweden's steel industry makes up about half a per cent of the world production. However, Swedish steel companies are highly specialised. In many cases they are world leaders within their respective niches.²

Steel forms part of an eco-cycle and can be recycled endlessly as raw material for new steel without any deterioration in quality. This makes it unique amongst modern materials.

New, advanced steel grades are being developed all the time. Many of the steel grades that Swedish steel companies produce today were not even on the market five years ago.²

High strength steel is stronger than conventional steel and makes it possible to produce lighter steel designs. A doubling in the strength delivers a weight reduction of about 30 % in the upgraded structural components.³ Upgrading means replacing with a steel of higher yield strength. Lighter structures lead to lower environmental impact through reduced emissions, more energy-efficient products and the sustainable use of natural resources. The use of high strength stainless steel makes it possible to reduce the amount of steel in the construction.

Case study

High alloy steel grades, so-called stainless steels, are normally used in environments that are corrosive or aggressive and where high demands are placed on hygiene.

Through using high strength steel in tank semi-trailers it is possible to produce lighter and more fuel-efficient vehicles and their load capacity frequently increases also. This leads to more efficient transport journeys and reduced pressure on the environment.

A study³ has examined the differences in a tank trailer's environmental impact when the tank is

¹ World Steel Association

² Jernkontoret, *Steel shapes a better future*

³ Ovaskainen M., Tonteri H., Haikka T., *Hybrid life cycle assessment (LCA) of semi-trailer truck with two stainless steel tanks. 2011.*



produced from two different stainless steel grades: a normal stainless steel and a high strength stainless steel.

The tank trailer’s environmental impact has been quantified through life cycle assessments. The assessments include the environmental impact of the steel production, the manufacture of the tank, diesel production and transportation of cargoes during the tank trailer’s lifetime. The transport journeys are assumed to take place on country roads with full payloads. The trailer’s lifetime is estimated to be 5 years which is assumed to correspond to 1 000 000 km in distance travelled.

Results

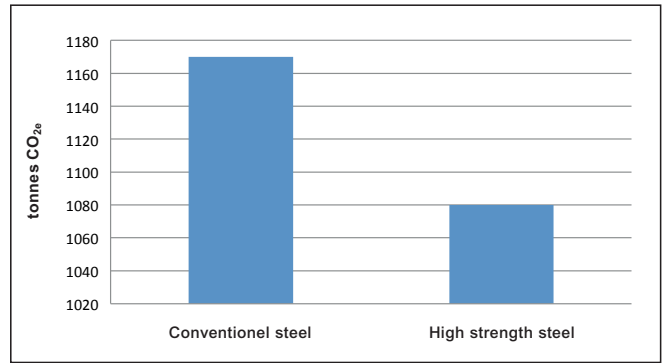
The actual production of the high strength stainless steel gives rise to greater environmental impact per unit weight compared with production of the stainless steel with lower yield strength. Since the high strength steel is stronger and more corrosion resistant it is possible to reduce the thickness of the walls of the tank. The weight of the tank can thereby be reduced from 7 tonnes to 5 tonnes. The weight reduction makes it possible to increase the trailer’s load capacity from 23 tonnes to 25 tonnes. The total weight of the two vehicles with full payload is the same.

Weight reduction and decrease in emissions for the tank trailer in high strength steel when compared with conventional steel.

Weight reduction (tonnes)	Weight reduction (%)	Reduced green-house gas emissions (tonnes CO _{2e})	Reduced greenhouse gas emissions (%)
2	29	90	8

The fuel consumption and thereby the emissions of greenhouse gases per tonne km⁴ (tkm) are lower for the tank trailer with larger load capacity. In overall terms, the greenhouse gas emissions are 90 tonnes CO_{2e}, or 8 % lower for the tank trailer of high strength stainless steel during its lifetime.

Besides the reduced environmental impact, an increased payload leads to reduced fuel costs.



Greenhouse gas emissions for a tank trailer made of conventional stainless steel and one of high strength stainless steel.

The useful life of a tank trailer made of high strength stainless steel is probably also longer than for one made of ordinary stainless steel. These effects have not been assessed in the study however.

Conclusion

Despite the environmental impact from production of the high strength stainless steel being greater than the ordinary stainless steel, the environmental impact for the upgraded tank semi-trailer’s entire life cycle is, in fact, lower. As a general rule, over 90 % of the environmental impact from the transport sector comes during utilisation of the vehicle, in the form of carbon dioxide emissions and other pollutants in the fuels.

Swedish steel and the companies’ knowledge of its applications create opportunities for producing more efficient designs which reduce the environmental impact when the products are used. High strength steel in vehicles is one example of this potential.

The properties of steel in terms of high strength, long operating life and recyclability make the material a significant component of sustainable development.

⁴ 1 tonne-km is equivalent to the transport of one tonne of payload for one km.

Do you wish to know more? Please contact us at Jernkontoret.

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