Environmental benefits

Environmental benefits of high strength steel in vehicles

Did you know...?

- Through replacing 1.3 million tonnes of conventional steel in motor vehicles with 1 million tonne of high strength steel, the greenhouse gas emissions are reduced by 8 million tonnes CO_{2e}.
- The emission reduction exceeds the total emissions that occur during production of the steel by 6 million tonnes CO_{2e}.
- Vehicles that have 10 % lower weight consume about 5 % less fuel.

The world needs Swedish steel

Steel is the most widely used metallic construction material in the world, thanks to its strength in relation to weight and price. In 2013, almost 1.6 billion tonnes of steel were produced globally[1]. The Swedish 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 among 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 enables the production of lighter steel designs. A doubling in the strength delivers a weight reduction of about 30 % in the upgraded structural parts[3]. Lighter structures lead to lower environmental impact through reduced emissions, more energy-efficient products and the sustainable use of natural resources.

Case study

High strength steel is of special interest to the transport sector where it can be used to produce safer, lighter and more fuel efficient vehicles. Over 90 % of the environmental impact from the transport sector, is made out of carbon dioxide emissions and other polluting emissions from the fuel consumed in the use phase of the vehicle.

In a case study[3], the possibilities of reducing the energy use and carbon dioxide emissions from transport in Europe through lighter vehicles manufactured of high strength steel, were investigated.

A scenario, where a million tonnes of advanced high strength steel replaces 1.3 million tonnes of conventional steel in a vehicle fleet, was studied. This is equivalent to a weight reduction of 25 % for the parts that are upgraded.

The vehicle fleet that was studied is a European

[1] *World Steel Association*
[2] *Jernkontoret, Steel shapes a better future*
[3] *The Steel Eco-Cycle, Environmental Research Programme D 853.*

STEEL SHAPES A BETTER FUTURE

mix i.e. the distribution of private cars, trucks and buses is an average for Europe[4].

Life cycle assessments were used to quantify the life time environmental impact of the steel. The difference in the environmental impact between vehicles made of high strength steel and conventional steel vehicles has been estimated on the basis of the input steel's environmental impact as well as the fuel consumption of the vehicles when they are used.

In the study, average values concerning the lifetime of European vehicles, i.e. the distance a vehicle travels over its useful life, is used[5,6].

Results

Through replacing 1.3 million tonnes of conventional steel with 1 million tonnes of high strength steel in the European vehicle fleet, the greenhouse gases from steel production and the use of vehicles would be reduced by 8 million tonnes CO_{2e}. At the same time, the use of non-renewable energy resources would be reduced by 31 TWh during the lifetime of the vehicles.

From a life cycle perspective, it is during the utilisation phase of the vehicles that the greatest emission reduction occurs, thanks to lower fuel consumption. A less significant portion of the emission reduction is attributable to less steel being needed to produce cars from high strength steel.

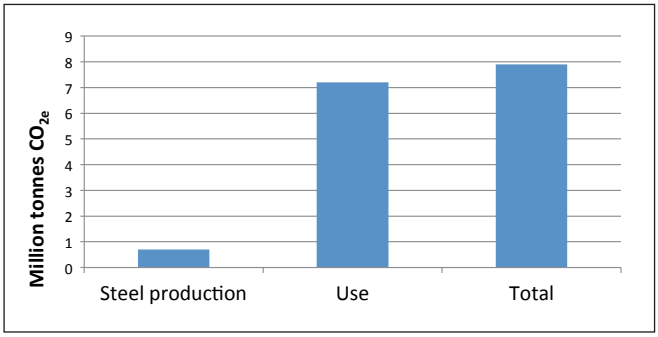
Reduced emissions and energy use during production of the steel and utilisation of the lighter vehicles[3].

Process	Reduced greenhouse gas emissions (million tonnes CO_{2e})	Reduced energy use
Production of steel	0,7 Mtonnes	3 TWh
Use of vehicles	7,2 Mtonnes	28 TWh
Total	**7,9 Mtonnes**	**31 TWh**

Conclusion

There is a significant potential to reduce emissions from transport through increased use of high strength steel in vehicles, in Europe as well as globally.

The European vehicle fleet incorporates about 100 million tonnes of steel and the global vehicle fleet about 500 million tonnes. Hence, the figure of 1 million tonnes of high strength steel that the example refers to, is equivalent to 1 % and 0.2 % respectively of the steel in these vehicle fleets.



Reduced greenhouse gas emissions on upgrading to high strength steel in the European vehicle fleet.

The upgrading to high strength steel in vehicles, in accordance with the example, would lead to a reduction in emissions of about 8 million tonnes CO_{2e}. This can be compared to the total emissions from private cars in Sweden, which in 2012 amounted to about 11 million tonnes CO_{2e}[7].

Swedish steel and the companies' knowledge of its applications create opportunities for manufacturing more efficient structures that reduce environmental impact when the products are used. The case of high strength steel in vehicles is one example of this potential.

This shows the importance of paying attention to the environmental impact during the entire life cycle of the steel product and not only examine the environmental impact from the production of the steel itself.

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

[4] *Data on the European vehicle fleet is to be found in the report The Steel Eco-Cycle, Environmental Research Programme D 853*

[5] *Helms, H., Lambrecht, U. and Höpfner, U. Energy savings by light-weighting Institute for Energy and Environmental Research, Heidelberg 2003*

[6] *Helms, H. and Lambrecht, U. Energy savings by light-weighting Institute for Energy and Environmental Research, Heidelberg, June 2004*

[7] *Swedish Environmental Protection Agency*

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