

Environmental benefits of high strength steel in furniture

Did you know that...

- Through upgrading 1.2 million frames of a certain chair model to high strength steel, greenhouse gas emissions during the life cycle of the chairs can be reduced by about 720 tonnes CO_{2e}.
- The upgrading of the chair frames also makes it possible to reduce the number of containers required for transport journeys, from 500 a year to just 200 a year.

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 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 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.

Case study

High strength steel has many different applications. To use high strength steel in furniture makes it possible to reduce the weight of the furniture and frequently, moreover, to adapt the design to use of the stronger steel. This leads to reduced environmental impact since less material needs to be produced and transported.

In a case study³, an estimate was made of the environmental benefit of upgrading the steel in the chair frame of an IKEA chair model to high strength steel. In the study, the steel in the chair frames was upgraded from steel with a yield strength of 200 MPa to steel with a yield strength of 400 MPa. The estimate was based on an annual production of 1.2 million chair frames which are made in China.

Steel's environmental impact has been quantified with the aid of life cycle assessments.

Differences in the environmental impact between chair frames in high strength steel and conventional steel have been calculated on the basis of the input steel's environmental impact, differences in packaging and transportation before and after the upgrade as well as recycling. The transportation of the chair frames is expected to take place by ship.

Since the transport journeys are assumed to be volume critical, their environmental impact has been calculated on the basis of how many containers are required in order to transport the chair frames before and after the upgrade.

¹ World Steel Association

² Jernkontoret, *Steel shapes a better future*

³ *The Steel Eco-Cycle, Environmental research Programme D 853.*

Results

Through upgrading the steel in the chair frames to high strength steel, the weight of each chair frame declines from 1,648 kg to 1,468 kg, i.e. by 11 %. For 1.2 million chair frames the total weight reduction is 216 tonnes. The weight reduction makes it possible to change the design of the frame so that more chair parts can be packed in each container load when the frames are transported. The number of load containers needed to transport the 1.2 million chair frames can thereby be reduced from 500 containers per year to 200 containers per year.

Emissions of greenhouse gases from steel production, transport and recycling decline by about 720 tonnes CO_{2e} on use of high strength steel in the chair frames instead of conventional steel.

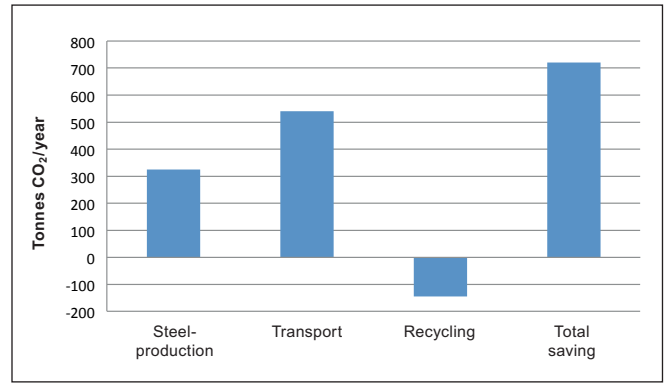
Weight reduction and reduced greenhouse gas emissions for chair frames in high strength steel compared with conventional steel.

	Weight-reduction (tonnes)	Weight-reduction (%)	Reduced emissions (tonnes CO _{2-ekv.})
1.2 million chair frames	216	11	720

The major emission reduction arises on transportation of the chair frames. The difference in environmental impact between frames of high strength steel and conventional steel diminishes when the scrap that can be recycled is taken into account. This is due to it being possible to recycle greater quantities of steel from the conventional steel compared with the lighter, upgraded frames.

Conclusion

IKEA is an example of a company that produces and sells very large volumes of the same merchandise items.



Reduced greenhouse gas emissions from steel production and transportation of high strength steel chair frames when compared with chair frames in conventional steel.

The products are sold on the global market which often implies long transport journeys. From an environmental and economic perspective, it is therefore important that the packaging and transportation of goods takes place as efficiently as possible.

The case study with high strength steel in chair frames shows, that the use of high strength steel can create opportunities for changing the design of products so as to streamline transportation and thereby reduce the product's environmental impact.

Swedish steel and the companies' knowledge of its applications create opportunities for producing structures with lower environmental impact on production, use and transportation.

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

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

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

Telephone +46 8 679 17 00 | E-mail office@jernkontoret.se | www.jernkontoret.se

JERNKONTORET

THE SWEDISH STEEL
PRODUCERS' ASSOCIATION

