

Submission of Papers

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Title:

Economic and Environmental Sustainability of High Strength Steels

Abstract:

Nowadays, the notions of sustainability and resilience from an economic and environmental point of view are becoming more and more essential subjects considering that the Earth's resources are not inexhaustible. The way we build must be modified by optimizing the future structures i.e., choosing the most appropriate material to realize material savings, improving the production process to reduce energy consumption, and designing in a way that respects the circular economy concept. All these actions are becoming compulsory to reach carbon neutrality by 2050.

Amongst building structural solutions, significant improvements can be observed in the field of steel structures allowing for a progressive decarbonization of the production processes but also for an increase of the yield strength and consequently, for a reduction in the weight of structures. Indeed, when the resistance of the material is the dimensioning criterion, the yield strength increase will lead to a substantial gain in material usage by drastically reducing the section dimensions. Less material also means lower environmental impact but also cost savings for building foundations, reduced transportation, and therefore reduced cost and reduced environmental burden. However, the execution of more slender structures is often associated with instability problems or excessive deflections which can sometimes limit the benefit in using these grades.

Considering some production techniques for high-strength steels, which are sometimes more emitting in terms of energy, as well as more demanding in terms of alloy content, the cost and the global warming potential (GWP) generally increase with the yield strength.

Based on this observation, the following question can be raised: where is the benefit, from an economic and environmental point of view, in using high-strength steels in civil engineering? This publication will reflect investigations initiated at the University of Liège, to reply to this crucial question.

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