APPLICATION OF HIGH-STRENGTH STEELS IN VEHICLE DESIGN

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Keywords: High-Strength Steels, Vehicle Design, Safety, Reliability, Environment Friendly

Abstract

High-strength steels are the materials, which could fulfill the requirements for mass reduction, improve energy efficiency, reduced fuel consumption of modern automotive industry without compromising in safety and affordability. This kind of materials are relatively new for automotive applications. The lightweight capability of high-strength steels resulted from theirs microstructure, obtained through combinations of micro alloying elements and highly controlled production processes. Due to advanced properties, especially very beneficial combination of strength and ductility, high-strength steels must be considered differently from the conventional steels, which they replaced during design process of new vehicles. This fact is the basis hypothesis for this paper. The research shown in the paper is done by relevant literature survey related to this area. The results presented in the relevant literature were analyzed and put into relationship with modern demands in vehicle design. The aim of this paper is to identify the aspects of high-strength steels application in automotive industry and to highlight of perspectives of this application. The conclusion of the paper is that high-strength steels provide lightweight and environment friendly capability in vehicle design with sustainable prices, remained reliability and even improved safety. The global conclusion of the paper is that steels, especially high-strength steels are favourable material for vehicle applications.

1 Introduction

Modern demands, which are founded at vehicle design in present automotive industry, encourage develop and usage of new, advanced, materials whose properties and behaviour in real exploitation conditions are not completely identified. Usage of those materials, despite significant benefits, induced large and potentially dangerous problems. The necessity for using the advanced materials with suitable properties requested the obligation for testing those materials, especially to sensitivity for stress concentration. The controls of raw and prefabricated materials, so as their processing technology, come to the focus of testing concerns. The listed tendencies in design, at the area of automotive industry, cause the improvement of existing technologies, so as the development and differentiation of new, advanced methods of elements' joints realizations. In addition, the analyses of demands which are founded in vehicle design, at automotive industry, show that modern cars have, beside the primary function as transport vehicle, numerous and very different functions. On the other hand, they have to fulfill very strict requirements, which are fundamentally different. The estimated requirements and criterions often have complex system of interactions [1, 2, 3 and 4]. Technology of joining by welding allows high level of flexibility during the process of design in relation to other joining methodologies. Selections of material in the area of automotive industry design, altogether with identification of adequate joining methodology, represent one of the most important procedures in this process [5, 6 and 7]. The principle of archiving the real properties of products in present automotive industry is presented illustratively at Fig. 1.