

UNIVERSITY OF ŽILINA IN ŽILINA
Faculty of Mechanical Engineering
Department of Materials Engineering



SEMDOK 2013

18th International of PhD. students' seminar

under the auspices of
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Terchová, Slovakia
30 January – 1 February, 2013

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APPLICATION OF HIGH STRENGTH STEEL OF THE S690QL CLASS FOR APPLICATION TO WELDED STRUCTURES

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Abstract

High strength steels belong into a group of high quality steels, with exceptional mechanical properties, especially in respect to strength and toughness. Those favorable properties are being achieved by application of special procedures of thermo-mechanical processing and simultaneous alloying. In this paper are considered the most important properties of a special class of high strength steels S690QL, which can be classified into the group of special low alloyed steels. It is also pointed to advantages that those steels have with respect to other steels, as well as to possibilities for application of those steels for responsible welded structures.

Key words: High strength steel, S690QL, Mechanical properties, Hardness, Microstructure.

1. Introduction

Considered steels of the S690QL class are being produced in Sweden and are known under the commercial mark WELDOX 700. They are produced according to precisely defined production phases and strictly controlled chemical composition. Such a treatment enables acquiring exceptionally high mechanical properties. Their structure is interphase, what makes them easily weldable, but only for sheets of relatively small thickness. For production of the more massive welded structures exact instructions and recommendations must be followed, related to selection of the optimal welding technology. Those steels are prone to appearance of cold cracks. They are being produced by a thermo-mechanical processing of semi finished pieces at high temperatures. The process consists of heating of a material up to the austenite region, when the recrystallization is complete, then follows rolling at that temperature and quenching (Q). After that they are tempered (T) in order to obtain the interphase structures and maintaining the high mechanical properties. Those steels are used for manufacturing of hoists and cranes, steel platforms, civil engineering machines, transportation tanks, for parts and assemblies exposed to high dynamic loads, responsible welded structures and others.

Steels of the S690QL class belong to a group of special low alloyed steels where the chemical composition is prescribed by the manufacturer (Table 1, [1 – 3]). The carbon content is limited to 0.20 % what improves the weldability. Addition of small quantities of other alloying elements causes improvement of those steels' properties, where should be especially emphasized content of niobium and boron which deoxidize steel and significantly make steel grains smaller.

