

Accepted Manuscript

Title: Effect of paint baking treatment on the properties of press hardened boron steels

Authors: Henri Järvinen, Mari Honkanen, Martti Järvenpää, Pasi Peura



PII: S0924-0136(17)30384-9
DOI: <http://dx.doi.org/10.1016/j.jmatprotec.2017.08.027>
Reference: PROTEC 15362

To appear in: *Journal of Materials Processing Technology*

Received date: 9-6-2017
Revised date: 18-8-2017
Accepted date: 19-8-2017

Please cite this article as: Järvinen, Henri, Honkanen, Mari, Järvenpää, Martti, Peura, Pasi, Effect of paint baking treatment on the properties of press hardened boron steels. *Journal of Materials Processing Technology* <http://dx.doi.org/10.1016/j.jmatprotec.2017.08.027>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Effect of paint baking treatment on the properties of press hardened boron steels

Henri Järvinen^{1*}, Mari Honkanen¹, Martti Järvenpää², and Pasi Peura¹

¹Laboratory of Materials Science, Tampere University of Technology

P.O. Box 589, FI-33101 Tampere, Finland

²SSAB Europe Oy, Harvialantie 420, FI-13300, Hämeenlinna, Finland

^{1*}) henri.jarvinen@tut.fi

ABSTRACT

This study comprehends the effect of a typical paint baking process on the properties of press hardened boron steels. Bake hardening response of four 22MnB5 steels with different production histories and two other boron steels of 30MnB5 and 34MnB5 type were analyzed. In particular, the effect of steel carbon content and prior austenite grain size on the strength of the bake hardening treated steels was investigated. Press hardened steels showed a relatively strong bake hardening effect, 80–160 MPa, in terms of yield strength. In addition, a clear decrease in ultimate tensile strength, 30–150 MPa, was observed due to baking. The changes in tensile strength showed a dependency on the carbon content of the steel: higher carbon content led to a larger decrease in tensile strength in general. Smaller prior austenite grain size resulted in a higher increase in yield strength despite the micro-alloyed 34MnB5. Transmission electron microscopy analysis carried out for the 34MnB5 revealed niobium rich mixture carbides of (Nb, Ti)C, which have most likely influenced the different bake hardening response. The present results indicate that the bake hardening response of press hardened steels depends on both prior austenite grain size and carbon content, but is also affected by other alloying elements. The observed correlation between prior austenite grain size and bake hardening response can be used to optimize the production of the standard grades of 22MnB5 and 30MnB5. In addition, our study suggests that baking process improves the post-uniform elongation and ductile fracture behavior of 34MnB5, but do not significantly influence the ductile fracture mechanisms of 22MnB5 and 30MnB5 representing lower strength levels.

KEYWORDS: Press hardening; Bake hardening; Paint baking; Martensite; EBSD; Prior austenite grain size

1. INTRODUCTION

Download English Version:

<https://daneshyari.com/en/article/5017560>

Download Persian Version:

<https://daneshyari.com/article/5017560>

[Daneshyari.com](https://daneshyari.com)