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PII: S0921-5093(18)30751-2  
DOI: <https://doi.org/10.1016/j.msea.2018.05.083>  
Reference: MSA36521

To appear in: *Materials Science & Engineering A*

Received date: 13 February 2018  
Revised date: 21 May 2018  
Accepted date: 23 May 2018

Cite this article as: Ji Hoon Kim, Eun Jung Seo, Min-Hyeok Kwon, Sington Kang and Bruno C. De Cooman, Effect of Quenching Temperature on Stretch Flangeability of a Medium Mn Steel Processed by Quenching and Partitioning, *Materials Science & Engineering A*, <https://doi.org/10.1016/j.msea.2018.05.083>

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# Effect of Quenching Temperature on Stretch Flangeability of a Medium Mn Steel Processed by Quenching and Partitioning

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## Abstract

The stretch flangeability of a medium Mn steel prepared by quenching and partitioning was examined using a hole-expansion test. Samples were heat-treated at quenching temperatures  $90\text{ }^{\circ}\text{C} \leq T_Q \leq 170\text{ }^{\circ}\text{C}$ , at which no secondary martensite is formed upon final quenching. The hole-expansion test used a  $60^{\circ}$  conical punch. The hole at the center of the specimens was prepared by punching or wire cutting. In both sample preparation conditions, hole expansion ratio (HER) increased as  $T_Q$  decreased. The dependence of HER on  $T_Q$  was more pronounced in the samples prepared by punching than in samples prepared by wire cutting. While there is no clear correlation between HER and tensile properties, the HER decreased as retained austenite increased. By punching, the retained austenite transformed to strain-induced martensite in the shear-affected zone near the hole edge. This martensite has a negative impact on the HER.

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