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Change of the yield stress in roll formed ERW pipes considering the Bauschinger effect

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ABSTRACT

ERW pipes formed with the roll forming process show a yield stress distribution along the circumferential direction and their quality is strongly influenced by the magnitude and by the distributions of the yield stress. In addition to that, strips are subjected to cyclic loading during roll forming process.

Since ERW pipes are firstly roll formed, welded and then sized, in order to develop an enhanced predicting method for the calculation of the ERW pipe yield stress, the same process flow has been also applied to authors' numerical simulations.

The Yoshida-Uemori kinematic hardening model has been applied considering several subdivision of the strain range, and different parameters, aiming to find the best correlation between the estimated Bauschinger effect and the one measured in the relevant cyclic loading experiment.

The comparisons between estimated and experimentally-measured values of the thickness distribution, and of the locally-measured yield stress, prove both reliability and accuracy of the adopted process chain analysis.

The growth of the sizing effect ratio has shown to cause the increase of the yield stress, which becomes more uniform along the circumferential direction.

KEYWORDS: ERW pipe, roll forming, Sizing effect, Yield stress distribution, Bauschinger effect, Modified Yoshida-Uemori model, Process chain analysis