

The Development of a Residual Stress Measurement Method for Roll Formed Products

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Abstract : The residual stresses in roll formed products are generally very high and un-predictable. This is due to the occurrence of redundant plastic deformation in roll forming process and it can cause various product defects. Although the residual stresses of a roll formed product consist of longitudinal and transverse residual stresses components, but the longitudinal residual stresses plays a key role to the product defects of a roll formed product and therefore, only the longitudinal residual stresses concerned by the roll forming scholars and engineers. However, how to inspect the residual stresses of a product quickly and economically as a routine operation is still a challenge. This paper introduces a residual stresses measurement method called slope cutting method to study the longitudinal residual stresses through layers geometrically to a roll formed products or a product with similar process such as a rolled sheet. The detailed measuring procedure is given and discussed. The residual stresses variation through the layer can be derived based on the variation of curvature in different layers and steps. The slope cutting method has been explored and validated by experimental study on a roll-formed square tube. The neutron diffraction method is applied to validate the accuracy of the newly proposed layering removal materials results. The two set results agree with each other very well and therefore, the method is expected to be a routine testing method to monitor the quality of a product been formed and that is a great impact to roll forming industry.

Keywords : roll forming, residual stress, measurement method, neutron diffraction

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