New Weld Metal Compositions Based on A Neural Network Analysis of HSLA Weld Wire

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Abstract

Using a neural network method within a Bayesian framework the tensile properties and the toughness of a series of experimental welding alloys were modeled. The tensile properties that were modeled were the yield and ultimate tensile strength as well as the elongation and reduction-in-area. The toughness of these same welds as measured by the Charpy V-Notch test at –18 and –51° C and the dynamic tear test measured at –1° and –29° C were also modeled. The models were all based on the composition of the as-deposited weld and the cooling rate. The original research had the intention of developing welding consumables for joining high-strength low-alloy steels (HSLA) for ship construction. New weld metal compositions have been proposed and are in test based on the data that was used for the neural networks. This paper predicts the properties of these new compositions for a variety of welding conditions and cooling rates based on the neural networks and shows some surprising results.