

CNST Project will Investigate High Heat Input Welding of Thick HSLA-100

Northrop Grumman Newport News will lead a project to evaluate the feasibility of joining High Strength Low Alloy-100 (HSLA-100) steel using 60oF preheat and high heat inputs. High heat inputs will lower the overall cooling rate (just as preheating does), which in many cases will result in crack-free welding. Both the American Welding Society and the British Standards recognize this and make allowances to use lower preheats when welding at high heat inputs.

The submerged arc welding (SAW) process, using a special flux with hydrogen scavengers, will be evaluated for thicknesses greater than 1 5/8 inches and the pulsed gas metal arc welding process will be evaluated for thicknesses greater than 1 inch. This project will attempt to demonstrate that higher heat



inputs can be used to compensate for low preheat (60oF), resulting in a favorable cooling rate for avoiding hydrogen cracking with current filler metals.

HSLA steels were developed in part to make it possible to weld at preheats as low as 60oF without developing heat affected zone (HAZ) hydrogen cracking. In developing weld procedures for HSLA 100, it was apparent that the base material could be welded with 60oF preheat without HAZ cracking. Unfortunately, the weld material could not tolerate 60oF preheat temperatures without getting hydrogen cracking, most

The Northrop Grumman Newport News-led team will investigate welding thick section HSLA-100 steel with Gas Metal Arc and Submerged Arc welding techniques using little or no preheat.

often in the form of cross cracks. As a result, a program to develop more crack resistant filler materials was undertaken. To date, these efforts have been largely unsuccessful.

In order to avoid weld metal cracking, current procedures using 60oF preheat are limited to thicknesses of 1 inch and less. One exception is the SAW technique, which allows welding HSLA-100 up to 1-5/8 inches thick. For greater thicknesses, higher preheat is required; however, preheating weldments above ambient temperature involves significant labor and electrical costs and contributes to welder discomfort.

About CNST

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