

Development of SS316L Single layer Weld Overlay using GMAW Cold Metal Transfer Technique

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ABSTRACT

Revamping and upgrading old equipment in oil, gas, petrochemical, and fertilizer plants means improving existing systems to enhance performance and longer life of equipment. Instead of replacing everything, this approach focuses on updating parts and adding new technology to increase efficiency and reduce costs. These projects address a variety of drivers, including technological obsolescence, the need for increased capacity, changes in production requirements. Typically, the scope in such brownfield and shutdown projects involves in-situ pre-inspection, in-situ part modification or replacement or revamp followed by final examination.

Recently we developed and qualified one procedure for low thickness columns in service, using automatic weld overlay with single layer in situ welding. The primary intent of this procedure is to control distortion of the existing equipment. Thus, a single layer low heat input technique of GMAW process has been established which also has resulted into achieving desired chemical composition of SS 316L at minimum possible level from the weld fusion line on carbon steel (SA516 Gr 70).

In this article, the challenges over carrying out the procedure qualification of single layer automatic weld overlay using advanced welding techniques – GMAW Cold Metal Transfer (CMT) will be discussed. Considering procedure development and qualification on low thickness, to mitigate the distortion and to achieve chemical composition at 0.5 mm from fusion line, Automatic GMAW welding process was performed using CMT technique. This involves trials using different modes of machine such as Mix Mode, Universal mode and Cladding Mode using different shielding gas(es). Accordingly, Results and observations will be discussed on various combinations of modes of machine and gas(es) and their effect on characteristics of weld fusion, bead appearance, base metal dilution, chemical composition and corrosion properties. Based on finalized parameters, Procedure was qualified. This paper will summarize and conclude the results achieved along with learning capture during the development.