

ABSTRACT

Stainless steel strip cladding is a flexible & economical way of depositing corrosion resistant, protective layer on low alloy or low carbon steel due to which it is widely used in the production of components for chemical, petrochemical & nuclear industries . Large pressure vessels are used in hydrogen containing environments, for example, in the petroleum industry in hydro-cracking, hydrodesulphurization and catalytic reforming processes as well as in the chemical and coal conversion industries. Generally, all hydro processing reactors require internal protection of the reactor vessel walls to resist the high temperature corrosion as well as pitting & IGC due to presence of various corrosive process streams. This protection is generally provided by stainless steel strip electrodes which are made up of different grade such as 347,309L, 309LNb, 316L, 317L. Weld overlay subjected to the Post-weld heat treatment (PWHT), at 690⁰C for prolong period of time to decrease residual stress levels of the base metal & improve the ductility of the cladding. But, the formation of inter-metallic compounds such as chromium carbide and sigma phase during PWHT may affect the pitting corrosion & IGC susceptibility of weld overlay and hence 309 L or 309L Nb austenitic stainless steel strip is used as cladding materials for such reactor vessel. The welding speed has a considerable influence on bead geometry, ferrite content, dilution & micro-structural changes of the weld overlay. Weld overlay developed at low welding speed has low dilution but at the same time it acquiring an unacceptable high content of ferrite & course grain structure which intern lead to increase the susceptibility towards IGC. Whereas, higher welding speed would produce an overlay with finer grain structure due to the faster cooling rates in the fusion region, which may lead to the inhibition of the formation of planar grain boundaries and hence decrease in susceptibility towards IGC.

In the present work, an attempt has been made to study the micro-structural changes of both the weld overlay under optical microscopy method with the help of Neophot-2 microscope along with inter-metallic compound as well as the elemental analysis were carried out by SEM & EDAX technique. The ferrite content was measured by Fischer Ferrite- scope MP 30 while hardness value was determined by Vicker hardness testing. The potentiodynamic testing was carried out for both weld overlays in 0.1 N HCl,