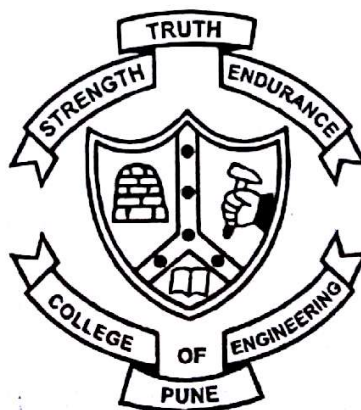


A
DISSERTATION REPORT
ON
**Effect of weld ferrite, heat input, and coating flux on impact energy
of SS308L and SS316L tested at -196⁰ C**

Submitted in partial fulfillment of the requirements
of the degree of
Master of Technology
(Process Metallurgy)

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ABSTRACT

In the present investigation, E308L and E316L austenitic stainless steel electrodes with three different delta-ferrite (δ -Fe) contents and two different coating flux types were subjected to two different heat inputs during Shielded Metal Arc welding (SMAW). Effect of these parameters on impact toughness of E308L and E316L shielded metal arc weldments at -196°C were investigated. Twelve weld assemblies were evaluated for E308L electrode and twelve for E316L electrode. These were prepared to obtain three ranges of weld ferrite number (ferrite no. 0 to 2, 4 to 6, 8 to 10) in each. Two coating fluxes (-15 type and -16 type) were used to prepare the weld with two different heat input ranges (0.8 to 1 kJ/mm and 1.3 to 1.5 kJ/mm). The impact toughness requirement of weld metal is governed by design codes. The ASME code which is widely accepted in engineering design recommends the use of lateral expansion as obtained in a Charpy Impact test. The minimum observed value should be ≥ 0.38 mm. The other approach is that of European code (TUV) which proposes a minimum value of Charpy energy ≥ 32 Joules. In this investigation both these parameters were evaluated for arriving at optimized welding parameters. From the results obtained it is found that the low weld ferrite range with low heat input and -15 coating type (basic flux) electrode give comparatively higher impact energy and lateral expansion at cryogenic temperature (-196°C). The optimized welding parameters also result in a weld that satisfies the codal requirement.

Keywords: E308L, E316L, Shielded Metal Arc Welding (SMAW), Cryogenic temperature, delta-ferrite (δ -Fe) number, Microstructure, Impact toughness, Lateral expansion.