SUMMARY OF RESEARCH

While the welded product of duplex stainless steels (DSS) is to be used for Cl^- containing environment and sour service applications for example petrochemical, off-shore platforms, oil, gas, paper and pulp industries etc. The resistance to chloride stress corrosion cracking (CSCC) during service application has always been a threat for the manufacturer and the end user of the product. Resistance to SCC in chloride containing environment depends on the available ferrite content in the carefully welded duplex (ferritic-austenitic) stainless steel structure. DSS ferrite specifications required by various organizations are 30 to 60%, 30 to 70 Ferrite Number, 35 to 75%, etc.

But there has been a lack of data to support a minimum ferrite content requirement for DSS weld metal to meet the requirement of minimum yield strength (Y.S) and resistance to CSCC. So, present work has been carried out by collaborating with a reputed filler metal manufacturer to investigate required minimum ferrite content to obtain required minimum Y.S. and resistance to CSCC. In this study, DSS 2205 material all weld metal consumable test coupons within ferrite content range 14% to 30%, or 20 FN to 40 FN have been prepared and investigated. Investigations have shown that yield strength and tensile strength requirements of base metal and filler metal classifications are exceeded at all ferrite levels investigated and no SCC cracking observed after 1000 hours exposure at ferrite level below 15%.

The objectives of the present research work are as under:-

To get prepared experimental electrodes to vary ferrite Number to a value below lower limit of ferrite specifications of Duplex Stainless steel welds.

To prepare weld test coupons with experimental electrodes following the standard procedure and guidelines applicable for welding Duplex stainless steels.

To obtained required minimum ferrite content for meeting specified minimum yield strength.

To compare among industrially practised ferrite measurements methods in terms of consistency and accuracy in measurement of FN and Percentage ferrite values.

To test the welding filler / electrodes for matching minimum mechanical and corrosion properties requirement specified in ASME BPVC Code.

To examine the effect of filler metal nickel content variation on Ferrite Number (FN), Percentage ferrite and microstructure, mechanical and corrosion properties of weld joints while keeping other elements - Cr, Mo and nitrogen constant as per standard commercial design of E2209-16 SMAW electrode.

To establish a relationship between minimum ferrite content and SCC resistance under Chloride environment with the welded 2205 alloy

To evaluate the stress corrosion resistance of welded joint without changing the pitting resistance equivalent number (PREN) values.