

ABSTRACT

Metallurgical studies for the development, characterisation and evaluation of an improved transition metal joint for steam generators, involved investigations on the trimetallic joint comprising type 304 stainless steel, Alloy 800 and 2.25Cr-1Mo steel. The objectives of this investigation were : (i) to make a choice of the suitable welding consumable between either 16-8-2 or Inconel 182 for the austenitic stainless steel to Alloy 800 joint, based on hot cracking susceptibility studies and microstructure and mechanical properties of the joint; (ii) to choose an optimum post weld heat treatment temperature for the Alloy 800 to 2.25Cr-1Mo steel joint, by studying the effect of post weld heat treatment and ageing on the microstructure and mechanical properties of the joint; and (iii) to study the performance of the trimetallic transition joint by accelerated thermal cycling of the Alloy 800 to ferritic steel joint after subjecting it to the optimum post weld heat treatment.

It has been concluded from the results of this investigation that for achieving improved performance of the steam generator transition metal joints, of at least a four-fold enhancement in service life over those presently in use, a trimetallic configuration comprising austenitic stainless steel, Alloy 800 and low alloy ferritic steel is to be used. The austenitic stainless steel to Alloy 800 joint is to be welded with 16-8-2 austenitic stainless steel, while the Alloy 800 to ferritic steel joint welded with Inconel 182 is to be post weld heat treated for 1 hour at 973 K, if the ferritic steel is of the type 2.25Cr-1Mo.