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RESEARCH ARTICLE

Finite element analysis of multipass GMAW butt joint for welding of AA 7020

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ABSTRACT : This study was conducted for analyzing the major failures of large metal inert gas arc welded structures of AA7020 aluminum alloy joined by using 5636 aluminium alloy electrode wire. The experimental study of two pass AA7020 aluminum alloys are carried out by preparing the standard welded samples as per British welding standard. The mechanical properties of the multiphase welded joint, like tensile strength, hardness and impact strength have been tested and reported. The analysis was carried out by using FEM solver ABACUS for identifying stress, strain and temperature distribution of welding. The number of nodes and elements selected for this study are 19,452 and 15, 840, respectively. Tie contact was used to connect molten and parent metal by using Ansys 6. By using Al-alloys lowering the mass by about 50 per cent can be obtained. However, it makes possible to increase and maintained ship buoyancy to increase its load carrying capacity and speed, as well as improve its stability. For these reasons Al-alloys are used for construction of ship hull and superstructures. Among weldable Al-alloys suitable to plastic working the group of Al-Mg alloys (of 5xxx- series) of good weldability and relatively good service conditions are still the most popular. Their relative insusceptibility to layer and stress corrosion is advantageous. Their disadvantage is low strength of welded joints of elements made of them, not exceeding 300 MPa. In order to more intensive craft of weight Al-Zn-Mg alloys (7xxx series) became more interesting. They are characteristic of higher strength properties as compared with those of Al-Mg alloys. Aluminum alloy 7020 [AA7020] a higher strength aluminum alloy, is widely used in welded engineering structural components, military applications, food processing industries and in aerospace applications.

KEY WORDS : AA7020, Finite element method, Heat affected zone, GMAW

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