

Potential application of acoustic emission technique for weld structure integrity monitoring under dynamic loading

S.V. Ranganayakulu^{1*}, Ramesh Kumar Buddu², P.V. Sastry³

¹ Guru Nanak Institutions Technical Campus, Ibrahimpatnam, Hyderabad-501506, India.

² FRMDC Division, Institute for Plasma Research, Bhat, Gandhinagar-382428, India

³ BHEL (R&D); Hyderabad- 500035, India

Abstract

Acoustic Emission (AE) has emerged as potential assessment technique for structural health monitoring and integrity inspection in nuclear components and weld structures during in service conditions. As in the case of nuclear fusion reactor components like vacuum vessel, magnets, support structures comprising of extensive fabricated weld joints. The operational and long term reliable performance is important for these expensive and complex structures. The present paper gives the experimental results of Acoustic Emission monitoring technique applied to welded specimens made out of AISI SS 316L steel, under dynamic stress conditions roughly simulating the pre failure conditions in the welded structures. This is a preliminary step towards application of similar techniques in the structural health monitoring of reactor components under actual operational conditions with the prevailing thermo mechanical stresses. The weld samples are fabricated by deliberately implanting different types of defects like porosity, slag and inclusions in the welded zone. These samples are subjected to dynamic loading precisely converging on the welded zone, with the help of a specially fabricated mechanical jig with a load cell. AE parameters like the no. of counts, energy, amplitude, frequencies are monitored during loading of the samples (until the physical appearance of failure) and it is observed that samples with defective welds gave distinctly higher yield of AE signals/parameters compared to sample without defects.

Keywords: Acoustic emission, welded structures, calibration, fusion reactor.