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EXPERIMENTAL STUDY OF DUCTILE FRACTURE IN WELDED JOINTS

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Abstract : The pressure pipes of water reactors are made of A48 steel tubes and welded together. These welded joints are always preferred areas for the occurrence of defects and the requirement in terms of security for such facilities, thus making it essential to study their fracture. Comprehensive approaches such as the J integral of Rice, are used to analyze the harmfulness of defects in welds. This work has explored the various parameters involved at the same time, to explain the phenomena of ductile tearing in a welded joint in order to develop an analytical method suitable for this type of junction. The tear tests showed the influence of volume fraction on the values of toughness and resistance to crack propagation J_{Ic} . The fatigue tests showed that the fatigue strength of welded joints depends not only on the properties of base metal and filler metal used but also the presence of construction defects and internal defects. On the other hand, the study of the influence of welding conditions on toughness of welded joint steel Stainless steels, showed that the solder joint is obtained austenitic ferritic structure with a ferrite content appropriate. This leads to the mechanical properties desired, move closer to the best of the middle of the band dispersion than the base metal. The numerical simulation of ductile tearing performed using the Rice-Tracey model based on the growth of voids, has highlighted the importance of parameters related to the model: in the case of a rate overmatching. Importantly, the mechanical properties of the base metal has a pervasive effect on the overall behavior of such structures and the growth rate of cavities R/R_0 is sensitive to changes in the fields of stress and strain at the bottom of the crack.

Keywords : Ductile fracture; A48 steel; Local approach