

Comparative Study for the Estimation of T_o Shift Due to Irradiation Embrittlement

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Abstract

Recently, an approach called the "Master Curve" method was proposed which has opened a new means to acquire a directly measured material-specific fracture toughness curve. For the entire application of the Master Curve method, several technical issues should be solved. One of them is to utilize existing Charpy impact test data in the evaluation of a fracture transition temperature shift due to irradiation damage. In the U.S. and most Western countries, the Charpy impact test data have been used to estimate the irradiation effects on fracture toughness changes of RPV materials. For the determination of the irradiation shift the indexing energy level of 41 joule is used irrespective of the material yield strength. The Russian Code also requires the Charpy impact test data to determine the extent of radiation embrittlement. Unlike the U.S. Code, however, the Russian approach uses the indexing energy level varying according to the material strength. The objective of this study is to determine a method by which the reference transition temperature shift (ΔT_o) due to irradiation can be estimated. By comparing the irradiation shift estimated according to the U.S. procedure (ΔT_{41J}) with that estimated according to the Russian procedure (ΔT_F), it was found that one-to-one relation exists between ΔT_o and ΔT_F .