

# REIRRADIATION RESPONSE RATE OF A HIGH-COPPER REACTOR PRESSURE VESSEL WELD\*

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## ABSTRACT

The reirradiation response of a high copper weld at several fluence levels is presented. This response is important in order to assess the cost to benefits ratio of restoring toughness properties of reactor pressure vessels (RPVs) that have been degraded by neutron irradiation. The Charpy (CVN) impact test results of reirradiated specimens that had previously been irradiated and annealed are presented. The rate of toughness degradation upon reirradiation is measured by the shift in the 41-J temperature ( $TT_{41-J}$ ) and drop in upper shelf energy (USE) of the impact curve. The material used is the HSSI Weld 73W, which has been very extensively characterized in the unirradiated and irradiated conditions. A relatively large number of specimens were tested in unirradiated and irradiated conditions such that statistical data on the effects of neutron irradiation on Charpy, tensile, initiation and crack-arrest toughness were obtained. These results have established a correlation of the  $TT_{41-J}$  to the shifts in fracture toughness. Assuming that such a correlation is a reasonable indicator of the fracture toughness for HSSI Weld 73W, then the  $TT_{41-J}$  from the annealed condition may also be a useful indicator of the re-irradiation fracture toughness. Previous results have also shown that the upper shelf energy over-recovers as a consequence of annealing which may explain why the USE value after re-irradiation has not changed from that of the unirradiated condition. The transition temperature of the reirradiated specimens is slightly higher than that which would be predicted by the vertical shift method, and significantly less than that would be predicted by the lateral shift method.

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