DISCUSSION

R. R. Hosbons[1]—We have seen large changes in properties with radiation in 3½ and 9Ni steels. Do you think that the nickel content of A543 influences its radiation response?

J. R. Hawthorne and H. E. Watson (authors' closure)—Recent NRL data for a 2¼ nickel-manganese-molybdenum submerged arc weld deposit (see Ref *7* in paper) do suggest a detrimental effect of nickel content on radiation resistance at elevated temperature, that is, at 550°F (288°C); however, this occurrence appears to depend on the other alloying agents present such as chromium content. In the case of A543 steels, its nickel content does not appear to be harmful because of a balancing chromium content.

H. S. Palme[2]—It was reported that the copper content controls the shift in transition temperature as well as the increase in yield strength due to irradiation of the studied steel. What are the effects of copper on the Cv upper shelf energy drop?

J. R. Hawthorne and H. E. Watson—The decrease in Cv upper shelf energy and the increase in Cv transition temperature, in general, are concomitant radiation effects. A relationship of copper content to the extent of both property changes has been observed. Specifically, a statistical study of one series of experimental submerged arc, 2¼ chromium-molybdenum-nickel welds irradiated at 550°F (288°C) obtained the following correlations for a fluence of 2.8×10^{19} n/cm^2 (> 1 MeV)

$$\Delta E \text{ (ft·lb)} = -2 - 100 \text{ (percent copper)}$$

$$\Delta TT \text{ (°F)} = -118 + 990 \text{ (percent copper)} + 14\,800 \text{ (percent phosphorus)}$$

From a mechanistic standpoint, it is interesting to note the appearance of a phosphorus term in the second expression (transition temperature increase) but not in the first (shelf energy decrease).

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