JUSTIFICATION OF NPP PIPELINES SERVICEABILITY IN CORROSIVE ENVIRONMENT

Yefimov O.V., Kavertsev V.L., Zhydetskyi A.I., Sidorkin I.D.
National Technical University «Kharkiv Polytechnic Institute», Kharkiv

The operability of the entire NPS steam-water path under the influence of a corrosive environment is ensured by the optimal choice of structural materials, limiting stresses in pipelines, using modern advanced manufacturing technologies that ensure minimal residual stresses and, of course, limiting aggressive impurities in the water of circuits number one and number two. In accordance with the requirements of the "Rules for the Construction and Safe Operation of Equipment and Pipelines of Nuclear Power Plants", the values of continuous corrosion rates under operating conditions (including parking corrosion) were established for the main structural metals of reactor units and their welded joints.

Currently, Ukraine has accumulated more than forty years of experience in operating NPS with BBEP reactors. Corrosion tests were conducted to study 08X18H10T steel, on the basis of which the corrosion increment for 30 years of operation for structural elements made of corrosion-resistant austenitic steels with improved surface quality that are not subjected to neutron irradiation was accepted as 40 μm, for 40 years - 55 μm, and for 50 years - 70 μm.

The analysis of equipment operation showed that resistance to intercrystalline corrosion of 08X18H10T steel and its welded joints, as well as austenitic surfaces during operation in the coolant environment is ensured by controlling the susceptibility to ICC during the supply of basic and welding materials, by ensuring the necessary quality control of the coolant during operation, and by controlling the operating culture itself.

Stress corrosion cracking leads to the destruction of a number of structures of NPS equipment made of chromium-nickel, austenitic and pearlite alloy steels. As practical observations have shown, the study of the conditions for the appearance of corrosion cracking of pipelines under the combined effect of mechanical stresses, both applied from the outside and residual, and an environment containing a process activator - chlorosulfate and an oxidizing agent - oxygen. The corrosive environment can significantly increase the fatigue crack growth rate.

A preliminary analysis of the damage from the operating experience showed what compensatory measures should be taken in the future, during further operation. This is especially relevant today, when almost all units are going beyond the design life.

The results of preliminary studies are presented.

References:

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