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Influence of the Coolant Chemistry on the Structural Materials Surfaces Exposed into the Candu NPP Primary Circuit

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One of the most important plant system is Primary Heat Transport System (PHTS) having in view its role in active zone cooling and heat transfer to steam generators. In PHTS the chemical control is directed to keep chemical parameters within specified limits in order to mitigate the corrosion of the key equipment and related piping, to control the corrosion rate and impurities concentration, such as corrosion and fission products and to minimize activity transport and heat transfer surfaces fouling.
By operation in aqueous environment at high temperature and pressure, the structural materials from PHTS cover with protective oxide films, which maintain the corrosion rate in admissible limits. A lot of potential factors exist, which conduct to degradation of the protective films and consequently to intensification of the corrosion processes.
The existing experience of different nuclear reactors shows that the water chemistry has an important role in maintaining the integrity of the protective oxide films. In order to minimize the adverse effects, an optimal water chemistry control and corrosion monitoring programme were established.
The understanding of the corrosion degradation phenomena that conduct to failure of some components from PHTS of CANDU NPP implicates the investigation of the structural materials corrosion processes, in different conditions of water chemistry and temperature.
To investigate the corrosion process of some structural materials from PHTS (Zr and Ni alloys) of CANDU 6 reactor were perfomed the following activities:
 out of pile corrosion experiments in different conditions of water chemistry;
 corrosion experiments in autoclaves assembled in by-pass of CANDU 6 reactor PHTS;
 corrosion analysis performed on some corroded components.
The gravimetric method, optical metallographic microscopy, XRD analysis, as well as electrochemical measurements have been used to evaluate the corrosion behavior of the pressure tube and steam generator tubing materials.
The obtained results allowed us to establish the contribution of the water chemistry in the initiation and evolution of some accelerated corrosion processes.

Country/Organization invited to participate

Romania

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