1.7.5. TWENTY YEARS OF EXPERIENCE IN ACOUSTIC-EMISSION EXAMINATION OF NUCLEAR POWER PLANT'S REACTOR VESSEL

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Safety of the nuclear power plants (NPPs) currently in operation used to be evaluated on the basis of defense-in-depth concept. One of the fundamentals of this concept is the assurance of the integrity of physical barriers. In NPPs, the major physical barriers are the pressurized components and piping, and among them, the reactor pressure vessel (RPV) is eminently important. Would the RPV wall at or below the core region loose its integrity and the loss of coolant be greater than the maximum supply capacity of the emergency core cooling system, then the core could be uncovered and overheated. This could seriously damage the core and lead to break of the containment structure and, in extreme case, to large radioactive release. During the whole plant service life it is necessary to demonstrate that such an RPV damage has a very low probability of occurring. The design and operation of a pressurized water reactor should ensure the operation in the ductile regime of RPV structural materials, which capitalize on the feature that energy requirement of ductile failure is larger than that required for failure in brittle mode. It means that RPV structural integrity assessment is an evaluation against brittle fracture.

The objectives of the presentation is to describe the details of the in-service hydrotest at the Paks NPP, Hungary's sole nuclear power plant. At Paks the hydrotest is supported by acoustic emission (AE) examination.

The aim of the acoustic emission structural integrity examination is to monitor and to determine the integrity of the reactor tanks (considered as pressure vessels) found at Paks Nuclear Power Plant under official pressure tests. The scope of the examination includes the stubband of the reactor vessel and the so-called 5/6 welded joint and its surroundings, located about 7 meters below the dividing plane of the tank. This welded joint is the one closest to the active zone, which means it is subject to the greatest amount of neutron impact. The hydrotest is executed every four years for every four blocks since 1988, so up to day there were completed 22 such AE examinations.