

**R&D Background for Life Management in Hungary**

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The first part of the paper summarise the already existing research results obtained in the frame of PLIM related research in Hungary. The second part of the paper introduces the ongoing research providing a strong background for the PLIM of NPP Paks.

Several actions are available to extend the operational time of the WWER-440 V213 RPV-s. The lifetime of structural materials influences the safe service time of equipment to a great extent. Longer lifetime is generally more advantageous both from the economic and environmental aspect, as waste volume decreases if decommissioning occurs less frequently. Enhancement of lifetime calculation is an important economic aspect in case of valuable equipment. WWER-440 V213 units provide about 40% of the electricity of Hungary, and play a similarly important role in several countries in the area.

In lifetime management of nuclear power plants reactor pressure vessels play a crucial role in safety. Their safe lifetime can be prolonged by mitigation actions, thus plant lifetime is not limited technically by the RPV. Generally the life limiting consideration of the WWER-440 vessels are the PTS calculations results.

To extend the safe operational lifetime of the WWER-440 V213 vessels –among other options using hardware solutions- the following actions -or at least one of them -are suggested:

- consideration of the clad in elastic-plastic PTS analysis.
- application of less over-conservative trend curves, especially the Master Curve
- extension of the analysis with crack arrest considerations
- increasing the understanding of vessel annealing, and elaborate the optimal annealing strategy.
- development nondestructive measurement methods of material degradation

These actions require further study of the material ageing mechanism. The purpose of the present paper is to show some of the realistic solutions for WWER-440 V-213 RPV PLIM and to propose the direction of further studies. Although this paper specifically considers the life management of WWER-440 V213 type vessels, other type RPV-s need similar R&D activity.

**Keywords:** Irradiation embrittlement, Life Management, Annealing, Clad, Master Curve, Elastic-plastic Analysis.

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