Assessment Of Thermal Aging Effects Based On Vver-1000 SS Data

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The VVER-1000 SS thermal aging (TASS) sets are located in vessel in real operation conditions during hundred thousand hours. Therefore TASS data is the most reliable sources of the information about mechanical properties changing of VVER-1000 RPV materials because of long term hold at operation temperature.

The analysis of base metal irradiated and thermal aging SS data has revealed high scatter. Transition temperature (TT) distribution in location of base metal (BM) SS cutting and in shells has been performed to reveal the reasons of high TT scatter in BM SS data. It was discovered that main reason of high TT scatter in BM SS is the gradient of TT along the height of coupon at the location of BM SS cutting. The TT distribution in shell is lower than at the location of BM SS cutting. The difference between actual initial TT sets of VVER-1000 BM SS sets (as an example reference and any of current set) could be not less than 26^{o}C.

To decrease the scatter contribution of in TASS data the reference and current sets have been formed from the specimens with maximum tight location with equal axial and radial coordinates. All specimens of new TASS data base have been manufactured using reconstitution of BM halves of HAZ Charpy and COD reference and TASS. The volume of tested material is more local in this case. The level of scattering is much lower for new TASS data base than for the regular TASS data. The assessment of VVER-1000 BM temperature aging effects has been done using the new TASS data base of base metal.

The revision of VVER-1000 weld metal thermal aging SS has been done. The reassessment of TT for all tested group of specimens has been performed. The time of exposition and phosphorus contents have been defined more precisely. The analysis of VVER-1000 weld metal TASS and assessment of thermal aging effects has been done.

The hardening measurement, study of carbides evolution show absent of hardening effects due to thermal aging at 310-320^{o}C. It was discovered the correlation between intergranular fracture mode in Charpy specimens and transition temperature shift under thermal aging at temperature 310-320^{o}C.