CORROSIVE STATES OF TANK AND INSIDE-TANK STRUCTURES OF WWR-M REACTOR

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Prolongation of the reactor operational life time and the planning the control for technological state make it necessary to determine the value of corrosive damages (CD) of the tank and the inside-tank structures.

For the whole operational time interval from 1960 the investigations of the corrosion have been periodically carried out on the WWR-M reactor. But systematic determination of the CD degree of the main units affecting the reactor safety has begun in 1986. It was due to two reasons — the GOSATOMENERGONADZOR (GAEN) requirements and the discovery of the "wash out" effect (WO) of the supporting grid.

The control techniques have been introduced gradually. From 1986, virtually every year, the measurement of the thickness of the connectors between the water flow holes into the supporting grid have been performed. The starting (when prefabricated) thickness of the connectors was equal to 4.2 mm, the thickness of the supporting grid itself was 40 mm.

According to the results of the measurements from 1986 till 1991 thinning of the connectors obeys to the linear dependence on the period of operation. Two moments were essential — the measurements were performed in the presence of the central gap, e.g. performed on the grid edges, and the bulk of the measurements constituted from 10 to 50 connectors. In 1993 the measurements of the connector thickness were conducted both upon the grid edges and under the central gap. The data obtained for the "averaged" connector, according to the state in 1993, are shown in table.

Since these measurements are not able to indicate the causes of the "wash out" and in accordance with the specified requirements, in 1993 the surveillance specimens (SS) have been installed into the supporting grid and into the reactor tank. The every year measurements of the SS have shown that the corrosive rate at the conditions of the supporting grid is equal to 0.01 mm/year as it follows also from the above mentioned relations. And at the conditions of the reactor tank, where the flow velocity of the coolant in few times lower, it is equal to 0.005 mm/year. Upon the SS the "wash out" effect is not detected with the accuracy of 0.01 mm on the basis of three year exploitation.

Table

Depth from upper plane	Thickness predicted	Thickness on grid edge	Thickness under water gap
mm	mm	mm	mm
10	3.4±0.1	3.5±0.2	3.5±0.1
20	3.3±0.3	3.4±0.2	3.4±0.1
30	3.0±0.4	3.0±0.2	3.2±0.1
35	2.1±1.1	1.4±0.2	1.7±0.1

Analysis of the results of the water-chemical regime control for the reactor first contour water has been carried out. The considerable deviations of the coolant parameters from optimum ones for exploitation of the utilized aluminium alloy taking place in 1962–1965 have been detected . Evidently, it was the reason to start the "wash out" process.

The visual (including the TV technics) inspections of the surface conditions for the reactor tank and for the inside-tank structures were being regularly carried out from 1988. The tubercular corrosion was detected at the regions located in the vicinity of the stainless steel structures. The regular control has been established for the group of the corrosive pits, it shows that for the last three years the depth of the pits (being of 1 mm in maximum) does not increase more then by 0.1 mm. Thus, the performed analysis of the control for the corrosive damage condition make it possible to state:

1.The corrosive damages detected as the result of the systematic inspections do not restrict the further exploitation of WWR-M reactor.

2.At present the connectors of the supporting grid are subjected to the uniform corrosion with the rate no greater then — 0.01 mm/year. The pit corrosion of the reactor tank does not threaten to the safety of the reactor operation.

3.The sample measurements of the supporting grid connectors in sample volume of 40:50 are the representative ones.

4.The utility of the SS and the analysis of the previous measurements make it possible to conduct the direct control of the supporting grid connector thickness once in three years.