

High Temperature Creep Analysis for Lower Head of Reactor Pressure Vessel

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Abstract : Under severe accident cases, the nuclear reactor core may meltdown inside the lower head of the reactor pressure vessel (RPV). Retaining the melt pool inside the RPV is an important strategy of severe accident management. During this process, the inner wall of the lower head will be heated to high temperature of a thousand centigrade, and the outer wall is immersed in a large amount of cooling water. The material of the lower head will have serious creep damage under the high temperature and the temperature difference, and this produces a great threat to the integrity of the RPV. In this paper, the ANSYS program is employed to build the finite element method (FEM) model of the lower head, the creep phenomena is simulated under the severe accident case, the time dependent strain and stress distribution is obtained, the creep damage of the lower head is investigated, the integrity of the RPV is evaluated and the theoretical basis is provided for the optimized design and safety assessment of the RPV.

Keywords : severe accident, lower head of RPV, creep, FEM

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