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Effects of Turbulence Penetration on Valve Leakage in Nuclear Reactor Coolant System

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Abstract : Thermal stratification has drawn much attention because of the malfunctions at various nuclear plants in U.S.A that raised significant safety concerns. The concerns due to this phenomenon relate to thermal stresses in branch pipes connected to the reactor coolant system piping. This stress limits the lifetime of the piping system, and even leading to penetrating cracks. To assess origin of valve damage in the pipeline, it is essential to determine the effect of turbulence penetration on valve leakage; since stratified flow is generally generated by turbulent penetration or valve leakage. As a result, we concluded with the help of coupled fluent-structural analysis that the pipe with less turbulence has less chance of failure there by requiring less maintenance.

Keywords : nuclear reactor coolant system, thermal stratification, turbulent penetration, coupled fluent-structural analysis, Von-Misses stress
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