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[Home](#) > Head Loss Coefficient Evaluation Based on CFD Analysis for PWR Downcomer and Lower Plenum

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## Head Loss Coefficient Evaluation Based on CFD Analysis for PWR Downcomer and Lower Plenum

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Nuclear vendors and utilities perform numerous simulations and analyses in order to ensure the safe operation of nuclear power plants (NPPs). In general, the simulations are carried out using vendor-specific design codes and best-estimate system analysis codes, most of which were developed based on one-dimensional lumped parameter models. During the past decade, however, computers, parallel computation methods, and three-dimensional computational fluid dynamics (CFD) codes have been dramatically enhanced. The use of advanced commercial CFD codes is considered beneficial in the safety analysis and design of NPPs. The present work analyzes the flow distribution in the downcomer and lower plenum of Korean standard nuclear power plants using STAR-CD. The lower plenum geometry of a pressurized water reactor (PWR) is very complicated, as there are many reactor internals, which hinders CFD analysis for real reactor geometry up to now. The present work takes advantage of 3D CAD model so that real geometry of a PWR is used. The results give a clear figure about flow fields in the downcomer and lower plenum of a PWR, which is one of major safety concerns. The calculated pressure drop across the downcomer and lower plenum appears to be in good agreement with the data in engineering calculation. An algorithm that can evaluate the head loss coefficient, which is necessary for thermal-hydraulic system code running, was suggested based on these CFD analysis results.

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