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# A momentum-preserved node concept for thermohydraulic analysis of fusion magnet

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Fusion magnet typically consists of an array of cable-in-conduit conductors (CICC's) and liquid cryogen is supplied by a cryogenic network. As the cryogen supply is one of the decisive factors for magnet operation, a complete modeling including cryogenic network is necessary. In order to cope with a variety of cryogenic components, such as circulator, valves and pipes, a numerical node joining each component together is required. In SUPERMAGNET code, such a joint is called as 'volume'node which behaves like a small reservoir. It is assumed that the cryogen completely loses its velocity in the volume node so that only pressure and temperature variations are calculated. However, in real system, especially when there is severe AC loss at cryogen inlet, transient backward flow needs to be carefully examined. Here, we discuss a plausible momentum-preserved node concept suitable for thermohydraulic analysis of fusion magnet. The momentum-preserved node is assumed to be a zero-dimensional object in order to minimized computing time. This requires additional assumptions. For example, mass flow inlet and pressure boundary conditions are applied for the momentum-preserved node. But when there is a transient backward flow, these boundary conditions need to be modified accordingly. A minimal set of assumptions will be discussed. Furthermore, a comparative study in between the volume and the momentum-preserved nodes has been carried out. A simplified cryogenic network has been studied and its implication for the thermohydraulic analysis of fusion magnet will be discussed.

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