Universität Stuttgart
Institut für Kernenergetik
und Energiesysteme

Prof. Dr.-Ing. Jörg Starflinger
Lehrstuhl für Kerntechnik
und Reaktorsicherheit

Masterarbeit

CFD Investigation of Dead-Leg T-Junctions

Title:
Numerical Investigation of Branch Geometry Effects on Thermal Stratification in Dead-Leg T-Junctions

Description:
Thermal stratification and mixing in dead-leg T-junctions can cause cyclic temperature fluctuations at the pipe wall and contribute to high cycle thermal fatigue (HCTF). The location and intensity of these fluctuations depend on both operating conditions and branch geometry.

Within the TEAR research activities, this thesis will numerically investigate how the position of a pipe bend influences hot-fluid penetration, thermal stratification and near-wall temperature fluctuations. The aim is to identify geometrical configurations and wall regions particularly exposed to thermal cycling using transient CFD simulations.

Procedure:
- Literature review on thermal stratification in straight and bent dead-leg branches
- Development of transient CFD models
- Investigation of different distances between the T-junction and branch bend
- Analysis of penetration depth and thermal-interface motion
- Evaluation of near-wall temperature fluctuations and gradients
- Identification of critical wall regions and comparison with a straight branch

Requirements:
- Interest in CFD, fluid mechanics and heat transfer
- Experience with CFD software (e.g. ANSYS Fluent, CFX or OpenFOAM)
- Programming skills (Python/Matlab) for data processing

Begin: as soon as possible

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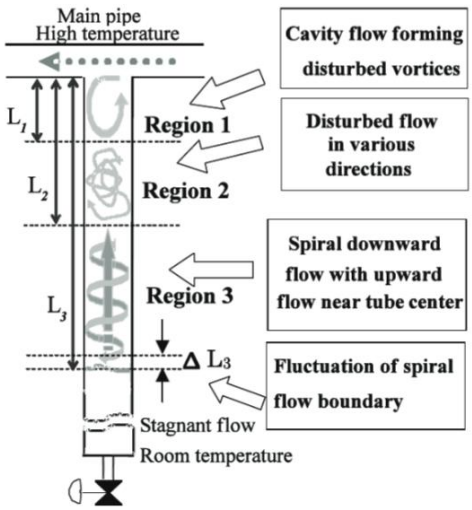
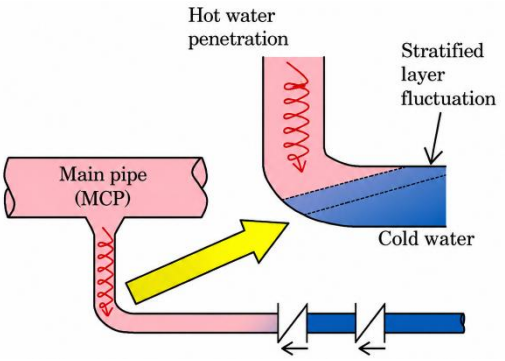


Nakamura et. al., 2014 Swirl Penetration in a dead-leg T junction



Swirl Penetration in a Dead-leg with bend

Die Universität Stuttgart möchte den Anteil der Frauen im wissenschaftlichen Bereich erhöhen und ist daher an Bewerbungen von Frauen besonders interessiert. Schwerbehinderte werden bei gleicher Eignung vorrangig eingestellt.

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