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Seminar

Institute for Plasma Research

Title: Thermal mixing and flow behavior of hot and cold fluid in the high-temperature joint for experimental helium cooling loop (ECHL)

Speaker: Dr. Sandeep Rimza
Institute for Plasma Research, Gandhinagar

Date: 14th March 2023 (Tuesday)

Time: 03.30 PM

Venue: Committee 4, IPR / Join the talk Online:

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Abstract

The development of an efficient Fusion Blanket Module (FBM) concept for a future fusion power plant is challenging because of the extraction of intense heat flux from the core of the plasma. Helium is used as a coolant due to its better safety characteristic. The experimental helium cooling loop (ECHL, 8 MPa, 300–500°C) is essential for the testing of the first wall of the blanket concept. The installation of ECHL is in progress at Institute for plasma research (IPR). T-joints are important components of nuclear reactor coolant circuits for both regular operation and system cooling in an emergency. Thermal mixing is one of the reasons for thermal fatigue failure in a nuclear facility. This is due to temperature fluctuation since the hot and cold flow streams of the fluid mix at various temperatures and concentrations. The objective of the current study is to investigate the turbulent flow characteristics, thermal mixing behavior, and backflow features of coolant fluid in a T-junction using three-dimensional numerical simulations. The turbulent mixing of hot and cold fluids at a T-junction with unique branch pipe extended mixing jets are investigated. Furthermore, the impact of critical flow parameters and different branch pipe axial and transverse incident angles on thermal mixing performance are explored as a function of momentum ratio. The current study will help the researcher to evaluate safety issues in high-temperature applications and better understand thermal mixing, flow characteristics, and thermal cracks. The discussion will cover all of the investigation's findings and conclusions.
