Contribution ID: **2** Type: **not specified**

Quantification of the heat flux transferred to supercritical helium flowing in tubes after loss of insulating vacuum

Friday 5 May 2023 09:15 (30 minutes)

Cryogenic devices have to be protected against accidental overpressure by installing pressure relief devices such as valves or rupture discs. The sudden loss of the insulating vacuum is often considered as the major accident, with the highest heat fluxes transmitted to the fluid.

Up to now, the design of safety devices was based on the use of experimentally measured standard heat flux values. For supercritical helium, measurements have only been carried out for the tank configuration with natural convection. However, in order to ensure a reliable sizing of pressure relief devices for cryogenic facilities equipped with cryolines, heat flux measurements have also to be performed for forced convection cases.

For this purpose, the HELIOS experimental platform has been previously modified to perform loss of insulating vacuum tests around a pipe with supercritical helium flowing in forced flow. The new HELIOS design was determined using the CATHARE thermal-hydraulic code.

In this work, the results of the two experimental campaigns carried out with HELIOS are presented. During the first campaign, a test section equipped with an electrical heater was installed in HELIOS. It allowed the validation of the new design of the device and the experimental method for estimating the heat flux transmitted to the supercritical fluid. The experimental measurements are also compared with the CATHARE modelling. For the second campaign, the electrical heater has been replaced by a specific test section to achieve an insulating vacuum loss around a pipe in which supercritical helium is flowing. The heat flux received by supercritical helium resulting from vacuum break is estimated from experimental measurement.

Primary author: SHOALA, Sulayman (CEA IRIG/DSBT)

Co-authors: Mr AYELA, Frédéric (LEGI); Mr PONCET, Jean-Marc (CEA IRIG/DSBT); Mr ERCOLANI, Éric (CEA IRIG/DSBT)

Presenter: SHOALA, Sulayman (CEA IRIG/DSBT)

Session Classification: Thermal-hydraulic modelling - 4