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C1Or2A-07: Measurement of heat flux in multi-layer insulated helium cryostats after loss of insulating vacuum

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The dimensioning of pressure relief devices (PRD) for cryogenic pressure equipment requires knowledge on the heat input at the maximum credible incident. In helium cryostats, this situation is typically defined by the loss of insulating vacuum (LIV), where the heat load is induced by desublimation and condensation of atmospheric air on the cryogenic surface. This surface is often covered with multi-layer insulation (MLI) in order to reduce the thermal radiation heat load in standard operation. During loss of insulating vacuum, the MLI represents a diffusive barrier for the air to reach the cryogenic surface, reducing the heat flux as well.

Experimental reference data for the heat flux in case of LIV exist mainly for blank surfaces; only few data are published for MLI-covered helium surfaces. Therefore, the effect has been investigated in the cryogenic safety test facility PICARD at KIT. The paper presents the results of venting experiments carried out with different numbers of layers and different types of MLI.

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