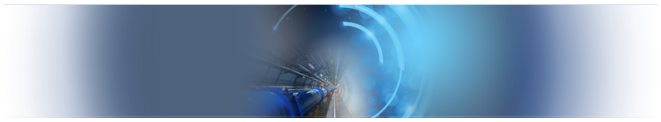

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The numerical evaluation of the minimal outlet area of the safety valve in the pipelines of cryogenic installations

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The flow of cold helium in pipes is a fundamental issue of any cryogenic installation. Pipelines for helium transportation can reach lengths of hundreds of meters. The proper selection of size for individual pipelines and safety valves is a crucial part in the consideration of costs for the entire installation and its safe operation. The size of the safety valve must be properly designed in order to avoid a dangerous pressure buildup during normal operation, as well as in the case of emergency. The most commonly occurring dangerous situation is an undesired heat flux in the helium as a result of a broken insulation. In this case, the heat flux can be very intense and the buildup of the pressure in the pipe can be very rapid. In the present work, numerical calculations were used to evaluate the buildup of pressure and temperature in the pipe, in the case of a sudden and intense heat flux. The main goal of the applied numerical procedure was to evaluate the proper sizes of the safety valves in order to avoid a rise in pressure above the safety limit. The proposed numerical model and calculations were based on OpenFOAM, an open source CFD toolbox.

Primary author: Dr MALECHA, Ziemowit (Wroclaw University of Science and Technology, Department of Cryogenic, Aeronautic and Process Engineering)

Co-authors: Dr POLINSKI, Jaroslaw (Wroclaw University of Science and Technology, Department of Cryogenic, Aeronautic and Process Engineering); Prof. CHOROWSKI, Maciej (Wroclaw University of Science and Technology, Department of Cryogenic, Aeronautic and Process Engineering)

Presenter: Dr MALECHA, Ziemowit (Wroclaw University of Science and Technology, Department of Cryogenic, Aeronautic and Process Engineering)

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