

Master Thesis

Calculation of the critical mass flow rate through safety valves during rapid pressure changes under non-equilibrium phenomena of industrial fluids

Vessels, fittings and equipment of many industry production processes sector are based on mixtures of multiple compounds and multi-phase streams. During the emergency relief of pressure systems with two-phase multi-component mixtures, the safety devices (e.g. safety valves and rupture discs) should be accordingly sized. During the pressure relief through these devices, thermodynamic, mechanical and the chemical non-equilibrium between the species may arise, which have a certain impact on the calculation of the mass flow rate and pressure drop.

Approach

1. Literature study and evaluation of literature models and non-equilibrium theories at flashing two-phase flow through nozzles.
2. Analysis of experimental data for industry-relevant fluids.
3. Physical investigation of the mechanical and thermodynamic non-equilibrium phenomena at flashing two-phase flow through nozzles.
4. Parameter investigation of the insertion of equilibrium equations of state in non-equilibrium models for the calculation of the critical mass flow rate and pressure drop through nozzles.
5. Übertragung der Erkenntnisse aus der Untersuchung von Düsenströmungen auf die Durchströmung von Sicherheitsarmaturen wie Sicherheitsventile.
6. Transfer of the findings from the investigation of nozzle flow to the flow through safety devices like safety valves.

This master thesis takes part within the framework of the international project **Multiflash**, to investigate the non-equilibrium phenomena of flashing multi-component two-phase flows through safety devices under critical flow conditions.

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Duration 6 Months



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TOPICS: Thermodynamics, Fluid mechanics, two-phase flow, Modelling...