Chemical and Process Engineering,
Bioengineering, Mechanical engineering…

Master Thesis

Start as of now/ upon agreement
Duration 6 Months

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. Calculation of the mass flow rate through nozzles under the assumption of thermodynamic equilibrium between both phases and maximum non-equilibrium.
5. Sensibility analysis for the determination of the influence of the decisive parameter in the thermodynamic non-equilibrium.
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 **SAM-Flash**, to investigate the non-equilibrium phenomena of flashing multi-component two-phase flows through safety devices under critical flow conditions.

Professor:

Prof. Dr. Jürgen Schmidt
CSE Institut & KIT
& TU Kaiserlautern

Contact person

Sara Claramunt

sara.claramunt@cse-institut.de

+49 (0)72166994836

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