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**Research the instability of dynamic condensation of environmentally friendly refrigerants in pipe minichannels**

(Abstract)

The following dissertation, entitled *Experimental research on dynamic instabilities during condensation of pro-ecological refrigerants inside tubular minichannels*, focuses on similarities and differences between refrigerants currently being phased out and their substitutes. The R134a refrigerant, a very popular working fluid of heat pumps systems, individual air conditioning systems and other small appliances like fridges, will soon be replaced by R1234yf and R1234ze. The R404A refrigerant, commonly used for industrial purposes like large refrigeration systems and collective air conditioning systems, will be replaced by R507 and R448A. The refrigerants have similar thermodynamic properties, however, for the safety purposes it is vital to investigate their behaviour while working under unstable conditions.

In the literature, there are plenty of identified and well explained instabilities, nonetheless, the following dissertation focuses only on two types of dispersive instabilities: the propagation of an *acoustic wave with velocity  $v_p$*  and the propagation of a *condensation front with velocity  $v_T$* . Both instabilities were induced using programmable cut-off valve in order to establish how the *and  $v_T$*  velocities depends on the frequency of valve operation.

The dissertation consist of 8 chapters. Chapter 1 contains a brief foreword about current trends in power industry and its refrigeration sector like miniaturization and lowering both refrigerants charge and their environmental impact. Chapter 2 refers to past, present and the future substances used as working fluids for refrigeration cycles. Chapter 3 covers the course of the condensation and the influence of various instabilities on the process. Chapter 4 is rather formal and lays out the justification for research, hypothesis and the main goal of the dissertation. Chapter 5 focuses on the experimental setup and the methodology used for the research and chapter 6 comprises compiled

experimental results. Chapter 7 includes modelling based on dimensional analysis and the last chapter wraps up the entire dissertation with a summary.

The dissertation is also complemented with 5 attachments: list of refrigerant parameters, compiled data on pressure instabilities, compiled data on temperature analysis, dimensional analysis procedure and uncertainty analysis.