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# EXPERIMENTAL AND NUMERICAL ANALYSIS OF BRAZED PLATE HEAT EXCHANGERS FOR ORGANIC FLUIDS

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## ABSTRACT

n-Pentane is a suitable working fluid for ORC applications exploiting temperatures around 180 °C. This work investigates the heat transfer process in brazed plate heat exchangers (BPHE) for n-Pentane. It provides more accurate information regarding the boiling process, which is not much discussed in literature, yet. According to Roser et al. [4], two-phase heat transfer is significantly influenced by mass velocity and is therefore dominated by convective boiling. Whereas Dário et al. [1] conclude that nucleate boiling dominates due to a strong heat flux dependency.

We present a preliminary experimental analysis carried out with a test rig consisting of a plate-type preheater and evaporator as well as an expansion valve, a condenser and a pump. First tests were made with a maximum temperature and pressure of 145 °C and 5 bar, respectively, with a mass flow of approximately $0.05\,\mathrm{kg\,s^{-1}}$. A numerical model is developed to compare experimental results with established heat transfer and pressure drop correlations from literature. Based on experimental and modelling results, the influence of nucleate and convective boiling is identified alongside other important parameters. Correlation from Focke et al. [2] correlates the experimental single-phase heat transfer coefficient, whereas correlation from Khan et al. [3] correlates the two-phase data. New correlations for single- and two-phase heat transfer of n-Pentane in BPHE, suitable for small-scale ORC, are developed from existing correlations. The molecular structural similarity of alkanes suggests that results can also be relevant for other alkanes, which yet is to be proven.

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