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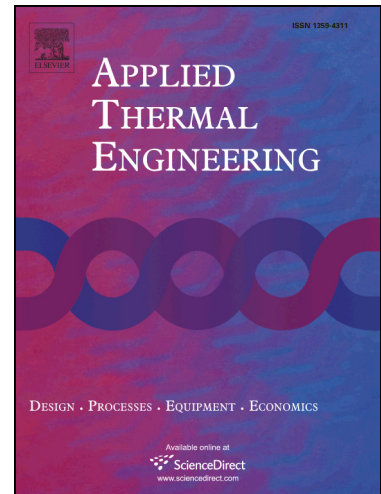
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Effect of water maldistribution in multi-circuit evaporator on superheat control dynamics of thermostatic-expansion-valve refrigeration system

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Abstract

Air/water mal-distribution widely occurs in multi-circuit evaporators, and may deteriorate the stability of thermostatic-expansion-valve (TEV) controlled systems. In this article, effect of water maldistribution on superheat control dynamics of a TEV system was studied experimentally. The evaporator had two circuits, with the overall outlet superheat controlled by TEV. By regulating the smaller water percentage of Circuit 2 (F_2) from 36.9% to 9.1%, the system underwent the stable period (F_2 from 36.9% to 27.0%) and the hunting period (F_2 from 21.2% to 9.1%) sequentially. In the latter period, temperature and pressure parameters of the evaporator oscillated over time. Moreover, the lag of evaporator outlet temperature responses behind TEV actions was found and considered to be a reason of hunting. The resultant superheat oscillation dynamics were also analyzed at both circuit outlets and the overall outlet, and we found that evaporator overall outlet superheat was highly influenced by the non-uniform water distribution and the final merging of the paralleled circuits.

Keywords: Water maldistribution; Thermostatic expansion valve; Hunting; Superheat.

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