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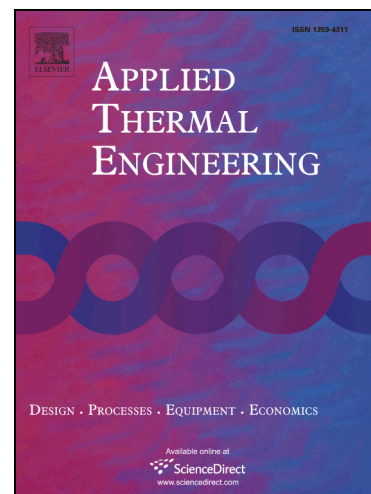
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Effects of evaporator superheat on system operation stability of an Organic Rankine Cycle

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Abstract

The stability of organic Rankine cycle (ORC) is important for the monitoring and controlling of the system. This paper analyzes the effects of the outlet superheat of evaporators on an ORC system using R245fa as working fluid. The experimental apparatus used in this research is an installed 500W ORC system integrated with a plate evaporator and a shell-and-tube evaporator in parallel. Test results indicate that the superheat at the evaporator's outlet is the main parameter correlated with the system's operation stability. When using the plate evaporator, with a superheat of 1.8°C, instability due to liquid entrainment was observed through a sight glass. However, if the superheat is increased to 8.7°C, the system became quite stable. In the case that the shell-and-tube evaporator was used, no unstable oscillation was observed even when a superheat was as low as 0.2°C. In addition, the relationship of the vapor dryness, the entrainment quality fraction, and the superheat was analyzed. It is suggested that installing a vapor-liquid separator or maintaining a relatively high superheat could be an effective way to avoid the liquid entrainment and hence to have a better operation stability.

Keywords: Evaporator superheat; Organic Rankine cycle (ORC); Operation stability; Liquid Entrainment; Plate evaporator; Shell-and-tube evaporator;

1. Introduction

At present, many researchers are engaged in research on alternative energy, especially renewable energy and waste energy. A lot of solutions have been proposed to utilize the renewable

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