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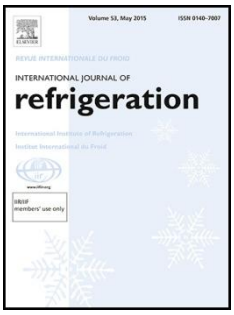

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Dynamic modeling and characteristic analysis of a two-stage vapor injection heat pump system under frosting conditions

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Highlights:

1. Frosting transients of an FTVI heat pump system are simulated.
2. The refrigerant loop is modeled following a fully dynamic approach.
3. Non-uniform frost growth and air flow redistribution are modeled.
4. System hunting phenomenon is well captured in the simulation.
5. Favorable agreement with experimental data demonstrates model fidelity.

ABSTRACT

This paper presents a distributed-parameter dynamic heat exchanger model integrated with a detailed frost growth model to account for non-uniform frost formation on a fan-supplied finned-tube coil. A novel, iteration-free approach is proposed to solve the air flow redistribution by linearizing a system of non-linear air pressure drop equalization equations, resulting in a significant improvement in the computational efficiency. As a continuation and extension of our previous work, the developed models along with the component models described in Qiao *et al.* (2015a) are applied for the first time to explore the frosting dynamics of a two-stage flash tank