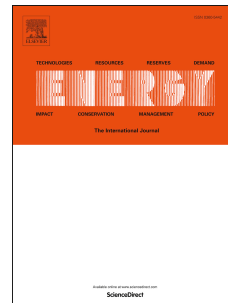


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Energy analysis of two-phase secondary refrigeration in steady-state operation,

Part 2: exergy analysis and effects of phase change kinetics

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Abstract

A great deal of attention is paid to secondary refrigeration as a means of reducing excessively high emissions of refrigerants (most of which have a potent greenhouse effect) due to leaks in large cooling units. Among the environmentally friendly fluids that can be used in secondary circuits for transporting and storing cold, hydrate slurries offer the advantage of significant latent heats of fusion associated with good fluidity. Research programs have focused attention on hydrate systems, including CO₂, TBPB (tetra-n-butyl-phosphonium-bromide), and mixed CO₂-TBPB hydrates. In addition to feasibility concerns, energy efficiency is also a crucial concern requiring an objective analysis of the improvements likely to result from these new materials. A numerical model of secondary refrigeration system was built for slurries ranging from ice-slurry to TBPB-CO₂ mixed hydrate slurries. The circuit was designed for

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