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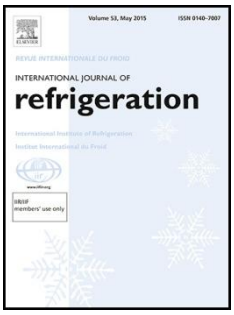

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Review of Vapour Compression Heat Pumps for High Temperature Heating using Natural Working Fluids

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Highlights

- Review of recent studies on heat delivery above 80 ^{o}C using vapour compression heat pumps
- Recent advances in natural fluids as high temperature working fluids
- Component development for high temperature heat pump operation
- Proposed fluid mixtures, cycle variations, system design in high temperature domain

Abstract

The use of High Temperature Heat Pumps (HTHPs) operating with natural fluids have been shown to be a potential environmentally friendly solution to increase energy efficiency in industrial processes. Industrial processes release a significant amount of energy as low quality waste heat to the environment. This paper reviews the research and development of efficient and cost effective HTHP technology that can utilize this waste heat. Natural fluids are of focus with consideration given to the comparable technologies using synthetic fluids. This review reveals the different challenges from fluid selection, component development to system optimization. The various innovative solutions to these challenges and promising technologies for further studies are discussed. The purpose of this paper is to serve as a start point for research by bringing together ideas, simulations and experimental results as a resource or reference tool for future development in HTHP using natural working fluids.

Keywords: Process heat integration, Heat pump technology, Energy efficiency, Waste heat

Nomenclature

COP	Coefficient of Performance
GHG	Greenhouse Gas
GWP	Global Warming Potential
h	Enthalpy
HACHP	Hybrid Absorption Compression Heat Pump
HTC	High Temperature Cycle
HTHP	High Temperature Heat Pump
HX	Heat exchanger
IHP	Industrial Heat Pump
MVR	Mechanical Vapour Recompression
P	Pressure
ODP	Ozone Depletion Potential
SDT	Saturation Dew Temperature
VCC	Vapour Compression Cycle

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