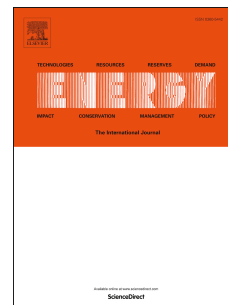


Accepted Manuscript

High temperature heat pumps: Market overview, state of the art, research status, refrigerants, and application potentials

Cordin Arpagaus, Frédéric Bless, Michael Uhlmann, Jürg Schiffmann, Stefan S. Bertsch



PII: S0360-5442(18)30575-9

DOI: [10.1016/j.energy.2018.03.166](https://doi.org/10.1016/j.energy.2018.03.166)

Reference: EGY 12624

To appear in: *Energy*

Received Date: 16 December 2017

Revised Date: 23 March 2018

Accepted Date: 30 March 2018

Please cite this article as: Arpagaus C, Bless Fr  e, Uhlmann M, Schiffmann J  , Bertsch SS, High temperature heat pumps: Market overview, state of the art, research status, refrigerants, and application potentials, *Energy* (2018), doi: 10.1016/j.energy.2018.03.166.

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

High temperature heat pumps: market overview, state of the art, research status, refrigerants, and application potentials

Cordin Arpagaus^{1*}, Frédéric Bless¹, Michael Uhlmann¹, Jürg Schiffmann², Stefan S. Bertsch¹

¹NTB University of Applied Sciences of Technology Buchs, Institute for Energy Systems, Werdenbergstrasse 4, 9471 Buchs, Switzerland

²Ecole Polytechnique Fédérale de Lausanne, Laboratory for Applied Mechanical Design, Rue de la Maladière 71b, 2002 Neuchâtel, Switzerland

*corresponding author: cordin.arpagus@ntb.ch, +41 81 755 34 94

Abstract

This study reviews the current state of the art and the current research activities of high temperature heat pumps (HTHPs) with heat sink temperatures in the range of 90 to 160 °C. The focus is on the analysis of the heat pump cycles and the suitable refrigerants. More than 20 HTHPs from 13 manufacturers have been identified on the market that are able to provide heat sink temperatures of at least 90 °C. Large application potentials have been recognised particularly in the food, paper, metal and chemical industries. The heating capacities range from about 20 kW to 20 MW. Most cycles are single-stage and differ primarily in the refrigerant (e.g. R245fa, R717, R744, R134a or R1234ze(E)) and compressor type used. The COPs range from 2.4 to 5.8 at a temperature lift of 95 to 40K. Several research projects push the limits of the achievable COPs and heat sink temperatures to higher levels. COPs of about 5.7 to 6.5 (at 30 K lift) and 2.2 and 2.8 (70 K) are achieved at a sink temperature of 120 °C. The refrigerants investigated are mainly R1 336mzz(Z), R718, R245fa, R1234ze(Z), R600, and R601. R1336mzz(Z) enables to achieve exceptionally high sink temperatures of up to 160 °C.

Keywords

high temperature heat pump, market overview, state of the art, research status, COP, refrigerant

Download English Version:

<https://daneshyari.com/en/article/8071642>

Download Persian Version:

<https://daneshyari.com/article/8071642>

[Daneshyari.com](https://daneshyari.com)