



# Annex 48

## Industrial heat pumps, Second phase

**Large CO<sub>2</sub>-emission reductions in the industry sector can be obtained by application of industrial heat pumps (IHPs). IHPs suit well in many processes, for example drying or distillation, which will be electrified in future. This is a mature technology - well integrated, IHPs are highly reliable and enhance process efficiency. The IHP is a key technology in almost all industrial sectors to obtain energy savings and mitigate greenhouse gas emissions.**

### Key Findings

IHPs are active heat-recovery devices that raise the temperature of waste heat in an industrial process to a higher temperature to be used in the same process or another adjacent process or heat demand. The results show that:

- 1 The use of IHPs for waste heat recovery is a great possibility to use heat that otherwise would have been wasted, and thereby avoiding CO<sub>2</sub>-emissions. "Don't waste waste heat". See figure 1.
- 2 Practical applications show increasingly clear that IHPs can provide heating and cooling to many different industrial applications and district grids. The outcomes of the annex are more than 300 good practices of IHP applications, such as drying,

washing, evaporation, and distillation processes. See figure 2.

- 3 One of the main barriers for application of IHPs is the energy prices in some countries, especially the ratio of electricity/gas price. Sweden, Finland, Netherlands, France and Switzerland have favourable price ratios for IHPs while Germany, Ireland and UK have inconvenient price ratios.
- 4 Japan relies on expensive overseas fossil fuels – it was approximately 90 % of its total energy supply in 2017. Japan plans to aggressively promote energy conservation measures and decarbonisation measures on both supply and demand sides. Therefore, Japan is a main driver for IHPs.

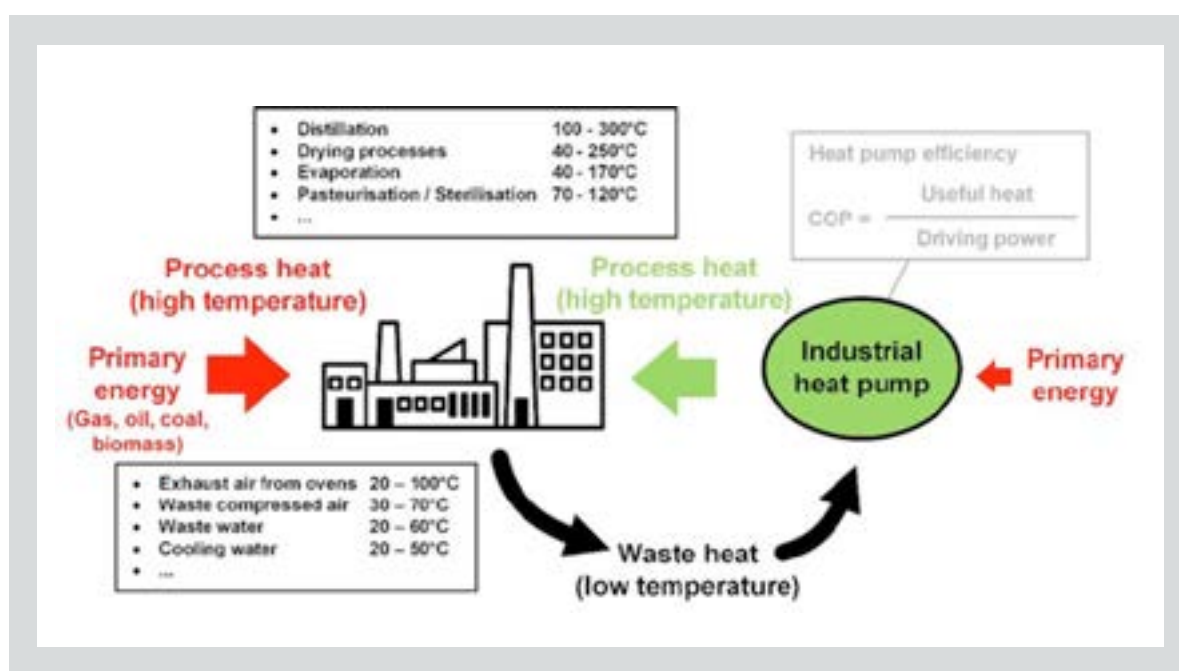


Figure 1. Efficient transformation of useful heat to higher temperatures

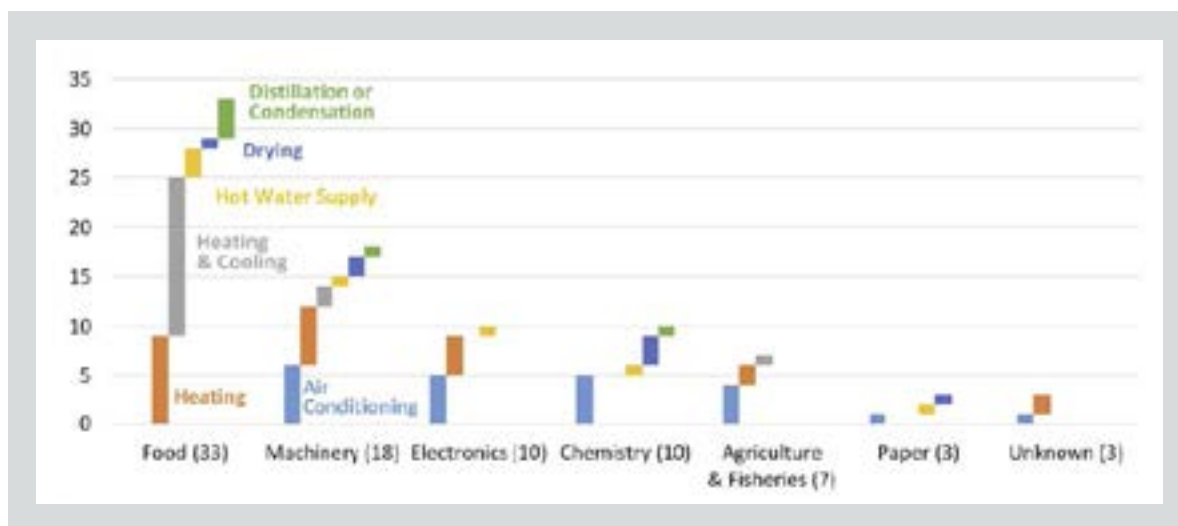


Fig. 2: Installation cases in Japan in various industries and processes

## Outcomes

- 1 Information and tools for IHP training, e.g. a guidebook for the district heating sector, a heat pump calculator, assessment tools, concepts for design, hydraulic, and controls.
- 2 A holistic guide considering HP integration with industrial processes is presented with technical details and insights which are relevant for many levels of plant personnel, consultants and practitioners.
- 3 The Annex has presented a special IHP website for the reader who is interested in IHPs and their applications. The website covers 60 presentations (2017-2019) from workshops, forums, congresses and summits and further 60 publications. Experiences from industrial heat pumps from the last 35 years are documented. All literature is directly connected via links. [Link to Annex 48](#)

## Background

Securing a reliable, economic and sustainable energy supply as well as environmental and climate protection are important global challenges. Increasing the production and the use of renewable energy and improving energy efficiency are the most important steps in order to achieve these goals.

The results of the previous Annex 35 show the successful integration of IHPs and how to overcome

barriers: short payback periods are possible (less than two years), large reductions of CO<sub>2</sub>-emissions (in some cases more than 50 %), and temperatures higher than 100 °C are possible while supply temperatures below 100 °C are standard.

In this Annex IHPs are defined as heat pumps in the medium (<100 kW) and high power range (up to 150 MW), and temperatures up to 200 °C, which can be used for heat recovery and heat upgrading in industrial processes, but also for heating, cooling and air-conditioning in commercial and industrial buildings..

## Objectives

The overarching objective of Annex 48 was to create a tool for decisions makers to use more IHPs in industrial processes by concentrating on the development and distribution of condensed and clear information materials for policy makers, associations, and industries. Thereby still existing difficulties and barriers for the larger scale market in industrial applications can be overcome. The IHPs take an active part in the current markets, in some countries more, in others less. The market penetration is good, and the expected impact of this project is an increased market share for IHPs.

## Further information

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Publications:

Final report of Annex48 and Executive Summary of Annex 48, available at <https://heatpumpingtechnologies.org/publications/>

Internet:

[Link to Annex 48](#)

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