



# **Industrial Heat Pumps, Second Phase**

IEA Heat Pump Programme Annex 48

## **Task 2: Structuring information on industrial heat pumps and preparation of guidelines The Netherlands Report**

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## Contents

<b>1</b>	<b>Selection of 4 best practice examples .....</b>	<b>1-4</b>
<b>2</b>	<b>Description of best practice examples .....</b>	<b>2-5</b>
2.1	McCain in Lelystad .....	2-5
2.2	Blue Band in Rotterdam.....	2-6
2.3	Slaughterhouse Apeldoorn .....	2-7
2.4	Mars Nederland in Veghel .....	2-8
<b>3</b>	<b>References .....</b>	<b>3-9</b>

## 1 Selection of 4 best practice examples

A total of 18 cases from The Netherlands, based on the final report of Annex 35, the brochure "Industrial HeatPumps in the Netherlands" /NL 2014/ and "Large scale heat pumps in Europe, Vol. 2" /EHPA 2019/ were considered in the framework of IEA HPT Annex 48.

Four examples were chosen as a best practice one. The criteria are mainly the same, as used for the German projects.

The chosen projects are:

- McCain in Lelystad (Food)
- Blue Band in Rotterdam (Food)
- Slaughterhouse in Apeldoorn (Food)
- Mars Netherland in Veghel (Food).

## 2 Description of best practice examples

### 2.1 McCain in Lelystad

In the summer of 2012, a heat pump is installed at a plant of a French fries producer. This heat pump will provide the majority of the energy needed for drying of French fries before they are baked. The used dryer type is a belt dryer that operates at a maximum temperature of 70 °C. The innovative application of a heat pump connected to a French dryer, invented by De Kleijn Energy Consulting, is the first of its kind. Energy savings as high as 70 % on the dryers energy consumption will be realized.

McCain in Lelystad	
Industry	Food
Application	Drying potatoes
Process applied	Process air
Location	Lelystad, The Netherlands
Year of installation	2012
User (company)	McCain Foods, NL
HP technology	MHP
HP system	Air cooled chiller
Working fluid	R717
Heating/Cooling capacity (kW)	880
Supply temperature (°C)	70
Heat source	exhaust air
"Heat source temperature (°C) IN	n.a.
Heat sink	Air
"Heat sink temperature (°C) OUT	70
Heat source/ heat sink	Process air
Thermal storage	no
Savings energy (%)	70 %
Savings CO <sub>2</sub> emissions (%)	n. a.
Savings energy cost (%)	n. a.
Others: additional effects	COP = 5 to 8 ROI = 4 a
Source	IEA HPT ANNEX 35 Report Task 4

## 2.2 Blue Band in Rotterdam

The Blue Band factory from Unilever, at the Nassaukade in Rotterdam is over 120 years old and at the moment the world largest factory for margarine with an output of more than 200.000 t of margarine and 10.000 t of peanut butter. Over that period of 120 years many changes in building, expansion and machinery have been done and a large overhaul of the complete production and building has never been undertaken creating a complex confusing situation. When in 2009 the boiler-room was going to be renovated the 40 years old steam boiler had to be replaced. Of the installed capacity more than 40% was not used because the new production lines have a lower energy use. As production had to go on a new boiler-house was designed near the old existing one.

Blue Band in Rotterdam	
Industry	Food
Application	Margarine production
Process applied	hot water, space heating
Location	Rotterdam, The Netherlands
Year of installation	2011
User (company)	Unilever, Rotterdam, NL
HP technology	MVR
HP system	Water cooled chiller
Working fluid	R717
Heating/Cooling capacity (kW)	1,400
Supply temperature (°C)	80
Heat source	water
"Heat source temperature (°C) IN	65
Heat sink	water
"Heat sink temperature (°C) OUT	80
Heat source/ heat sink	Hot water
Thermal storage	n. a.
Savings energy (%)	n. a.
Savings CO <sub>2</sub> emissions (%)	1,600 t/a
Savings energy cost (%)	220,000 €/a
Others: additional effects	COP = 5.5 ROI = ~ 2 a
Source	IEA HPT ANNEX 35 Report Task 4

## 2.3 Slaughterhouse Apeldoorn

The slaughterhouse at ESA for veal requires large amounts of hot water for room and machinery cleaning and for removing hair from veal skin, and a smaller amount for sterile water (90 °C). The heat pump has been installed in a slaughter house at a moment that the steam boiler had to be replaced. This created the opportunity to improve the hot water system efficiency. The heat pump is a 45 bar reciprocating compressor coupled to the high pressure side of a refrigeration plant with ammonia as refrigerant. The heat pump condenser heats up water up to 62.5 °C. The installation is running more than one year with great satisfaction and reliability.

Slaughterhouse Apeldoorn	
Industry	Food
Application	Slaughterhouse
Process applied	Hot water
Location	Apeldoorn, The Netherlands
Year of installation	2009
User (company)	Export Slachterij, NL
HP technology	MHP
HP system	Water cooled chiller
Working fluid	R717
"Heating/ Cooling capacity (kW)	440
Supply temperature (°C)	62.5
Heat source	water
"Heat source temperature (°C) IN	23
Heat sink	n. a.
"Heat sink temperature (°C) OUT	62.5
Heat source/ heat sink	Hot water
Thermal storage	Hot water
Savings energy (%)	n. a.
Savings CO <sub>2</sub> emissions (%)	50 %
Savings energy cost (%)	65 %
Others: additional effects	COP = 6.7 ROI = 4 to 5 a
Source	IEA HPT ANNEX 35 Report Task 4

## 2.4 Mars Nederland in Veghel

MARS Nederland in Veghel, The Netherlands, operates the largest chocolate factory in the world. GEA heat pump technology installed at the facility allows waste heat from the refrigeration plant to be upcycled and reused, which has reduced total energy consumption across the site by 6%, equivalent to the combined annual energy consumption of about 625 households.

Heat recycling is a key contributor to MARS' drive to become fully energy neutral by 2040. This includes focusing on zero fossil fuels, recycling all waste, and discharging only completely cleaned process water. Each Mars factory aims to reduce energy consumption, carbon dioxide emissions, waste production and water consumption by 3% each year.

Mars Nederland in Veghel	
Industry	Food
Application	Chocolate
Process applied	process heat and hot water
Location	Veghel, The Netherlands
Year of installation	n. a.
User (company)	Mars
HP technology	MHP
HP system	Water cooled chiller
Working fluid	R717
"Heating/ Cooling capacity	1,400
Supply temperature (°C)	63
Heat source	waste water
"Heat source temperature (°C) IN	n. a.
Heat sink	water
"Heat sink temperature (°C) OUT	63
Heat source/ heat sink	Hot water
Thermal storage	n. a.
Savings energy (%)	6 %
Savings CO <sub>2</sub> emissions (%)	n. a.
Savings energy cost (%)	n. a.
Others: additional effects	COP = 5.9
Source	EHPA 2019



### 3 References

- /A35 2014/ Application of Industrial Heat Pumps, IEA HPT ANNEX 35 Report, Task 4, p. 601 ff., 2014
- /EHPA 2019/ Large scale heat pumps in Europe. Vol. 2, Real examples of heat pump applications in several industrial sectors, European Heat Pump Association (EHPA), 2019
- /NL 2014/ Industrial Heat Pumps in the Netherlands, IEA Heat Pump Programme ANNEX 35, Version 080514-0.8, 2014