



# Industrial Heat Pumps, Second Phase

IEA Heat Pump Programme Annex 48

## Task 2: Structuring information on industrial heat pumps and preparation of guidelines French Report

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## **1 Selection of 5 best practice examples**

A total of 33 French cases was collected in the framework of IEA HPT Annex 48. We only considered here heat pumps integrated into an industrial process on the heat source and/or supply side. Prototypes and R&D development were not considered here.

## 2 Description of best practice examples

### 2.1 Agriculture / Greenhouse

Heating of rose greenhouse through heat pump	
Country/ Company	France/ n.a.
Industry sector	Agriculture
HP Manufacturer	Ochsner
Cold source type	10,000m <sup>3</sup> outside water storage
Cold source temperature	6 – 10°C
Heat sink type	Greenhouse air heating
Heat sink temperature	55 - 60°C
HP Capacity	440 kW
COP	Not available
HP cycle	Not available
Refrigerant	R-134a
HP cost	Not available
HP project cost (including integration)	Not available
Payback time	Saving costs : 50 k€ / year (from 91 k€ to 41 k€)
Other	Installed in 2008 Screw compressor
Reference	Data provided from « References industrial heat pumps », Ochsner

## 2.2 Malt processing recovery on exhaust humid air

Recovery of heat through NH <sub>3</sub> Heat pump for air dryer in malt processing	
Country/ Company	France /Malterie Soufflet Nogent Sur Seine
Industry sector	Food industries / Malt production
HP Manufacturer	GEA MATAL
Cold source type	Process exhaust air from malt dryer
Cold source temperature	10° C
Heat sink type	Process heating (drying air)
Heat sink temperature	60° C
HP Capacity	10,000 kW
COP	>3.6
HP cycle	2 chillers FXPP3300 and 1 chiller FXPP4200 screw compressors
Refrigerant	R- 717 (Ammonia)
HP cost	Not available
HP project cost (including integration)	Not available
Payback time	Not available
Other	Installed in 2010
Reference	<a href="http://larpf.fr/Imprimer/fiche/?id=3827&amp;from=actualites&amp;type=archive">http://larpf.fr/Imprimer/fiche/?id=3827&amp;from=actualites&amp;type=archive</a>

### 2.3 High temperature heat pump in a cheese factory

GreenPAC Hybrid heat pump operating at high temperatures (85°C)	
Country/ Company	France /Compagnie des Fromages et Richesmonts
Industry sector	Food industries / Manufacture of cheese
HP Manufacturer	Hybrid Energy/Engie Axima
Cold source type	Condenser waste from Thermorefrigeration
Cold source temperature	50° C
Heat sink type	Heating process water
Heat sink temperature	85° C
HP Capacity	1,700 kW
COP	5.6
HP cycle	Compression/Absorption heat pump
Refrigerant	R-717 /R-718 (NH <sub>3</sub> /H <sub>2</sub> O)
HP cost	Not available
HP project cost (including integration)	Not available
Payback time	Not available
Other	Refrigerant (40% H <sub>2</sub> O, 60% NH <sub>3</sub> ) CO <sub>2</sub> Reduction 2,025 t/year Installed in 2017
Reference	<a href="https://engie-axima.fr/wp-content/uploads/engieaxima_greenpac_140217.pdf">https://engie-axima.fr/wp-content/uploads/engieaxima_greenpac_140217.pdf</a>

## 2.4 Heat Pump for hot water production in a cheese factory

Energy recovery from cooling towers as a source for heat pump in Cheese making	
Country/ Company	France/ RichesMonts
Industry sector	Food industries / Manufacture of cheese
HP Manufacturer	JCI
Cold source type	Cooling towers
Cold source temperature	32°C
Heat sink type	Process hot water and space heating
Heat sink temperature	50°C
HP Capacity	692 kW
COP	3.2
HP cycle	Standard heat pump YLCS 350 HA
Refrigerant	Not available
HP cost	Not available
HP project cost (including integration)	417,000 €
Payback time	5 years
Other	Installed in 2010 Water preheat from 10-12°C to 45°C before the PAC condenser which heat from 45°C to 50°C
Reference	Site CETIAT " <a href="http://www.recuperation-chaueur.fr/recuperation-de-chaueur-et-valorisation-par-pompe-a-chaueur-industrielle">http://www.recuperation-chaueur.fr/recuperation-de-chaueur-et-valorisation-par-pompe-a-chaueur-industrielle</a> "



## 2.5 Heat Pump for hot water production in a slaughterhouse

Heat pump in Slaughterhouse	
Country/ Company	France/ Not available
Industry sector	Meat Industry/Slaughterhouse
HP Manufacturer	n.a.
Cold source type	Waste heat from condenser chiller
Cold source temperature	70°C
Heat sink type	Cleaning water production
Heat sink temperature	85°C
HP Capacity	2,500 kW (1,000+800+700)
COP	5.75
HP cycle	Water-water Heat pump
Refrigerant	R-717
HP cost	Not available
HP project cost (including integration)	Not available
Payback time	3.5 year
Other	Saving of 10,284 MWh/year Hot water production 11,456 m <sup>3</sup> /year