HWW 2/9583I R1233zd(E)

COMBITHERM GmbH

Figure 1: COMBITHERM HWW 2/9583I R1233zd(E) with BITZER CSH2T screw compressors

Summary of technology

COMBITHERM's high temperature heat pump series provides heating water temperatures up to 120 °C. The series was commercialized in 2021.

The heat pump uses one to three BITZER screw compressors type CSH2T with frequency converters, for excellent part load efficiency and stepless capacity control between 17-100 %. The heating capacity ranges from 0.3 MW (1 compressor, 35 °C heat source) to 3.3 MW (3 compressors, 90 °C heat source).

Relevant applications include drying processes where heat source and heat sink are present in the same process or industries with a cooling water network and a hot water demand at 80 - 120 °C.

The heat pump is electrically driven and is designed as a closed circuit. Water is used as heat transfer medium.

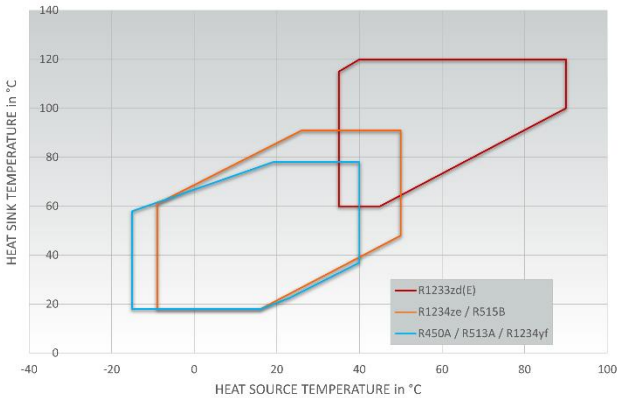

Figure 2: Application field comparison

Table 1 shows the performance of the heat pump in a dryer application. COPs were measured on an operating plant in a final installation.

Table 1: Measured performance

$T_{source,in}$ [°C]	$T_{source,out}$ [°C]	$T_{sink,in}$ [°C]	$T_{sink,out}$ [°C]	$COP_{heating}$ [-]
45	40	110	120	2,2
45	40	70	80	4,7
50	45	110	120	2,4
50	45	70	80	5,3

Project example

In order to decarbonise the aqua feed production process and reduce energy consumption, COMBITHERM has installed four high temperature heat pumps with a total heating capacity of 3.5 MW in Geelen Counterflow's first Electric Counterflow Dryer. This heat recovery measure will save 3,000 t of CO_2 emissions per year and reduce energy consumption by 75 % (15,000 MWh per year).

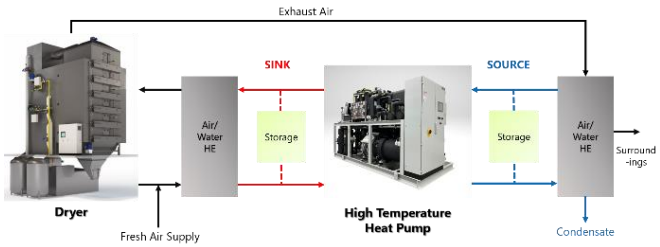

Figure 3: Implementation in a feed dryer

'Heat recovery and high temperature heat pumps are now a proven alternative to gas burners for drying of extruded feed or food. Following the first month of monitoring, we can now say that the system performs according to our calculations with a COP (Coefficient of Performance) of approximately four. This means that only 1 kWh of electricity is needed in the heat pumps to supply 4 kWh of heat to the dryer. The other 3 kWh are recovered from the warm wet air exiting the dryer, so 75 % of energy is saved compared to drying with gas. At the same time, water is recovered, odor emissions are reduced and thanks to renewable electricity all emissions of both CO_2 and NOx have been eliminated.'

Read more: Geelen Counterflow starts up first electric dryer for Cargill-Ewos in Norway (aquafeed.co.uk)

FACTS ABOUT THE TECHNOLOGY

Heat supply capacity: 0.3 MW – 3.3 MW

Temperature range:
Hot water supply 80-120 °C.
Hot water return 5-30 K below supply.
Heat source temperature 35-90 °C.

Working fluid: R1233zd(E)

Compressor technology: Semi-hermetic compact screw

Specific investment cost for installed system without integration: 200-400 €/kW

TRL level: 9

Expected lifetime: 25 years

Size: Weight 4.7-12.1 t, Footprint 5.0-12.4 m^2

Contact information

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All information were provided by the supplier without third-party validation. The infomation was provided as an indicative basis and may be different in final installations depending on application specific parameters.