

# Waste heat from data center to warm local community

**Odense, Denmark**



The leading social media giant aims to minimize the energy, emissions, and water impact, embracing the responsibility and opportunity to impact the world beyond their operations.

## **The opportunity**

The construction of the new Odense Data Centre in 2017, was determined to be one of the most advanced, energy-efficient data centres in the world. The new facility features the latest hyper efficient hardware, cooled using outdoor air through indirect evaporative cooling technology and powered by clean and renewable wind energy. This facility is unique because of the infrastructure to capture and recycle the excess heat generated by the servers to provide heat to the local community.

The heated air from cooling the servers flows via water coils, recovering the heat by raising the temperature of the water. This water is then supplied to a newly constructed heat pump installation where the temperature is raised further and delivered to the district heating network and distributed to the local community.

**The solution – sector coupling**

Sector coupling was made possible by a partnership with the local district heating company “Fjernvarme fyn”. They were looking for new heat sources to phase out fossil fuels for the district heating of the city. A partnership was initiated. The local district heating company made the additional heat pump investment to recover the waste heat and will operate a new built heat pump station. A pipeline of cooling water circulating between the data center and the heat pump station was established. The data centre proximity to the local heat distribution grid did minimize additional infrastructure connecting the heat pumps to the district heating network. The impact of the facility’s heat recovery infrastructure will help recover 100,000 MWh of energy per year – enough to warm some 7,000 homes.

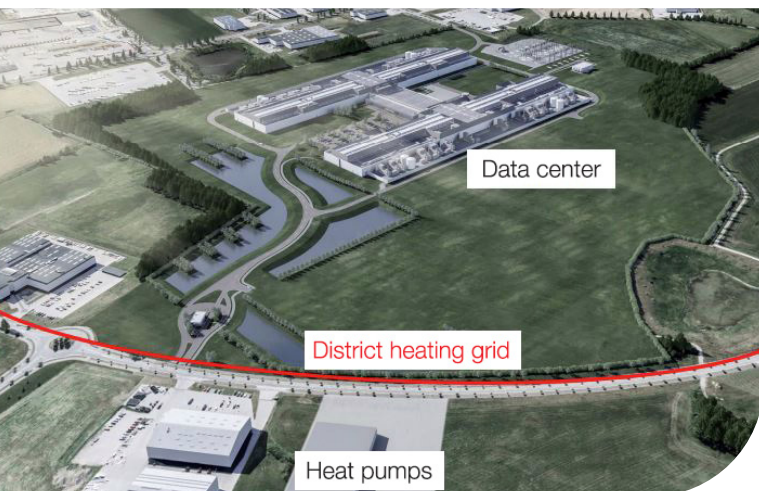
**The heat pumps**

The heat pump installations are made in three sections each supplying about a third of the total heat to deliver. IESenergy ApS delivered highly efficient industrial heat pumps designed in cooperation with leading main component suppliers such as Mayekawa (screw compressors) and Alfa Laval (semi-welded plate heat exchangers).

The heat pump technology chosen is based on the latest development of industrial heat pumps avoiding F-gases and instead benefitting the efficient and future-proof natural refrigerant ammonia.

**The Alfa Laval supply and benefit**

Alfa Laval is supplying the evaporators, condensers, sub-coolers and oil coolers to the heat pumps. The impact of the facility’s heat recovery infrastructure will help recover 100,000 MWh of energy per year – enough to warm some 7,000 homes.



**Data center heat recovery, Odense**

General	
Supply heating of district heating system Odense Denmark. Source: Heat recovery from data center.	
Temperatures	
Temperature source (water)	27°C → 15°C
Evaporation temperatures	12°C, 16°C, 20°C (3 steps)
Temperature supply (water)	40°C → 75°C
Condensing temperature	57°C, 67°C, 77°C? (3 steps)
Refrigerant	
Refrigerant	R717/Ammonia
Global warming potential (GWP)	0
Ozone depletion potential (ODP)	0
PFAS content	0
Quantity refrigerant	3,000 kg
Capacity	
Heating capacity	20 MW
Expected operating hours	4,000 hours/year
Annual heating production (heat pump)	~80,000 MWh/year
Heat pump set-up	
3 steps in serial heating water as:	
1 step (single stage)	40°C → 52°C
2 step (single stage)	52°C → 63°C
3 step (two-stage)	63°C → 75°C
System with thermal storage	
Several tanks on hot (sink) side	
1 x 5,000 m³ tanks on cold (source) side	
COP	
COP heating	4.7 (kW heating/electrical power kW)
COP cooling	3.7
CO <sub>2</sub> emission reduction	>90%
Major equipment in the plant	
3 pcs Mayekawa screw ammonia compressor 280J and 2 pcs Mayekawa reciprocating compressors HS6	
Elin water cooled motors	
Alfa Laval evaporators T20-BW semi-welded plate type 304 SS	
Alfa Laval condenser TK20BW semi-welded plate type 304 SS	
Alfa Laval subcoolers and oil coolers: T10EW and M10BW	
Atlas flooded separator	
Grundfos circulation pumps (glycol and water)	

**How to contact Alfa Laval**

Up-to-date Alfa Laval contact details for all countries are always available on our website at [www.alfalaval.com](http://www.alfalaval.com)

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