Heat pump demonstrator at AGRANA wheat starch dryer in Pischelsdorf, Austria

High temperature heat pumps in energy intensive industries: demonstration plants
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AGRANA Biorefinery, Pischelsdorf

- 250,000 m³ bioethanol
- 80,000 t biogenic CO₂
- 260,000 t wheat starch
- 50,000 t wheat protein
- 170,000 t ActiProt®
- 100,000 t ActiGrano®
- 10,000 t bran
Heat pump demonstrator – Starch dryer WSA1

• Container outside the starch dryer WSA1
  – Start of installation September 2019
  – Start of commissioning May 2020
  – Trial test until August 2020
  – Ongoing performance optimization

• Design parameters
  – Heating capacity of appr. 400 kW
    (appr. 10% of the starch dryer's heat demand)
  – The heat supply temperatures are in the range of 110 - 160 °C.
  – COP up to 4

• Integration
  – Heat source: heat recovery circle (water)
  – Heat sink: drying air
Closed loop heat pump cycle

- Variable configuration (twin-cycle source parallel or serial)
- Refrigerant OpteonMZ™ by Chemours
- 2 screw compressors (Bitzer)
Wet product 35% moisture

Dry product 14 t/h @12% moisture

Exhaust air 150-160°

Flow dryer

Steam

90°

Drying air 200 t/h @30°

70°

Water (Heat recovery cycle)

Condenser

Evaporator

Expansion valve

Compressor

Heat pump demonstrator

Wheat starch factory
Wet product 35% moisture

Dry product 14 t/h @12% moisture

Exhaust air 150-160°

Drying air 200 t/h @30°

Heat pump demonstrator

Wheat starch factory

Flow dryer

Intermediate circuit (water)

Condenser

Evaporator

Compressor

Expansion valve

Water (Heat recovery cycle)

Steam

90°
Performance

- ~2300h Operation hours
- max. heat output ~350kW
- COP between 2-4
- Varying source temperature
Performance

- Annual CO₂ savings up to 600 t

Operation hours: 8280 h/a
CO₂-Factors: 271 kg/MWh Natural gas; 258 kg/MWh Electricity (Austrian Mix) [Umweltbundesamt 2019]
Ongoing optimization in cooperation with AIT, AMT and ENERTEC.

The demo phase until August 2021 will be split in thirds:

- providing the heat supply temperature of the design point with different operation conditions and
- providing the heat supply temperature close to the design point with different operation conditions.
- more challenging conditions at the operational limits of the heat pump