

# Heat pump challenge



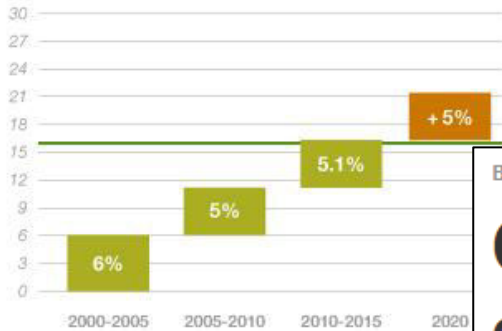
Helping the world *thrive*

Norbert Koot – Global Manufacturing Technology group



### Improvement in Energy Efficiency

■ 2020 Goal: 5% improvement  
 — 2015 Goal



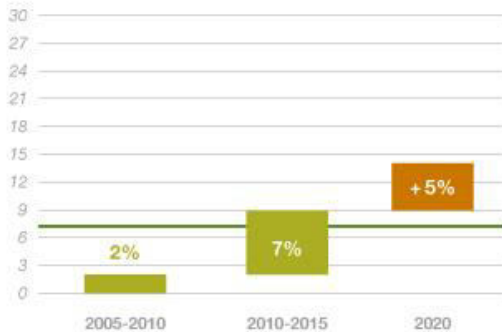
### Improvement in Freshwater Efficiency

■ 2020 Goal: 5% improvement  
 — 2015 Goal



### Improvement in Greenhouse Gas Intensity

■ 2020 Goal: 5% improvement  
 — 2015 Goal

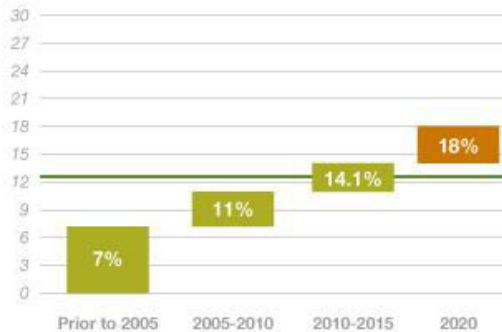


**BUSINESS**

# Cargill signs White House pledge to combat climate change

At White House, the company agreed to take action to help mitigate climate change.

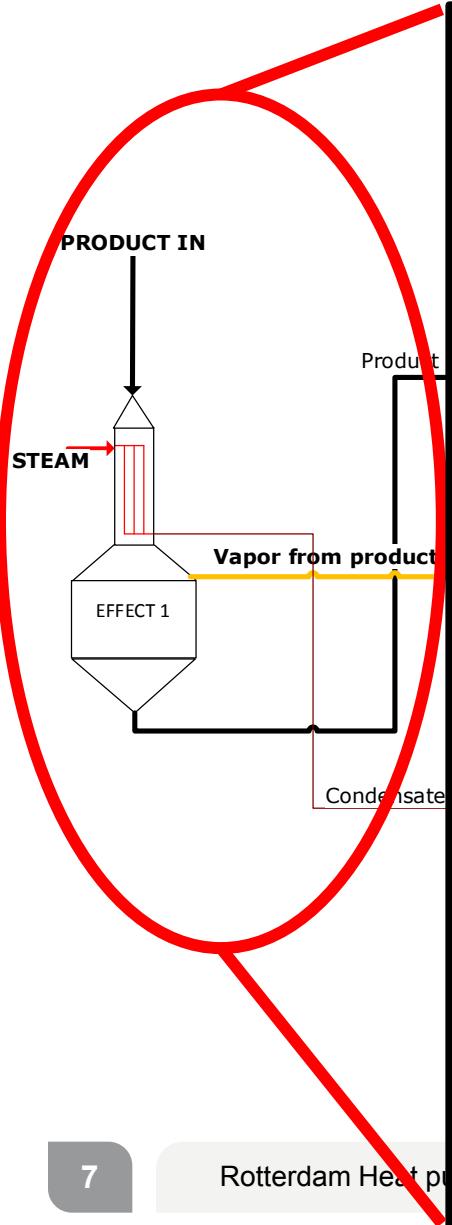
By Jim Spencer Star Tribune | JULY 27, 2015 — 9:08PM



# Heat pump case

The evaporator condenser

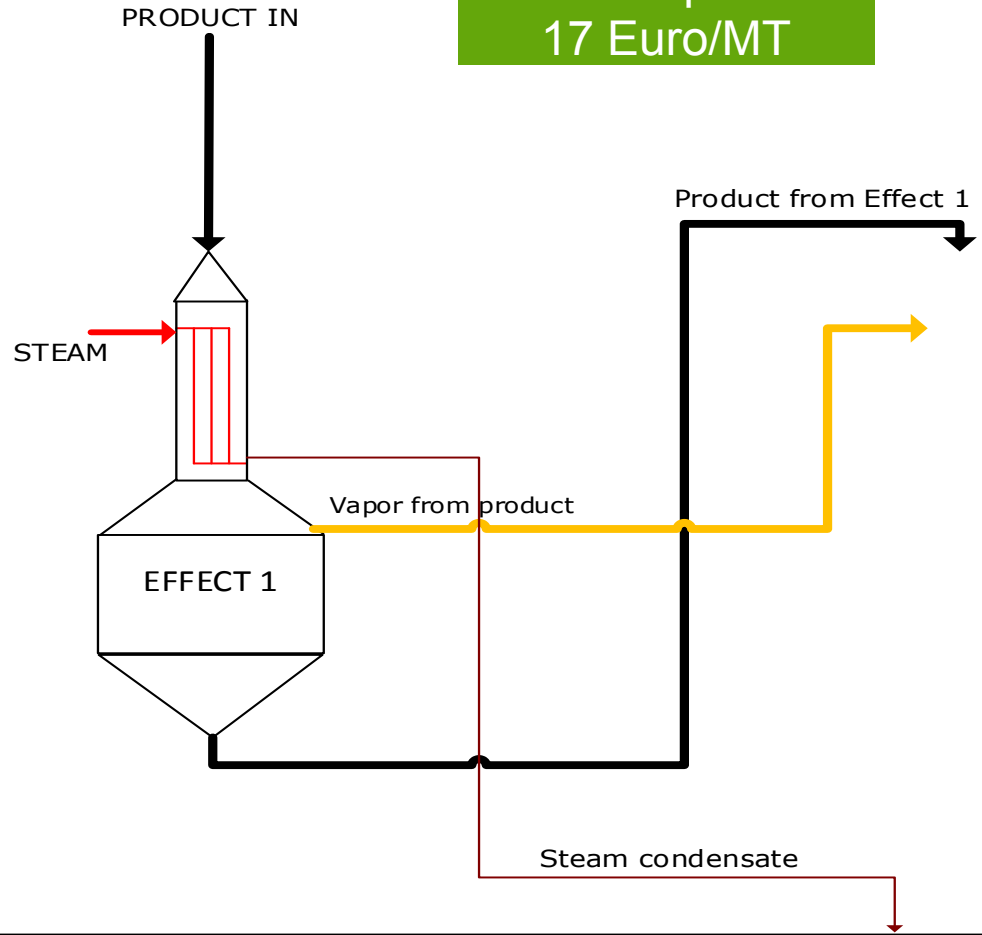
# Steam driven evaporator



STEAM  
3 MT/hr  
1.5 Bar, 120°C  
(sat. temp. 111 °C)  
2 MWth

PRODUCT IN  
18 MT/hr  
85°C  
25% DS

Operating  
350 d/y, 24 hrs/d  
Steam price:  
17 Euro/MT

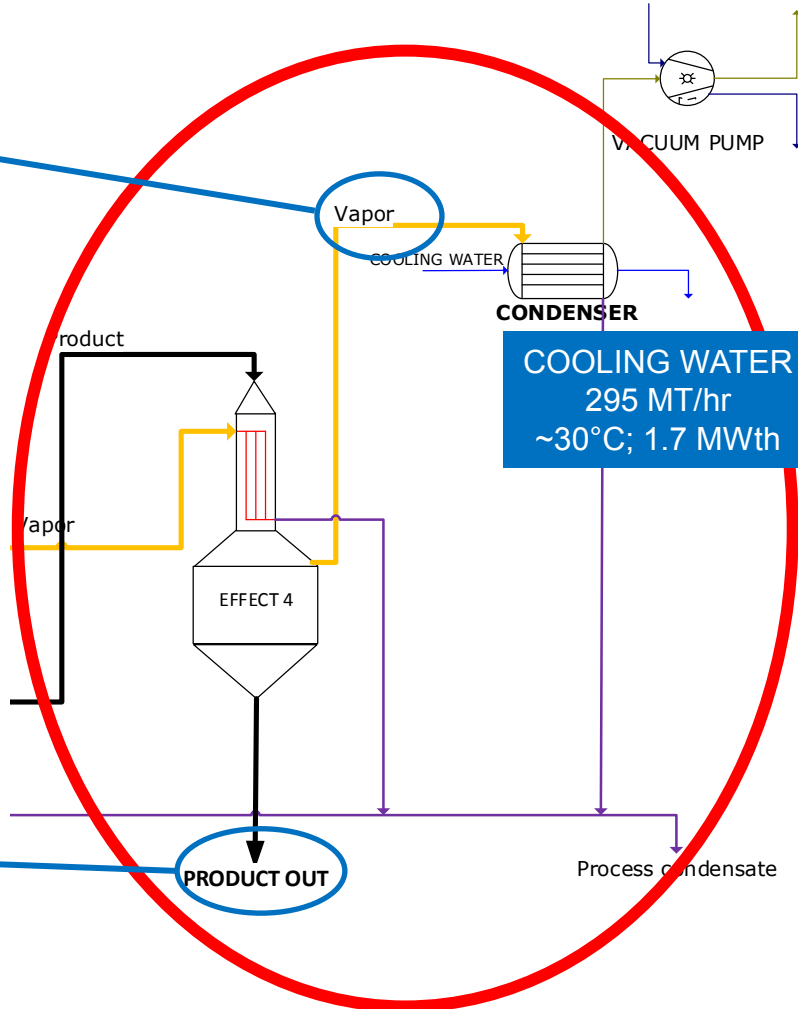


# Steam driven evaporator

Water vapor flow  
2.5 MT/hr  
56°C  
0.14 Bar-a

**HEAT SOURCE**

Product out  
7.5 MT/hr  
59°C  
60% DS



# Heat pump case

Key numbers:  
Operating  
350 d/y, 24 hrs/d

Steam input:  
3 MT/hr  
17 Euro/MT

Power price:  
60 Euro/MWh

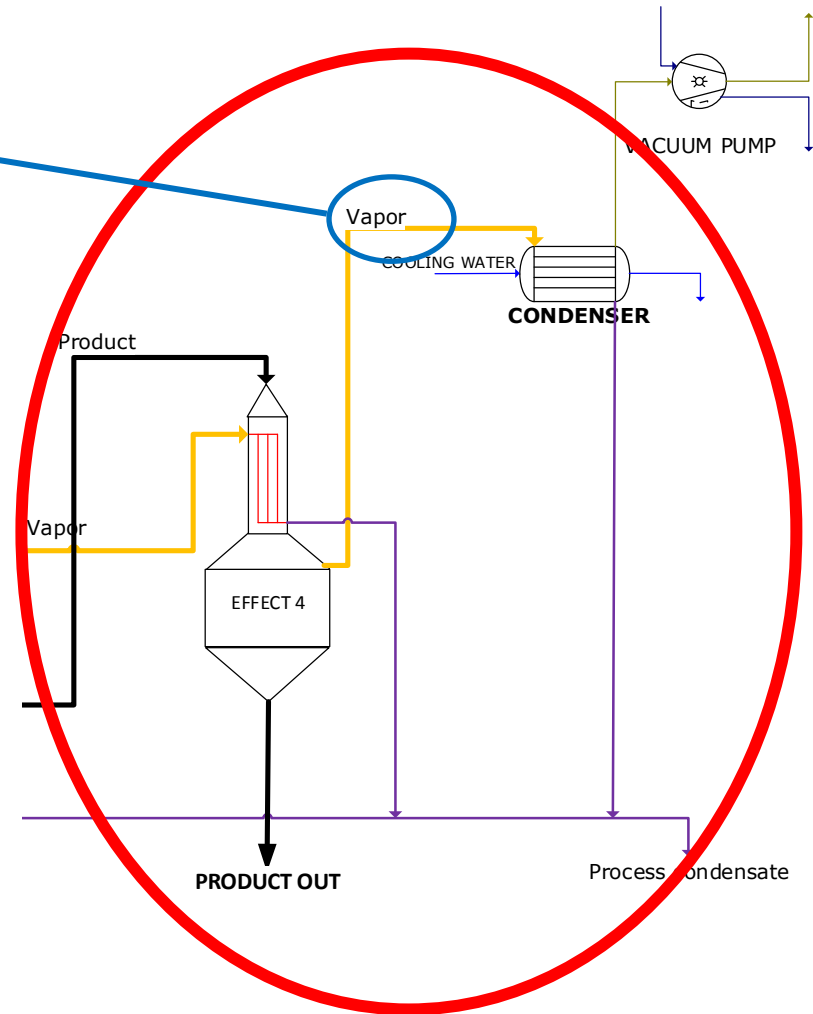
Vapor water flow  
2.5 MT/hr  
56°C  
0.14 Bar-a

HEAT SOURCE

HEAT PUMP

WATER VAPOR  
>1 Bar, >100°C

Replace  
steam inlet  
evaporator  
(constant)



# Questions

- 1. Someone present that can already deliver a feasible heat pump solution? (Say SPOT ~5 Years)**
- 2. Wait for new developments?**
- 3. The investment is the bottleneck for implementation?**
- 4. The industrial heat pump adds unwanted complexity to the production process?**