Heat pump challenge

Norbert Koot – Global Manufacturing Technology group
2020 Goals (as of May 31, 2015; from 2015 baseline)

**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

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**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

- **Product from Effect 1**
- **Vapor from product**
- **STEAM**
- **3 MT/hr**
- **1.5 Bar, 120°C**
- **(sat.temp. 111 °C)**
- **2 MWth**

**Operating**
- **350 d/y, 24 hrs/d**

**Steam price:**
- **17 Euro/MT**

**PRODUCT IN**
- **18 MT/hr**
- **85°C**
- **25% DS**

**Product from Effect 1**

**Vapor from product**
- **Product in Effect 1**

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

**Product out Effect 1**

**Condensate**

**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

COOLING WATER
295 MT/hr
~30°C; 1.7 MWth

VACUUM PUMP

CONDENSER

PROCESS CONDENSATE

EFFECT 4

PRODUCT OUT
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

Vapor

Product

Cooling Water

Vacuum Pump

Condenser

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?