High Temperature Heat Pump for increased sustainability papermachines

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Smurfit Kappa, Paper Production Technology
What is Smurfit Kappa

► We make packaging, systems, corrugated boxes etc...

► From recycled paper and wood

► In large paper machines 5 - 8 m wide, 100 m long 1100 m/min, 35 ton/h

using a lot of energy 50 ton steam/h = 4000 m^3/h natural gas + 8,5 MWe
jumbo reel : 15-20 ton paper

► 35 % of variable costs is energy : E-power + steam
How do we do that

► Recycled Paper machine

- Extensive anaerobic water treatment plant with biogas production.
- Re-use of non paper-fiber materials.
- Integrated CHP ($\eta = \text{ca} \ 87\%$).
- Strong focus on energy efficiency/reduction.
- Energy recovery.

Increase sustainability !!!!!
Paper machine

99 % water

50 % water

8 % water

Evaporation of water: 40 ton/h
60 – 65 % of total energy use
TARGET:
18% reduction in steam consumption
4,5 MWth out
as recycled steam to paper machine

8300 h/y
Planned Project

3,5 MWth Demonstration unit 2018/2019 (HT Heat Pump + MVR)

Steam Compressor
COP = 7,5

Water injection
0,5 ton/h

Life steam
13 barg

Air heater hood system
1,5 barg

Flash tank PM3
3CRT207

Flash tank PM1
1CRT207

136 deg C

127 deg C

PM2
PIC
FIC
PIC
PIC
PM 1

Flash tank steam compressor
0,5 barg

111 deg C

1,5 MWth out

1,2 MWth in

0,37 MW e

111 deg C

Condensate

111 deg C

HT HEAT PUMP
COP = 4,1

Steam
165 deg C

175 deg C

111 deg C

136 deg C

127 deg C

4 barg

6,5 barg

4 ton/h

0,5 barg

111 deg C

PIC

PM 1

PM 2
Industrial TARGETS

- Low investment cost ( < € 100 /kWth uit)
  Attention for integration costs
- Higher values of COP (Carnot > 75 %)
- Low ratio: price power / price gas
- Refrigerant: low GWP ( < 5)

FINAL TARGET : ROI < 3 year
Thank you for your attention!