

FLIE event 8 December 2021 – Case Ducor, Heat Pump

Ducor is a producer of polypropylene granulate. The granulate is produced in three independent extruders from a polymer powder. The granulate is cooled and results in a stream of cooling water (60 °C, 50 kg/s) for every production line, representing total excess heat of about 3,5 MW for the three production lines.

Utilizing part of this energy by a heat pump was investigated in a sustainability study. Steam import of the plant is on average 5.5 ton/hr (range 4 to 6.5 ton/hr) at 18 barg. However, this steam pressure is not required in the plant. Approximately 60% of the steam is consumed at 12 barg, 40% at 4 barg. The sustainability study highlighted the installation of a heat pump to prevent steam usage for a reboiler and propylene heater.

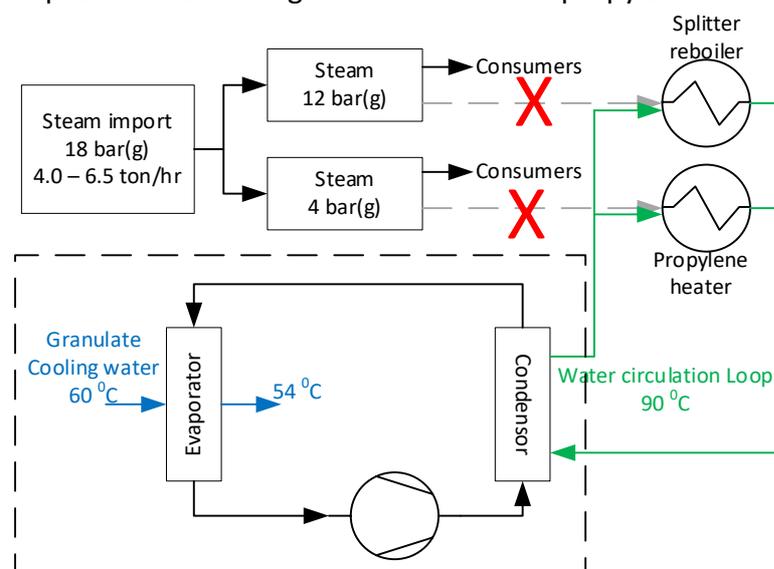


Figure 1 Illustration of proposed heat pump to reduce steam consumption

Steam is currently used in the reboiler of a splitter to maintain a recycle stream over the reboiler of 90 °C (duty of 1,4 MW, steam consumption 21 kton/year). Additionally, steam is used in a heat exchanger (steam/glycol) to maintain a glycol recirculation at 66 °C for propylene heating (duty of 0,7 MW, steam consumption 3.1 kton/year). The proposal was to install a heat pump to create a 90 °C water circulation loop by utilizing the excess heat of the granulate cooling water. This water could directly be used in the reboiler of the splitter; the steam/glycol heat exchanger had to be replaced, since the new water circulation loop has a lower temperature than the steam. Problematic was the long payback time of 7 years for the heat pump.

Therefore, would it be possible to lower the investment and/or utilize more of the available excess heat to improve the business case?

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