HEAT PUMP UTILISES WASTE HEAT FOR PROCESSING PURPOSES

As part of processing rapeseed, the Scanola A/S oil mill needs to dry the seeds. This generates waste heat that can be utilized for processing purposes. Consequently, Scanola invested in a heat pump that helps preheat the rapeseed.

Scanola A/S, Aarhus

PRODUCTION
Rapeseed oil and rapeseed cake for biodiesel and the livestock feed industry

INITIATIVE
Waste heat utilisation using a heat pump

RESULT
New heat pump generates 2.5 GWh per year

Economy

COP 3.7
Heat pump efficiency

500 tonnes
Annual carbon emissions cut

220 tonnes
Annual fuel oil savings

1.5 years
Simple pay back period

The result

- Annual savings of 220 tonnes of fuel oil in rapeseed preheating.
- The company's CO_2 emissions were reduced by approx. 500 tonnes per year.

How much did it cost?

Total capital investment was DKK 2.3 million (EUR 308,000). After energy subsidies, this results in a simple payback period of 1.5 years.

Why was the project carried out?

Scanola produces rapeseed oil and rapeseed cake from rapeseed with a moisture content ranging between 6–9 %. Before they are pressed, the seeds have to be conditioned to obtain the highest possible oil yield. The moisture content is reduced to 3-4 % and the seeds are heated to approx. 100 °C.

In the drying process, airflow removes moisture from the seeds, and this airflow is washed in a scrubber before being released to the surroundings. The water circulating in the scrubber is cooled by direct exchange, and the cooling water is heated from 53 °C to 71 °C. The energy is used by a plate exchanger to preheat the rapeseed.

As the seeds have to be heated to 100 °C, Scanola thought there might be a case for additional preheating using the air discharged from the scrubber.

How was the project carried out?

In 2016, Scanola carried out an analysis to identify the commercial potential of utilising more heat from the discharged air.

Additional cooling of the water in the scrubber yields energy at a relatively low temperature, but the possibilities for utilising the energy at

low temperatures are limited.

Therefore, the analysis focused on using a heat pump for additional cooling in order to obtain a more useful energy flow. This resulted in a concept with a heat pump cooling the scrubber water to 40 °C and heating the cooling water to 90 °C. The energy is still used to preheat the rapeseed in the plate exchanger, but with more energy and at higher temperatures.

The financial assessment of the concept was promising, and it was decided to install an electric heat pump using ammonia.

What were the results of the project?

The heat pump has resulted in annual savings of 220 tonnes of fuel oil in rapeseed preheating. After deducting the electricity consumption for the heat pump, Scanola's total CO_2 emissions have been reduced by approx. 500 tonnes per year.

The heating capacity of the heat pump is 2.5 GWh per year and with an electricity consumption of 0.68 GWh per year - corresponding to a COP of 3.7. COP stands for Coefficient Of Performance and indicates the relationship between the heat produced by the pump and the amount of electricity it uses.

Total capital investment was DKK 2.3 million (EUR 308,000). After energy subsidies, this results in a simple payback period of 1.5 years.

This solution recovers waste heat from the process and uses it for processing purposes. This means that there are no tax implications.

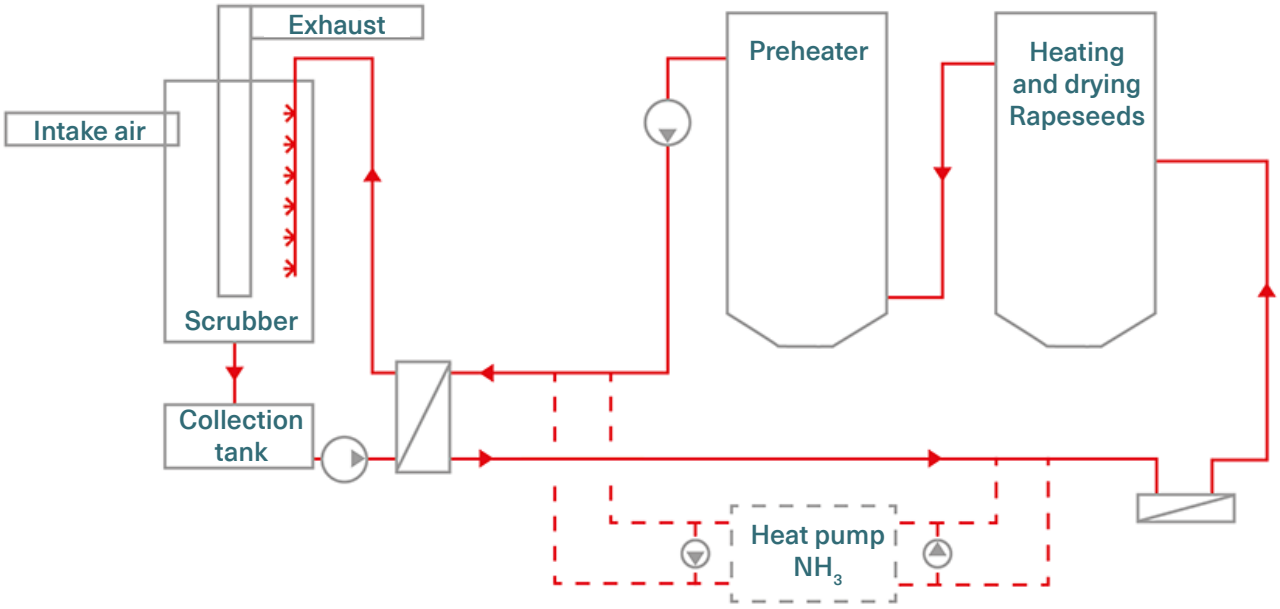

Figure 1: Diagram of the heat pump solution

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