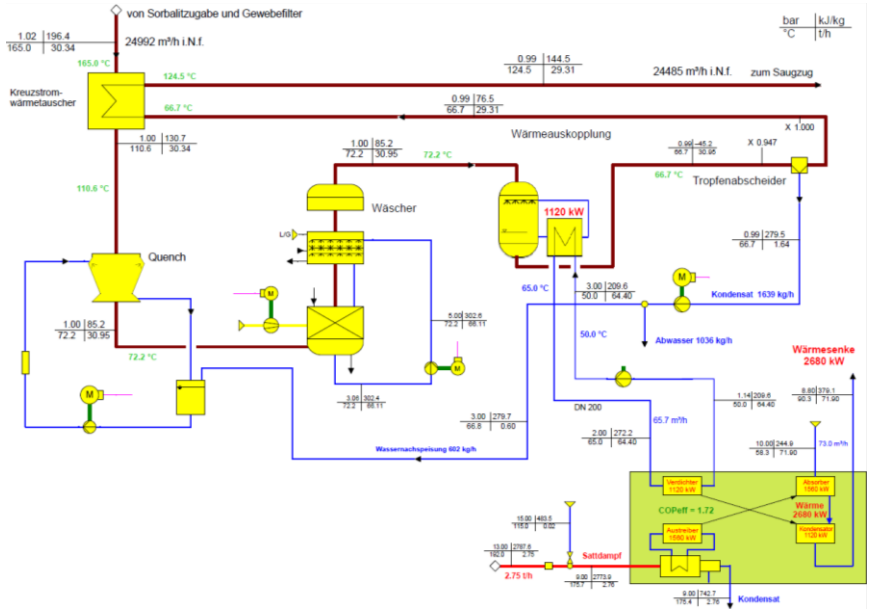
Client: Waste incineration plant MV Kiel
Project: Heat recovery and temperature increase with heat pump system
Services: Feasibility study



General

MV Kiel is planning to extend its incineration plant by a sewage sludge incineration plant. As part of the feasibility study, various concepts were developed and examined for the treatment of vapours produced during drying of the sewage sludge, and for cleaning the flue gas from sewage sludge incineration. Moreover, the study also covered the possibility of extracting heat from the flue gas cooling process, and the increase in district-heat temperature by means of a heat pump.

Core areas

Because of the high saturation temperature, various possibilities were taken into consideration for the recovery of heat downstream the SO_2-scrubbers through flue-gas condensation. A comparison was made here between heat extraction using a corrosion-resistant heat exchanger and extraction by means of a mixed cooler (condensation and cooling tower).

The mixed cooler proved to be the most cost-effective solution for heat extraction. Here, the hot flue gas is led over a packed bed in direct contact with the cooled cycle water and is cooled below the saturation temperature. The heat energy contained in the flue gas is transferred to the cycle water and is passed on to a secondary cycle in an external heat exchanger.

Since the temperature that can be reached through flue-gas condensation is relatively low at a level of 65°C, various alternatives were studied for increasing the temperature by means of a heat pump to the level required for the district-heating network.

The study showed that at the given parameters, the amount of heat that can be extracted using a steam-heated absorption heat pump is significantly more than with a compression heat pump.

Moreover, the comprehensive method of heat extraction using the mixed cooler and absorption heat pump proved to be a very cost-effective solution.

Recommendation

In view of the excellent technical feasibility and high cost-effectiveness, the measure was strongly recommended.