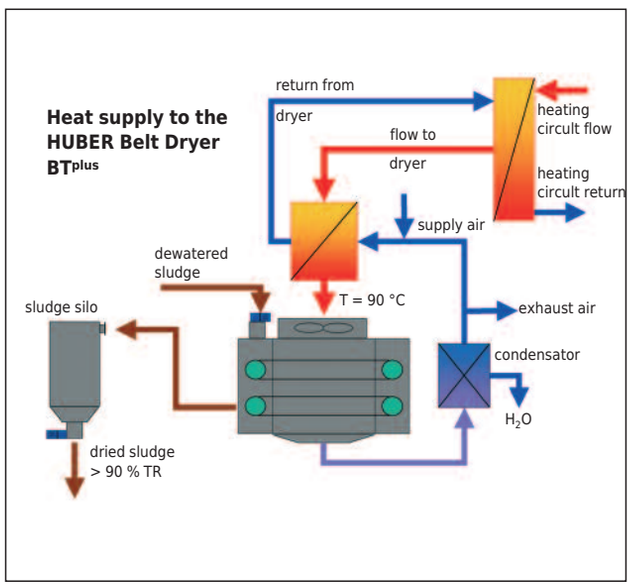
Sewage sludge drying with exhaust heat from biogas plants

In addition to electric energy, biogas plants produce heat. The sale of electric energy at a fixed rate is safe for 20 years, whereas the heat is still insufficiently used but would significantly improve the economic efficiency of the plant. Plant operators can earn several thousand Euros a year with the CHP bonus alone. The sale of exhaust heat secures additional income; sewage sludge drying offers a possibility. Sewage sludge is continuously produced on wastewater treatment plants and is normally utilised in agriculture or dewatered to 70 – 85 % water content prior to disposal. This involves high costs for municipalities because it has to be paid fully for the high water content and the sludge needs to be transported over long distances. Drying of sewage sludge produces a high-caloric granulate. The thermal value of this granulate is similar to that of brown coal. Drying reduces the sludge volume to one eighth of the dewatered sludge volume.



Biogas exhaust heat supply to a belt dryer

Generation of heat from biogas plants

Approximately 40 % of the energy contained within biogas is transformed into electric energy and up to 60 % is exhaust heat. A part of the exhaust heat is used internally to heat the fermentation tank, the rest can be used in other processes. Combined heat and power generation guarantees a bonus of 2 ct/kWh. Combined heat and power means the transformation of used energy into mechanical or electrical energy and useful heat. It represents the most efficient solution for the energetic use of fuels, whether fossil or renewable. The application of combined heat and power generation is essential for climate and resource protection. In most cases combined heat and power plants are used to convert biogas into electricity. The heat generated can be used to dry sewage sludge. About 30,000 € per year are paid as CHP bonus for an exhaust heat amount of two MWh. Additional proceeds are generated with the heat for sewage sludge drying – a lucrative business for biogas plant operators.

Sewage sludge drying

Mechanical sewage sludge dewatering represents the most favourable method to reduce sludge volumes and over along time has been used as the last treatment stage for sludge from sewage treatment plants. Now that some German federal states are about to abandon the agricultural use of sewage sludge and the Sewage Sludge Ordinance has been amended by the EU with more stringent limit values for copper and zinc for example, thermal utilisation of sewage sludge will remain as the only availa-

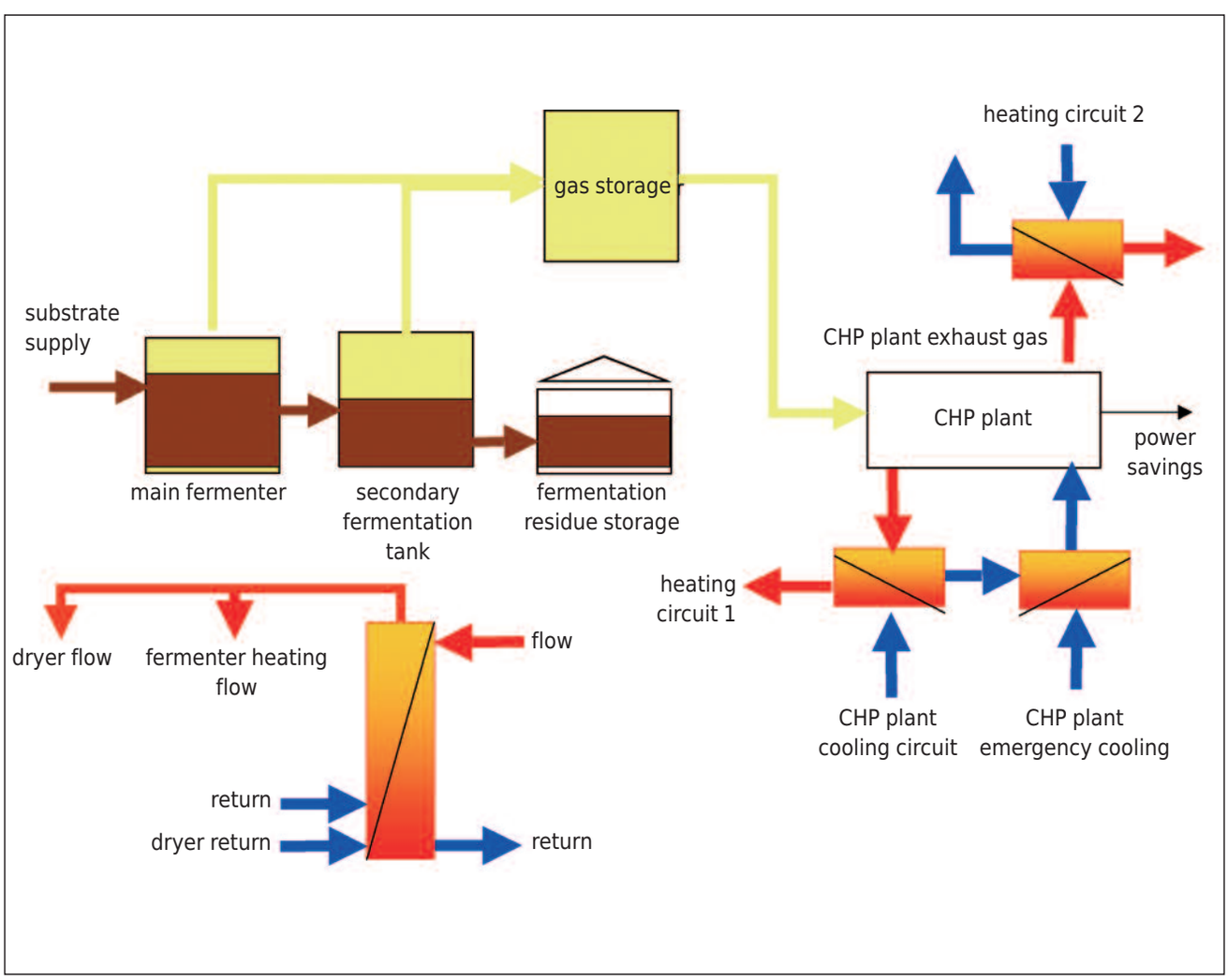
ble future disposal option. To minimise the costs for municipalities, the water content of dewatered sewage sludge needs to be reduced. Sludge drying with belt dryers provides for the optimal energetic utilisation of exhaust air. Conventional drum or disc dryers are operated with fossil fuels, whereas belt dryers use the exhaust heat from biogas plants with typical temperatures of 80 – 90 °C. The energy necessary to evaporate in a sewage sludge dryer one ton of water is approximately 800 - 850 kWh. If, for example, 5000 m3 dewatered sludge is generated per year on a sewage treatment plant, about three million kWh heat are required.

Heat exchangers provide the heat for drying by means of 80 °C hot water. Air streaming over the heat exchangers is heated and the heated air passed to the sewage sludge layer on the dryer belts. The water contained within the sewage sludge evaporates into the air. The water-laden air is condensed and re-heated. Such recycling ensures the economic utilisation of heat energy. The generated exhaust air is treated prior to being discharged to the ambient air.

Summary

The design of the HUBER Belt Dryer BTplus has been tailored for the use of exhaust air as generated in biogas plants. The utilisation of heat from the CHP process guarantees the operators of biogas plants an additional source of income over 20 years. The exhaust air is used continuously as prescribed by the legislator as a prerequisite for benefiting from the financial bonus. Sludge volume reduction by drying of sewage sludge reduces transport kilometres to one fifth and actively contributes to CO_2 reduction. Due to the fact that biogas is produced from regenerative resources and the use of the exhaust heat from biogas production for sewage sludge drying a CO_2-neutral fuel is generated for the production of energy in power plants.

Bernhard Ortwein
Business Unit Industry



Circulation of exhaust air from a biogas plant