

Pumps with extended service life for generating biogas from organic waste

When regular commercial pumps are used to process organic waste, they typically wear out after only a short period of time. Liquids pumped under these conditions attack pumps from two different angles: first with highly abrasive additives and second with liquids that have highly fluctuating pH values and therefore a high level of chemical aggressiveness. These conditions are very tough on seals and elastomer stators. As a result, these parts must be changed often, increasing downtime.

BioEnergie GmbH, located in Austria's wine-growing region, has found a solution. This company collaborated with plant builders Komptech Anlagenbau GmbH and Allweiler AG to optimize the materials used in these pumps. The results are significantly longer service lives, even for pumps located at the beginning of the process where they are attacked the most.

Organic waste with packaging materials

The plant receives all conceivable types of organic waste. Household waste, leftover food, restaurant waste, and plant material are a few examples of the materials that find their way to the plant. Total volume is approximately 15,000 metric tons every year, 5000 metric tons of which are sent to a dump or used as fertilizer.

All waste is received in its packaging and processed without being separated. Examples of this include glass, metal lids and seals, wooden pallets, plastic packaging, and even metal drums. The first step in the process reduces the material to a grain size of no larger than 60 mm. Once reduced in size, a conveyor belt carries the material to a separation container. Process water is added, causing heavy extraneous materials to sink to the bottom where they can be removed. The remaining liquid contains 10% to 15% dry substance and a minimum pH of 4. A sieve retains solids with a diameter of greater than 12 mm before the first progressing cavity pump carries the mass to the grit separator. This is a AEB1E-series pump capable of moving up to 60 m³ per hour. Due to the highly variable chemical properties of the liquid and the presence of sand and other abrasive solids, this pump must be able to handle a high level of stress. Organic waste in particular has a highly variable composition, but it almost always contains sand, gravel, and glass.

ALLWEILER pumps for every process step.

The same or similar Allweiler progressing cavity pumps are used in the subsequent process steps. In total, the plant utilizes eleven progressing cavity pumps. They move the biomass from disinfection to the biogas reactor and then to the separator in addition to pumping process water within the plant.

Important characteristics for achieving a long pump service life are slow speeds and high quality materials. BioEnergie GmbH has chosen to run the pumps at about 200 rpm. In order to achieve the required pump capacity of up to 100 m³/hour at such low speeds, the plant utilizes large pumps equipped with frequency-converter control.

Special stators

After starting operation, the plant collaborated with the vendor to experiment with potential materials. With its readjustable polyurethane stators and specially coated rotors, the first pump (subject to the greatest loads) stayed in service for more than one year, logging more than 1000 operating hours. This is possible because Allweiler AG is one of a small number of pump manufacturers that produces its own stators and offers its customers a choice of more than 20 different materials.



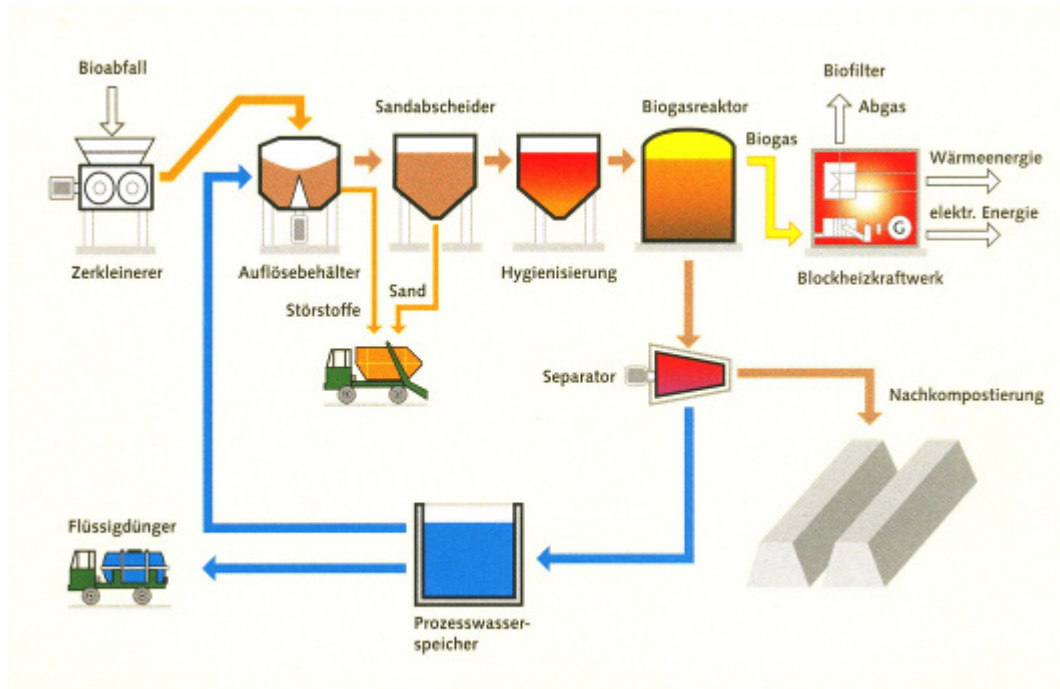
The plant processes virtually any type of packaging and additive.



Over the course of a 30-day fermentation process, the 1,250-m³ biogas reactor produces gas that is later converted to heat and electricity in the block-type thermal power station.



Martin Hajszan manages the plant: “These pumps are unusually durable. We replace worn parts ourselves. The elastomer stators have been in service for more than a year without visible signs of wear.”



The waste is fermented in containers. A block-type thermal power station uses the resulting gas to produce heat and electricity



Allweiler progressing cavity pump of the AEB1E1450 series; liquid: process water; capacity: 60 m³/hour; pressure: 2 to 4 bar.



Allweiler progressing cavity pump of the AEB1E750 series; liquid: biomass at 75 °C; capacity: 18 m³/hour; pressure: 2 to 4 bar.



Allweiler progressing cavity pump of the AEB1E2700 series with readjustable stator; medium: biomass; capacity: 100 m³/hour; pressure: 2 bar.



Allweiler progressing cavity pump of the AEB1E1450 series; liquid: digestates;
capacity: 60 m³/hour; pressure: 4 to 5 bar.

Requirements

To pump highly abrasive and aggressive organic materials with greatly fluctuating chemical properties during all steps of the biogas production process.

Solution

ALLWEILER progressing cavity pumps with stators constructed from special materials, readjustable version, with specially coated rotors. Low-speed, high-capacity pumps with frequency converter control.

Result

Long service life of more than one year, more than 1000 operating hours. Low maintenance minimizes production downtime.

About the author

Jörg Gertz has been employed at ALLWEILER AG for eight years. For the past three years, he has been Director of Sales at Allweiler's Bottrop location where he is in charge of "water/wastewater" and other segments.

About Allweiler – Allweiler AG is the oldest German pump manufacturer and the European market and technology leader for centrifugal, propeller, screw, progressing-cavity, cogwheel, rotary lobe, macerators and peristaltic pumps. Headquartered in Radolfzell and with locations in Bottrop and Gottmadingen, Allweiler owns a foundry, produces its own stators and manufactures ready-to-use fuel and lube-oil skids and rinsing-water facilities for commercial marine, oil & gas, chemical processing, specialty chemical and waste and wastewater applications.

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