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Dairy Industry - Switzerland

Anaerobic Treatment of Whey Permeate for Energy Recovery



The customer, a large Swiss manufacturer of animal feed, was looking for an option to dispose permeate from whey protein concentrate (WPC) production. H+E were commissioned to build an anaerobic wastewater treatment plant to recover the energy from whey permeate in form of biogas. The project was carried out successfully and, following commissioning in late 2010, is in successful operation, discharging a high quality wastewater stream, whilst also providing a substantial contribution to the client's overall energy cost.

1 Customer

The customer is a large Swiss manufacturer of animal feed who produces mainly milk powder, whey powder and whey protein concentrate (WPC). WPC is created by ultra-filtration of whey in order to retain the proteins. The remaining permeate has a low protein content, but it still contains high levels of lactose, nitrogen, phosphorus and calcium.

Whey permeate can be used for other processes, for example as a milk replacer for feeding calves. However, demand and price for this product vary greatly; therefore it is not always a profitable option. For this reason, the customer was looking for another way to dispose of the whey permeate cost-effectively.

2 Project

As the whey permeate still contains a considerable amount of organic pollution, it represents a possible energy source. H+E developed the concept to recover the energy by anaerobic digestion with use of the biogas in a micro-turbine. The produced electrical and thermal energy can be used by the client and substantially reduces his energy costs.

The customer awarded the contract for the entire wastewater treatment plant (WWTP) to H+E in December 2009, while construction of the WWTP started in July 2010 and commissioning in September 2010.

3 Solution

The permeate from whey filtration, with a flow rate of 120 m³/d, is treated in an anaerobic stage consisting of a hydrolysis reactor and a special anaerobic reactor by H+E.

This reactor was developed particularly for the anaerobic treatment of dairy wastewaters, as their special composition creates treatment problems in conventional anaerobic reactors such as UASB-type (sludge loss, calcium precipitation etc). The anaerobic reactor H+E have developed achieves very good degradation rates while operating reliably and avoiding the typical calcium precipitation problems.



The effluent from the anaerobic stage has to be treated additionally in an aerobic stage in order to comply with the effluent limit values for indirect discharge. The aerobic stage is built as a sequencing batch reactor (SBR) and is designed for carbon and nitrogen removal (nitrification and denitrification). Finally, phosphate is removed by precipitation before the treated wastewater is discharged to the public sewer.

4 Results

The WWTP is in successful operation. The anaerobic treatment stage reduces the organic pollution load by more than 95 %.



H+E ranks among the world's leading suppliers in the fields of: water & wastewater treatment, and energy efficiency. Based on its global presence, the **H+E GROUP** has completed projects in over 50 countries.



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