POLISH AND NORWEGIAN CITIES
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BIOGAS PLANT WITH THE CAPACITY OF 0,2 MW AT THE WASTEWATER TREATMENT PLANT IN SIEMIATYCZE

Sector: Biogas use

Timeframe: 2013 – 2015

Location: Kościuszki str., Siemiatycze, Poland

Photo: Marcin Jakimczuk

PROJECT BACKGROUND

Siemiatycze (approx. 15 000 inhabitants) is located in the southern part of the Podlaskie Voivodeship. Since 2016 the city is a member of the Association of Municipalities Polish Network "Energie Cités". Local authorities care deeply about environmental protection and engage in different environmental initiatives. One of them was construction of the biogas plant at the municipal wastewater treatment plant, which was done within the project entitled "Efficient disposal of sewage sludge through its use for the purpose of electricity and heat co-generation". The project was initiated by the municipal company named **Przedsiębiorstwo Komunalne Spółka z.o.o.**, which wanted to solve the problem of high energy consumption in the waste treatment facility modernised several years before. The project was completed in May 2015 and the biogas plant officially launched its operation in June 2015.

Investments in renewable energy sources are still rare in the Podlaskie Voivodeship. The one done by Siematycze is the first investment of this kind implemented in the whole district. Except for increasing renewable energy generation, it also helped to solve the problem of offensive odours from the sewage sludge. The sludge was stored before in open tanks and - as a result - all related gaseous pollutants were emitted to the environment.

PROJECT DESCRIPTION

The biogas plant generates approx. 1 200 - 1 600 m^3 of biogas per day. It is later combusted in the co-generation unit producing electricity and heat. Nominal electrical output of the installation comes to 190 kW, while thermal output amounts to 240 kW. Electricity generated is used for the wastewater treatment plant's own purposes, i.e. for powering equipment used in sewage sludge and wastewater treatment processes. Heat, on the other hand, is used for technological purposes, i.e. for heating the digesters and the technological building.

The biogas plant is composed of the 2 air-tight digesters. Each of them has the diameter of 13 m, height of approx. 15 m and capacity of 2 100 m^3. The biogas storage tank has the capacity of 1 040 m^3.

New installation ensures proper management of sewage sludge produced during wastewater treatment. Both surplus activated sludge and primary sludge are subjected to the anaerobic fermentation process, which was introduced in the sludge handling system. Before being directed to the process, surplus activated sludge (from secondary sedimentation tanks) is thickened and dehydrated. The outcome of the anaerobic fermentation is biogas, which is then stored in a special tank and - through the condensate dehydration system and biogas desulphurisation system - transported to the


Photo: Marcin Jakimczuk

low-pressure tank. Then, through the pressure pump, biogas is transferred from the tank to the energy co-generation unit, where heat and electricity are produced. Heat is used to maintain process temperatures in digester chambers at adequate levels, while electricity is used for the wastewater treatment plant's own purposes. Each chamber is equipped with heat circulation system and double-impeller agitators, which ensure complete sludge mixing.

FINANCING SCHEME

The total value of the project came to approx. 12 Mio PLN (approx. 2.8 Mio EUR). Out of this amount almost 7.5 Mio PLN (approx. 1.7 Mio EUR) was granted from the Regional Operational Programme for the Podlaskie Voivodeship for 2007-2013 and further 2.5 Mio PLN (approx. 0.6 Mio EUR) came from a loan from the Voivodeship Fund for Environmental Protection and Water Management in Białystok. The project also foreseen the purchase of the installation for dehydration of the digested sludge, which cost approx. 2 Mio PLN (approx. 0.5 Mio EUR) and was also co-financed from the ROP (with the 85% co-financing rate).

PROJECT RESULTS

The main aim of the investment was to ensure proper and efficient management of sewage sludge by using it to generate heat and electricity satisfying part of plant's own demand. As a result the plant managed to halve its electricity costs related with powering process equipment. Average monthly savings on energy bills reach nearly 20 000 PLN (approx. 4 600 EUR). The company managing the plant also gains profit from selling certificates of origin of electricity from promoted sources (so called "green certificates"). These additional financial resources cover part of the plant's exploitation costs.

Except for economic benefits, implementation of the project also brought social ones. It improved comfort of life of Siemiatycze's citizens as it contributed to the liquidation of bothersome odours. Air pollution was eliminated thanks to the controlled fermentation of sewage sludge. Moreover, introduction of the fermentation process resulted in decreasing sludge volume by even 30% and increasing sanitary safety of digested sludge making it usable for agricultural purposes. After degasification and mechanical dehydration, the sludge is subjected to the process of hygenisation and can be used as a natural fertiliser. Preparation of the sludge for further treatment (drying, combustion) according to global trends opened way for future investments planned by the municipal company, i.e. construction of a drying and combustion unit.

Environmental benefits related with the investment consist in using renewable energy source (biogas) to generate heat and electricity, thus allowing to reduce fossil fuels consumption.

The project entitled "Efficient disposal of sewage sludge through its use for the purpose of electricity and heat co-generation" implemented in Siemiatycze's wastewater treatment plant was nominated for the prize in the contest "Top municipal investments from Eastern Poland" carried out in 2015.

MORE INFORMATION

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