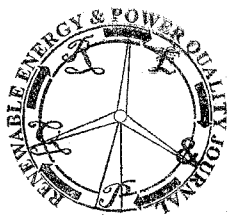


Practical experience with electricity production from unused energy at the water management company



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Abstract. The paper deals with electricity production from unused energy at the water management company. We have practical experience with using biogas produced by wastewater treatment plants for the production of electricity and with using drinking water stored in reservoirs for the production of electricity. In the first part, technology of the biogas production in a waste water treatment plant is described, technology of the water storage and pipelines is described and then production of electricity and bargain redemption price are discussed.

Key words

Biogas, wastewater treatment plants, hydroelectric, water supply structure, small hydropower station, electricity production.

1. Introduction

The paper deals with the use of biogas produced in municipal wastewater treatment plants (WWTP) for generating electricity. Firstly, the technology of production is described and later the production of electricity and bargain redemption price are discussed. The second part of the paper deals with utilization of hydraulic potential of potable water in water supply structure for electricity production with help of small hydropower station (SHS). There is also mentioned bargain redemption price of electricity produced by SHS in the Czech Republic (CR).

2. Biogas Production in WWTP

The beginning of production and use of biogas in the CR, as in other countries, is connected with anaerobic sludge stabilization. The first wastewater treatment plants using this technology were operating as early as the 1950s and nowadays, in effect, every plant with over 50 000 equivalent inhabitants (EI) uses it.

Biogas is a gas mixture of mainly methane (60 – 75%), carbon dioxide (25 – 40%) and small amounts of other gases, such as hydrogen, nitrogen and sulphone. It is created by anaerobic bacterial decomposition of organic mass. This process is called anaerobic fermentation. The main holder of energy is methane and small amount of hydrogen; carbon dioxide and other gases are ballast.

Wastewater treatment plants work on the principle of mechanical biological treatment. The wastewater treatment process starts with primary pre-treatment by grit removal and screen, then the water is pumped over to settling tanks. The settling tanks are the final mechanical level where the primary sludge sediments, and along with the redundant aeration sludge, constitutes the untreated sludge which is further processed by methanation. Prior to the methanation the sludge is concentrated – the sludge is pumped into heating fermentation tanks where anaerobic methanation takes place while biogas accumulating in the upper part of the tanks is collected by gasholders.

External indicators must be taken into consideration when checking the correctness of the fermentation process. The correct process manifests itself by high gas capacity and gas outputs with small daily fluctuations with dry residue decomposition of about 50%.

Treatment and disposal of municipal and industrial wastewater sludge has become a topical and critical issue. In municipal plants, the sludge constitute approximately 1 – 2% of the wastewater capacity with the concentration of 50 – 80% of the original contamination.

Production of sludge in the CR in the years 2002 – 2008 is shown in Table I.

Table I. - Annual Production of Sludge by municipal WWTP in the Czech Republic

Year	2002	2003	2004	2005	2006	2007	2008
Sludge (1,000 t of dry matter)	211	180	178	171	175	172	175

Biogas as a source of energy can be used for:

- Gas boilers – heating
- Piston gas engines – driving electricity generators including the cogenerating engines providing use of the lost heat
- Gas turbines and microturbines
- Gas engines driving compressors of cooling systems
- Gas boilers heating the medium of absorption cooling systems
- Immersion gas burners (evaporation, concretion of e.g. wastewater)