

INSTALLING SMALL COGENERATION BIOGAS UNIT IN MINE OF BANKOV

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ABSTRACT

This paper deals with installing small cogeneration biogas unit in mine of Bankov in Košice. This units will supply electricity to mine distribution grid for own consumption in mine, they will also supply heat that will be used to heat buildings in Bankov mine. This unit helps to minimize amount of electricity purchased from a distribution company and helps to reduce operating costs in mine, which helps to improve operating in mine.

1. INTRODUCTION

Biomass energy has rapidly become a vital part of the global renewable energy mix and account for an ever-growing share of electric capacity added worldwide. Renewable energy supplies around one-fifth of the final energy consumption worldwide, counting traditional biomass, large hydropower, and “new” renewables (small hydro, modern biomass, wind, solar, geothermal, and biofuels). Biomass energy resources are readily available in rural and urban areas of all countries. Biomass-based industries can provide appreciable employment opportunities and promote biomass re-growth through sustainable land management practices. The negative aspects of traditional biomass utilization in developing countries can be mitigated by promotion of modern waste-to-energy technologies which provide solid, liquid and gaseous fuels as well as electricity. Biomass wastes encompass a wide array of materials derived from agricultural, agro-industrial, and timber residues, as well as municipal and industrial wastes. [1] [2]

The most common technique for producing both heat and electrical energy from biomass wastes is direct combustion. Thermal efficiencies as high as 80 – 90% can be achieved by advanced gasification technology with greatly reduced atmospheric emissions. Combined heat and power (CHP) systems, ranging from small-scale technology to large grid-connected facilities, provide significantly higher efficiencies than systems that only generate electricity. [3]

2. COGENERATION UNIT

2.1. Description of cogeneration unit

Cogeneration Unit (CGU) TEDOM Cento series belong to the secondary machine performance, based on gas engines, which are based on car engines. Form a variety of performances ranging from 40 to 200kW. Block layout of these units contains a motor-generator set, complete thermal equipment unit and the acoustic cover. Also included is freely supplied muffler. CGU is equipped with an electric switchboard with power part and control section. CGU is designed for operation on natural gas and biogas fuel, for installation in indoor-space engine. CGU Cento T160 is in the version with synchronous generator designed for parallel operation with the network: 400V/50 Hz. Hot water circuit is adapted to the temperature drop 90/70 °C.



Figure 1 – Cogeneration unit TEDOM Cento T160

Advantages CGU TEDOM Cento:

- automatic regulation of the richness of the mixture - a way to reduce emissions is one of the standard equipment of CGU,
- the CGU is a variant of the engine-mounted magnet BOSCH optimizing engine operation,
- forms easily attachable compact unit,
- using acoustic enclosure CGU has a low noise,
- possibility of adapting to different thermal gradient heating systems,
- thanks to the modular design of the control system it is possible to easily extend the number of binary and analog inputs for monitoring and controlling downstream equipment or allow the change operation,
- the customer's terminal can be connected to the basic control signals for CGU (external emergency stop, external trigger).

Table 1 - Storage size and capacity depending on the control range

| | |
|-------------------------|--------|
| nominal electric output | 160 kW |
| maximum thermal output | 216 kW |
| power in the fuel | 424 kW |
| electric efficiency | 37,8 % |
| thermal efficiency | 50,9 % |
| overall efficiency | 88,7 % |

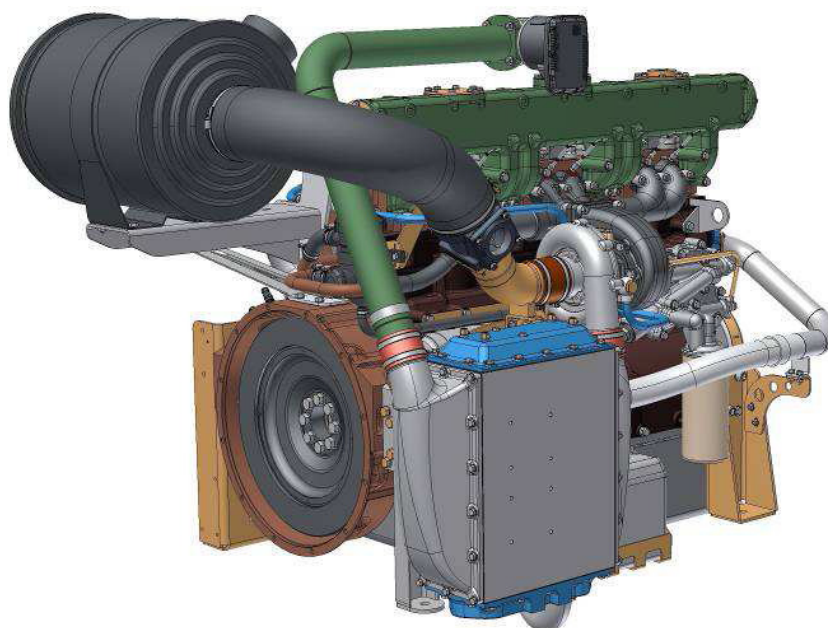


Figure 2 – Motor TG 170 G5V TW 86

3. CONCLUSIONS

Average daily consumption Bankov mine is 159.28 kW as can be seen in Figure 3.

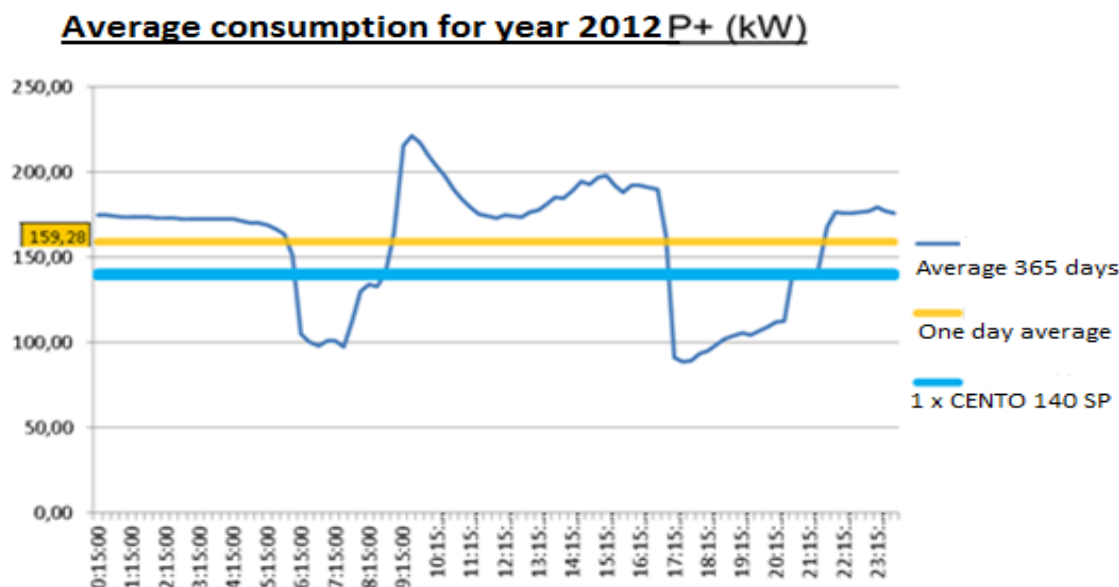


Figure 3 – Year average consumption of electricity in Bankov mine

Cogeneration unit Cento T160 has a power 160kW therefore can theoretically supply all of mine Bankov electricity. The top is from 8:00 am to 17:00 pm. Maximum demand has been measured in the mine Bankov is 475kW, it follows that neither 2x CGU Cento T160 are unable to meet the demand for electricity and thus must be purchased from a distributor. CGU Cento T160 will offset the supply and purchase of electricity to "zero", this means that if the regulator delivery report from the distribution network units started and begin to deliver the necessary power to the grid until the controller has

stabilized at "zero" on the other hand, if the regulator report delivery to distribution network units reduce their power or be disconnected from the network and thus should reduce the cost of purchasing electricity from the distributor.

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