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# USING TECHNOLOGY OF BIOCONVERSION FOR METHANIZATION BEET PULP

**Prof. Oleksandr Serogin, Doctor of Science**
Department of theoretical mechanics and resource-saving technologies,
National University of Food Technologies, Kyiv, Ukraine
e-mail: seroginoo@ukr.net

**Dipl. Ing. Oleksandr Vasylenko, postgraduate degree seeker**
Department of theoretical mechanics and resource-saving technologies,
National University of Food Technologies, Kyiv, Ukraine
e-mail: aleksandr.v.vasilenko@gmail.com

***Abstract:*** *In presented article is proved the expediency of operation of biogas unit at sugar factory. It is supposed by means of given of this biogas unit receive the electrical and thermal power, which could be used for the sugar factory operation. Besides, it is offered as the heat-carrier for bioreactor heating to use return water, thereby improving an operating mode vacuum-condensing unit.*

***Keywords:*** *biogas, sugar factory, beet pulp, methanization*

## INTRODUCTION

During the processing of sugar beets, by-products as sugar beet pulp and sugar beet tails are coming out of production process. The sugar beet pulp is coming out during the sugar extraction process whilst the sugar beet tails will be produced during cleaning and cutting sugar beet. Until now the most of them were used as an animal food, but unfortunately the consumption of such by-products as food fed to livestock is continuously reducing, that allows the usage of sugar beet pulp and sugar beet tails for energy production through anaerobic fermentation on biogas plants. The methanization of sugar beet pulp is a promising path for treating sugar beet pulp and generating energy. Producing a methane-rich gas known as biogas, which can be purified, and used as a substitute for natural gas. What is more, it offers a coproduct, digestate, which is highly recyclable as fertilizer and organic amendment.

**THE OBJECT OF OUR** research is to determine the feasibility and effectiveness of implementing a biogas plants on the sugar factories of Ukraine. A major component of this research is determining the factors used to calculate both feasibility and effectiveness. After creating a model for judging each of these concepts, the projected outcomes will need to be compared to existing conditions in order to determine the cost-benefit relationships. Some examples of the factors that will be taken into consideration are financing of the plant, public sentiment for such a development, and geographic space necessary for a functioning plant. By determining the costs for developing an optimal biogas plant, a model can be developed to gauge the effectiveness of the plant through comparisons of different aspects such as pollutants, energy production, waste disposal. Our research is based largely on statistics and figures collected from existing biogas plants. Case studies of biogas plants around the world act as realistic experiments from which data can be gathered and analyzed.

**THE SUBJECT OF OUR RESEARCH** is a possibility of receiving biogas from sugar beet pulp on Ukraine sugar factory. From 1 ton of dry material of wet beet pulp with moistness of 93 % it is possible to receive **250-350 (550-600)** m³ biogas. This biogas, which has a methane content of around **70-75%**, helps reduce fossil fuel demand (to produce heat and electricity). Biogas is increasingly used in the sugar industry as a valuable substitute for fossil fuels, for

example, as a source of energy in the boiler house (the factory's power station) or for drying the pulp.

Our researches have a applied and theoretical nature. Result of our researching can be using for building of biogas plant on sugar factory, or they can be using for more deeply analysis of problem of producing biogas from waste.

Our research is devolved the problems of utilization sugar factories wastes with receiving of energy. To implement this technology need to solve many technological, design and economic issues. We are engaged solving these issues when working on our research.

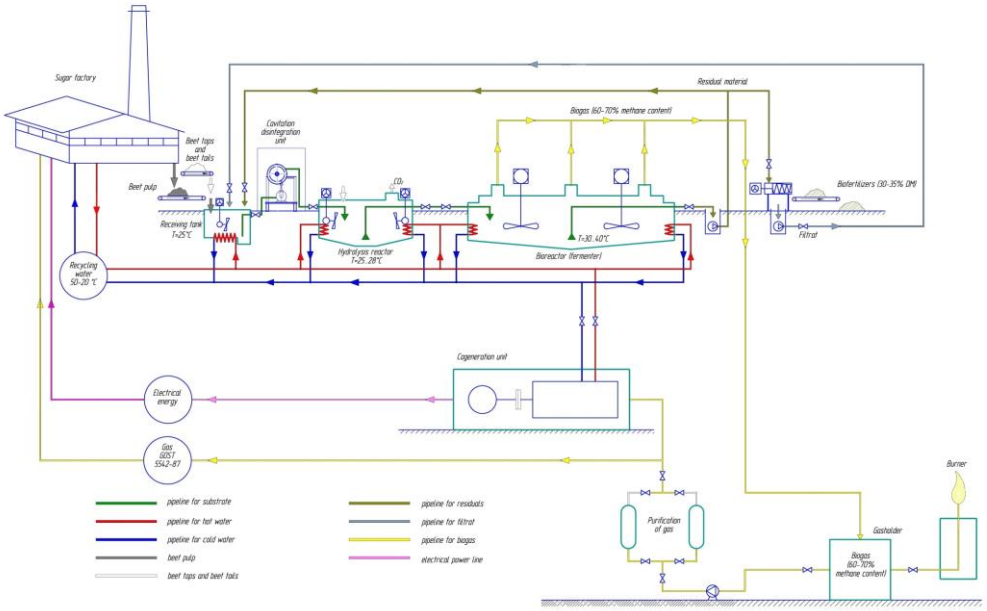


Fig. 1. Technological layout of the biogas faility at a the sugar factoyry

After analyzing of the experience of the biogas plants building in the world and on basis of our local tests with a laboratory biogas facility, we have developed the optimal biogas facility technological layout (please see picture 1), which will allow to process a bee pulp as a monosubstrate and receive the maximum biogas yield from the 1otnn of the beet pulp.

Also we have made a theoretical calculation of effectiveness of the designed technological layout , on basis of the source data of the typical Ukrainian sugar factory (please see below).

**Productivity of factory and other output data:**

| | | |
|---|---|---|
| Type of raw material: | beet pulp | beet pulp |
| Productivity, | t\day | 4.800 |
| Dry material content, | % | 7 |
| | or, t\day | 336 |

**Operating modes** (Calculation of theoretical mode of operation):

| | | |
|---|---|---|
| Production season | days\year | 100 |
| Feeding of bioreactor | hours\day | 8 |
| Processing of beet pulp | hours\day | 24 |
| Fermentation | hours\day | 24 |
| Biogas generation | hours\day | 24 |
| Residuals output (after fermentation) | hours\day | 24 |
| Expenditures of raw material (DM of beet pulp) | t\day | 336 |
| Biogas generation | $m^3$\t | 350 |

| | | |
|---|---|---|
| Total amount of biogas | m³\day | 117.600 |

**Electrical energy:**

| | | |
|---|---|---|
| Calorific value of biogas | kWh m³ | 6,3 |
| Processing efficiency | % | 83 |
| Generated energy | kWh day | 614.900 |
| Percentage conversion into electricity | % | 38 |
| Equivalent of electrical energy | kWh day | 234.000 |
| Electrical energy for own use | kWh day | 18.900 |
| Electrical energy for sale | kWh day | 215.100 |
| Power of equipment for producing electrical energy | kW | 11.700 |

**Heat energy:**

| | | |
|---|---|---|
| Equivalent of heat energy | kWh day | 380.900 |
| Heat energy for own use | kWh day | 48.000 |
| Heat losses during production | kWh day | 20.000 |
| Surplus available for use at sugar factory | kWh day | 312.900 |
| Heat energy 450 °C | kWh day | 156.500 |
| Heat energy 90 °C | kWh day | 156.500 |

## CONCLUSION

The building of the biogas plant in accordance to the proposed technological layout will allow the sugar factory to solve the problem with the beet pulp utilization. Moreover it will allow the sugar factory to receive the biogas, electrical and thermal energy, which will allow to reduce the using of the natural gas during the production season. In the end, by implementation of the proposed technological layout, sugar factory can solve the problem of the waste utilization and in the same time can reduce the net price of the manufactured sugar.

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