

## UTILISATION OF BIOMASS CLOSE TO KOŠICE

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### ABSTRACT

*This paper deals with the utilization of biomass close to Košice. Because of increased pollution caused by fossil fuel power plants there have been agreed that renewable energy sources should be utilized according to country propositions. Close to Košice (city in the eastern part of Slovakia) there are very good conditions for placing the small biomass power plants for combined production of heat and electric power. In this paper will be mentioned two companies that utilize biomass nowadays.*

### 1. INTRODUCTION

In the Renewable energy directive (2009/28/EC) biomass is defined as follows: “Biomass means the biodegradable fraction of products, wastes and residues from biological origin from agriculture (including vegetable and animal substances), forestry and related industries including fisheries and aquaculture, as well as the biodegradable fraction of industrial and municipal waste”.

Geographical structure of Slovakia = assumption for biomass production:

- 47 % of the area consists of agricultural land,
- 41 % of the area consists of forest land.

Table 1 – Biomass potential in Slovakia [1]

Biomass kind	Energy equivalent	
	TWh	PJ
Agricultural biomass	12,89	46,5
Forest biomass	4,69	16,9
Waste from wood-processing industry	7,36	26,5
<b>Total</b>	<b>24,94</b>	<b>89,9</b>

### 2. BIOGAS POWER PLANT IN ROZHANOVCE

Biogas power plant in Rozhanovce is a joint project of: Východoslovenská energetika a.s. and Agrotrade Group, spol. s r.o.

Table 2 – Basic data of the biogas power plant in Rozhanovce [2]

<b>Installed power (electric)</b>	1000 kWe (600kW+400kW)
<b>Installed power (thermal)</b>	1035 kWt (620kW+415kW)
<b>Planned annual production</b>	8100 MWh
<b>Investments costs</b>	3,2 mil. EUR
<b>Start of construction</b>	03/2010
<b>Functional tests</b>	06/2011
<b>Start-up period of fermentation</b>	4.7.2011
<b>Starting materials for the fermentation</b>	corn silage (90%), stable manure (10%)

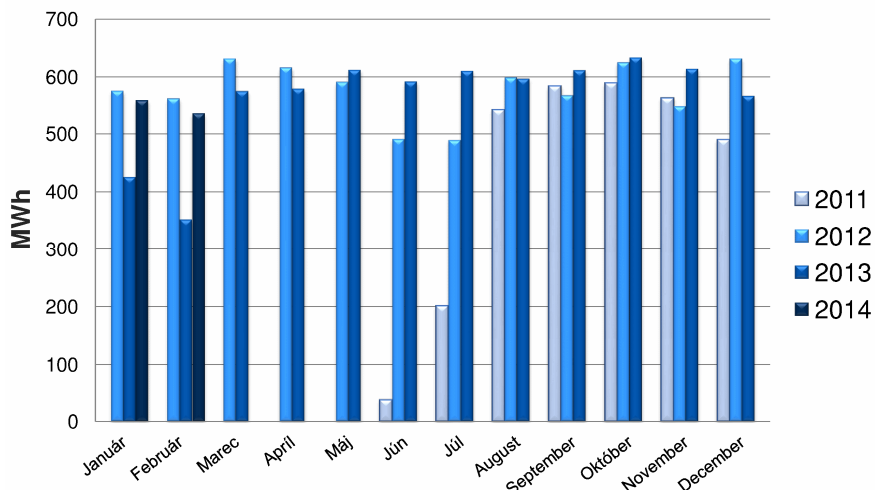


Figure 1 – The electricity balance in biogas power station in Rozhanovce

The biogas plant in Rozhanovce currently uses heat only for fermentation process of biogas power plant (biogas production). In the winter months is the highest heat consumption – about 215-270 kWt. Annual average stands at level about 145 kWt.

#### ***Cooperation with the municipality Rozhanovce***

Location of the biogas power plant in the village Rozhanovce was also connected with years of village activities in the field of environment and sustainable development (construction of sewage treatment plants, support of conservation of primary agricultural production in the region, exploring the possibilities of renewable energy sources within the municipality).

Cooperation of village and a Bioplyn Rozhanovce, s.r.o. consists of the use of heat economy of biogas power plant for potential objects from the municipality, which could be heated by heat from a biogas station.

For a number of community-managed buildings (municipal office, kindergarten, service center, etc.) from the perspective of the pilot project there was selected complex of elementary school.

The primary school complex (school and the sport-gym) is located about 800 m from the biogas plant.

In the long term interests of the school is to build a school swimming pool since elementary school complex is used by the other four municipalities (Hrašovík, Beniakovce, Košické Olšany, Čížatice).



Figure 2 – The actual view at biogas power station in Rozhanovce

### 3. 4 MW BIOMASS POWER STATION IN THE AREA OF VSS KOŠICE

This power plant is a highly effective eco-friendly energy source, which provides: “Green” electricity for more than 10,000 households and heat for more than 6,000 apartments in Košice from a renewable source.

Concept of the introduced biomass power plant was generation of electricity and heat generation with high-efficiency cogeneration by combustion of waste biomass and the main goals nowadays are as follow:

- combustion of wood split billet on the grate of steam boiler
- production of electricity in condensing steam turbine with steam cross-consumption
- utilization of heat from the cross-consumption of turbine to generate heat for the hot-water system of SCZT Košice (District heating).



Figure 3 – View of area of Košická energetická spoločnosť a.s.

#### *Technical specifications [3]*

##### **Steam boiler of SES Tlmače**

Performance of a steam boiler	20 t/h
Pressure and temperature of the steam	5,0 MPa, 465°C
Thermal boiler capacity	16 MWt
Min. fuel efficiency	8 MJ/kg
Max. fuel consumption	7,9 t/h

##### **4 MW turbogenerator SIEMENS**

Type: Condensation consumption steam turbine	SST300
Pressure and temperature	4,9 MPa (a), 460°C
Max. steam consumption	21,5 t/h
Average power generator	3,59 MWe, (max. 4,0 MWe)
Generator voltage	6,3 kV

##### **Heat exchanger steam / water**

Heat power output in hot water (SCZT Košice) 10 MWt (max. 12 MWt)

### ***Emissions emitted to air***

Emission limits are set for power plant according to Annex No. 4 IV. table 1.2.2 regulation of Ministry of the Environment of SR No. 410/2012

NO <sub>x</sub>	650 mg/m <sup>3</sup>	measured	237 mg/m <sup>3</sup>
CO	250 mg/m <sup>3</sup>	measured	20 mg/m <sup>3</sup>
TOC	50 mg/m <sup>3</sup>	measured	2 mg/m <sup>3</sup>
Dust	150 mg/m <sup>3</sup>	measured	3 mg/m <sup>3</sup>

on the basis of authorized measurement of 17.6.2013

Source of similar power on fossil fuel is the air pollutant and also by emissions SO<sub>2</sub> (emission limit on SO<sub>2</sub> is 2500 mg/m<sup>3</sup> of combustion gas).

## **4. CONCLUSIONS**

In this paper there were presented the companies close to Košice that utilize the biomass for production of heat and electricity. The placing of these stations in area of Košice was not very kind but during the time the surrounding accepts the production from renewable sources as necessary and it forms also the shape of the city environment nowadays.

## **REFERENCES**

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## **ACKNOWLEDGEMENT**

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