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The Technical-Economic Reasoning of using the Cogeneration Project, Current Situation of the Network and Possibility of Changing the Method of Metering Thermal Energy

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Work as Engineer at District Heating – PE "Termokos" J.S.C

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Abstract

The City of Pristina has approximately 400,000 inhabitants and its own system of central heating, where production and distribution of thermal energy is carried out by a specialized company for district heating - PE "Termokos" j.s.c. It currently has a designed production of a total capacity of 116MW. Having in consideration the unaffordable increase of heavy oil price , rapid expansion of the city and old age of the current system, the district heating has completed the design and now has entered the project implementation cogeneration.

Key words: *City of Pristina; District Heating "Termokos"; the Cogeneration Project; thermal energy; calculation.*

Introduction

The term co-generation means the combined production of electricity and thermal energy, and in the case of the implementation of such project in Prishtina, we have to construct two thermal stations, one at the TPP Kosovo B where steam will be extracted from medium and low pressure turbines and than heat exchange will take place through a system of steam-water exchange, and the other station will be constructed at the PE "Termokos" j.s.c. where heat exchange will take place through a system of water-water exchange. Surely the entire system is traversed by preisolated pipes of DN 600/800 with a total length of 11.4 km.

The Cogeneration Project, which is expected to stabilize/regulate the ,situation of supply with thermal energy, will be done with following parameters:

• Thermal output of the plant, Qth:	140MW
• Length of the pipeline, approximately	10 km
• Performances:	DN 500 or DN 600
• Outside diameter:	800 mm or 600 mm
• Energy carrier:	Hot water
• Temperature in input and return f1ow:	120- / 70°C
• Design temperature:	130°C
• Pressure stage of plant:	PN 25

Condition of thermal power supply to the city, will be done with the following parameters:

Heat Supply in Prishtina	Designed Heat Load MW	Area m^2	Actual Heat Load MW	%
Region 1	43	249.000	15	22
Region 2	42	245.000	15	23
Region 3	39	242.500	17	24
Region 4	26	183.000	11	15
Region 5	25	150.000	9	13
Region 6	9	34.000	2	3
Total	182	1.103.500	69	100

Actually heat destribuiting in Prishtina

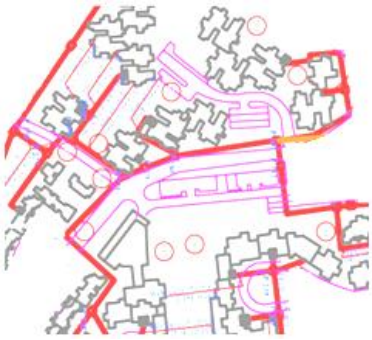
Region 1 – Pipeline network

Region 2 – Pipeline network

Region 3 – Pipeline network

Region 4 – Pipeline network

Region 5 – Pipeline network



Region 6 – Pipeline network

The Technical-Economic Reasoning of using the Cogeneration Project

The rational objectives of the project are

- reducing fuel consumption at District Heating since there is an enormous cost of fuel expenses,
- reducing overall harmful emissions and CO2,
- improving of the heat energy quality,
- reducing the need for the import of electricity as an increased heating availability will reduce electricity demand for existing DH customers,
- reducing the heat tariffs to final customers and determining the effect of increased heating penetration on the reduction of electricity demand,
- improving the quality of air for the residents of Pristina,
- increase production capacity of thermal energy and greater coverage of the city area
- the possibility of expanding the network and create opportunities to connect new buildings to the district heating system
- lower supply cost to the customer, including all factors: thermal power generation, distribution process, maintenance of system
- creating financial sustainability of the company
- in cooperation with the competent authorities, the possibility to provide cheaper price for the energy consumed
- to create opportunities in the future for hot sanitary water through our system, by installing special system for sanitary water and maintenance by district heating company

Current Status of Pipeline Network

The city of Pristina has an installed thermal network for heating purposes, built during the 80s. For energy production it uses thermal boilers which run on heavy oil with low heat of combustion Hu = 36,000 kJ / kg

There are a total of 69,942 m of pipe, and 3250 m3 of water in the network. Most of these pipes are installed in the urbanized part of the city, the installation date of which goes back to early 70s. From 1999-2012 about 40% of old steel pipes have been replaced with new pre-insulated pipes, Because of the corrosion of old pipes there has been a 10-15% loss of water from the network. Supplying users with two hot water boilers, type VKL-50, with thermal capacity of 58 MW and produced by TPK in Zagreb, Croatia.

For circulation of hot water there are two pumps mounted with constant flow of V = 835 m3 / h, H = 80 m effect and power P = 250 kW, and two pumps with variable flow of V = 835 m3 / h, H = 83 m effect and power P = 315 kW. Pumps are mounted in the return

pipe. Two pumps with constant flow and one pump with variable flow are always working. The boiler system works with recirculation of water which has a working temperature of 170/130oC, where thermal network is designed for 140/80oC temperatures. Recycling of water for each boiler is accomplished with the help of two pumps, of which one is with a constant flow from V = 600 m3 / h, H = 30 m effect and power P = 90 kW and the other one is with a variable flow from V = 600 m3 / h, h = 30 m effect and power P = 90 kW.

Keeping the constant pressure on the network is made possible by the pumps with technical characteristics: flow V = 15-39 m3 / h, H = 154-39 m effect and power P = 15 kW, where one is at work and one spare.

The Idea of Changing the Method of Metering Thermal Energy

Metering of thermal energy in the residential sector is of a particular importance, especially now when District Heating is in the implementation phase of the cogeneration project.

A thermal energy meter is a compact unit which operates with batteries and serves to measure the thermal energy so it can record the energy spent. This meter enables measuring of the energy consumption of combined systems of heating/cooling. Main area of application is in the district heating (in our case the city heating) systems or heating/cooling systems. Equipment which this meter uses to operate are temperature sensors at the entrance and exit and movement sensor, the parameters which give their production as a result of the amount of energy used for places of interest.

Conclusion

Based on the current state of the pipeline network, we propose to intervene on the part of the network in the city (actually pipeline network) we want through these interventions to change for the better supply situation.

In the pipeline of DH Termokos it is expected that the total heat consumption will undergo a development from presently approx. 180,000 MWh to approx. 630,500 MWh per annum in 2020.

The total investment has been calculated to around. 22 euro million, which is the most likely development in Pristina. Out of the investment approx. 40% is dedicated to the pipeline system and approx. 39% is dedicated to the cogeneration plant

The implementation of the project will result in **production prices around 70% lower** than before, and this is more than important for District Heating company.

In measurements field, equipment that we propose are:
1.**"Heat cost allocators"**
This device is placed in facilities in which the heating system is such that the supply is vertical in an apartment (in the system of Pristina - mainly old buildings), or Heat meter placed on each radiator but the project will end up with higher costs.
2. "Heat Meter"
This device is placed in facilities where supply is vertical for the entire apartment (system with tapes / floors - new construction). These devices have accompanying devices and can be placed / installed with the wireless system

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