

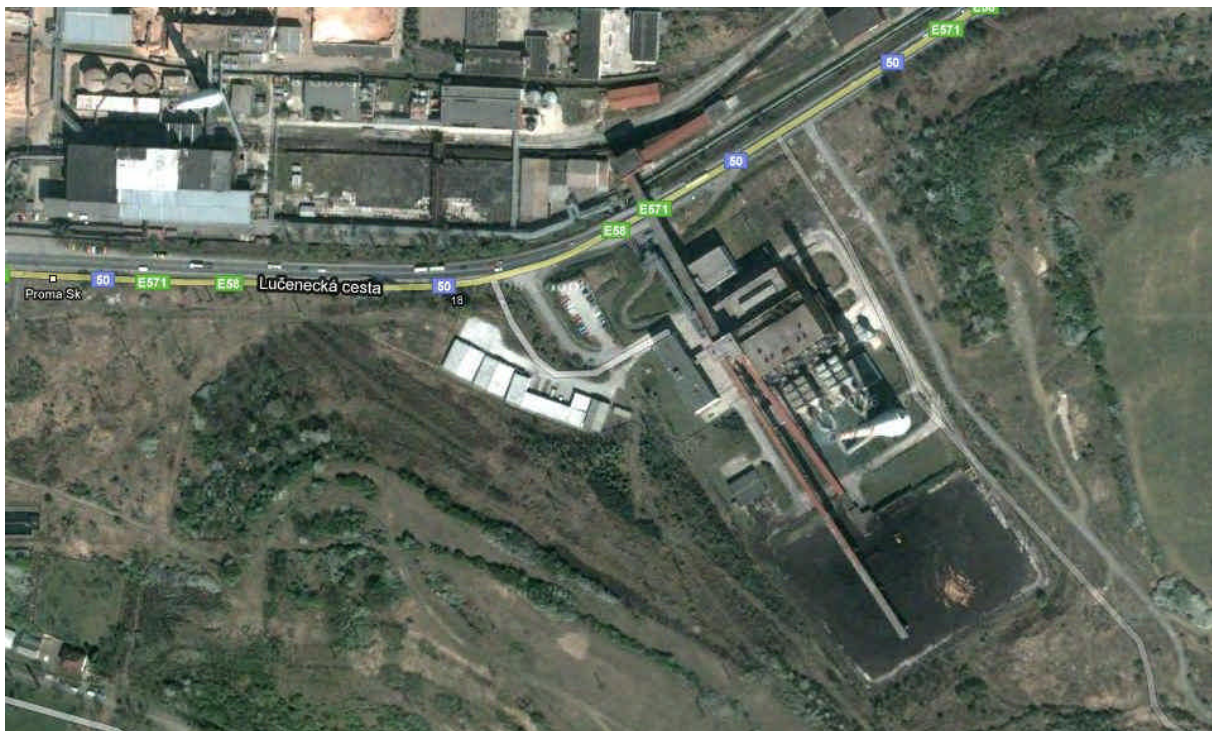
1st study tour Zvolen, Slovakia (04.11.2009)

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Johannes Schmidl (Austrian Energy Agency)



1 Location

Name: Zvolenska Teplarenska inc.
Address: Lučenecká cesta 25, 961 50 Zvolen, Slovakia
web: www.zvtp.sk



2 Aim of the study tour

In the Application form the partners of 4biomass stated that one of the main objective of the project is to foster the sustainable exploitation of biomass by exchanging experiences and best practices between the partners and other stakeholders. Through this an equal level of knowledge regarding available technologies, investment possibilities and operation of bioenergy system can be reached.

The second 4biomass project partner meeting held in Zvolen, Slovakia was combined with a site visit. Thanks to our Slovakian partner we had the opportunity to visit a cogeneration (combined heat and power production) plant in the area, where a typical example of co-firing (combustion of two different types of materials at the same time) was examined.

First the management of the plant gave a presentation about the plant. The representative gave a short historical overview and then explained the technical details and operation of the plant. The improving emission trends were highlighted during the presentation. Some time was also allocated for discussion, where raw material use and sustainability questions were raised. After having all the necessary information the group was ready to see the whole plant. During the tour the project partners examined the burners, the two reconstructed generators and the control room among others. We have also seen the newly developed depot for woodchips.

3 Description of the plant

The biggest share (80%) of heat supply in the city of Zvolen belongs to the Zvolen Heating and Power Plant (Zvolenská teplárenská, a.s.). Heat supply is the main activity for this company. It has two basic consumer spheres – industrial and community – which involve local apartments. Heat supply of industrial and other organizations is mainly used for heating of manufacturing plants.

In the plant, a maximum of 30% of biomass can be co-fired to the brown-coal.



3.1 History

The establishment of the plant dates back to 1949. The main purpose was to supply the citizens with district heat and domestic hot water. Only later on they have installed combined heat and power generator fed by coal and heating oil.

The brown coal fired plant had two boilers generating 216 MW heat and 34 MW electricity (25 MW by counterpressure turbogenerator+ 9 MW condensation turbogenerator), but it has not fulfilled the emission standards. Therefore a reconstruction work has started in 2006 with EU and governmental subsidy to redesign to burners. Since 2008 the whole plant is fed by a mixture of low-sulphur brown energetic coal and wood chips. They are using 70-85% coal and 15-30% wood. A modern control and automatic emission monitoring system was also installed. Additionally, 5% of natural gas is burned to cope with varying biomass-quality and for startup of the burner.

3.2 Technical description

• **Thermal production** – enforced, combined and depended on heat supply. Electric power produced this way is fully economically effective with low cost of fuel. From the technological point of view, the power is produced by a counter pressure turbo generator. Transformation effectiveness during such production reaches more than 90%.

• **Electric power production** – condensing production of electric power was activated in 1996. It is realized by a condensing turbo generator. The turbo generator was designed for additional production of electric power, i.e. as a low-pressure part of counter pressure generator. This technical solution was realized with a goal to improve effectiveness of heat production.

- Installed heat output: 312 MW
- Installed electric power output: 45 MW
- Output medium: steam 1,0 MPa, 260 °C
- hot water 150/70 °C
- Number of distribution station: 32
- Heat production: 1 820 000 GJ
- Heat supply for central heat supply system: 800 000 GJ
- Electricity energy production: 100 000 MWh
- Distribution length: 31km

3.3 Motivation, problems

One motivation for the installation of the plant was to reduce emissions of SO₂ resulting from coal-combustion – biomass is a fuel free of sulphur. The forthcoming (2016) emission-limits of 200 mg/m³ of SO₂ will, however, not be met with the current plant-design. Additionally, this plant supports Slovak Republic in meeting her renewables-requirements and increasing the share of renewables in a relatively simple way by using available and running fossil-based infrastructure.

Due to the process, the ash from biomass-combustion is mixed with coal-based ash, so it cannot be treated separately and has to be dumped in landfills. Other problems arise from carbon-blackening of the heat-exchangers, the still needed optimization of secondary-air vans, operational handling by the operators of the plant, and the adaptation of the plant to the different qualities of the biomass-fuel.



4Biomass partners at the Study Tour at Zvolenská teplárenská; 04.11.2009



This project: "The ecologisation of heat source by using cofiring of biomass in Zvolenská teplárenská, Inc." was co-financed by European Union in years 2006 - 2008



ses tlmače



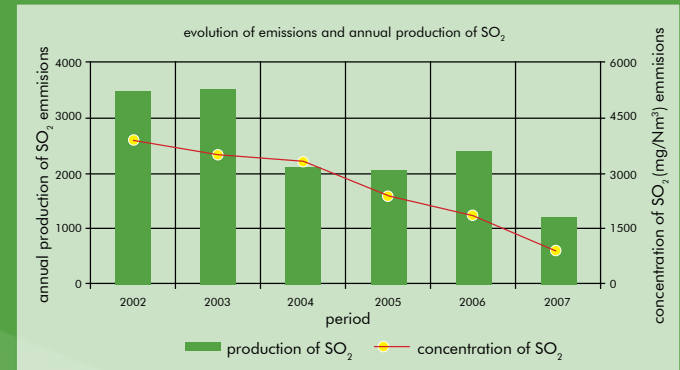
*Project of ecologisation
2005 - 2008*



Zvolenska Teplarenska inc. is the biggest producer and supplier of heat in the area of town Zvolen. The plant originally used Slovak brown coal as fuel, which had installed heat output of 216 MW in two boilers, K-01 and K-02 each having output of 108 MW. Electrical output of the plant is realized in a 25 MW counterpressure turbogenerator (TG-01) and a 9 MW condensation turbogenerator (TG-5). Slovak brown coal did not allow the plant to satisfy standards for pollutants. The major problems were exceeding concentrations of sulphuric oxides in combustion gases. The company decided to solve this ecological problem by realization of the Project „ Ecologisation of heat source by using co-firing of wood chips in ZVTP Inc.“ (further on just Project) and applied for a non-recourse financial grant (NFG) needed for its financing. In 2005 the provider of the financial help - ME-SR approved 470 mil. Sk from the sources of the EU and the state budget as NFG, which originally represented 95% of capital costs of the Project. On 24th April 2006 the company made a contract for work with selected contractor Slovenské energetické strojárne Inc. Tlmače (further on just SES). The building process started immediately after the contract was signed, by realization of the first phase of the project, in which the following facilities were reconstructed. The K-01 boiler, the facility for receiving, storage and internal transfer of wood chips to the combustion features of boilers, control system and automatic monitoring of combustion gases (AMC). The first phase was finished by complex examinations in March 2007. After this date the realization of a second phase of the Project started by reconstruction of K-02 boiler. The second phase was finished with complex examinations of K-02 boiler that took place in May 2008.

The exchange of the fuel base for low-sulphur brown energetic coal with a calorific value of 13,5 MJ/Kg demanded a change of combustion devices, main and stabilizing burners and pressure parts of the boiler. The combustion devices were supplemented with a band grate enabling combustion of wood chips. All

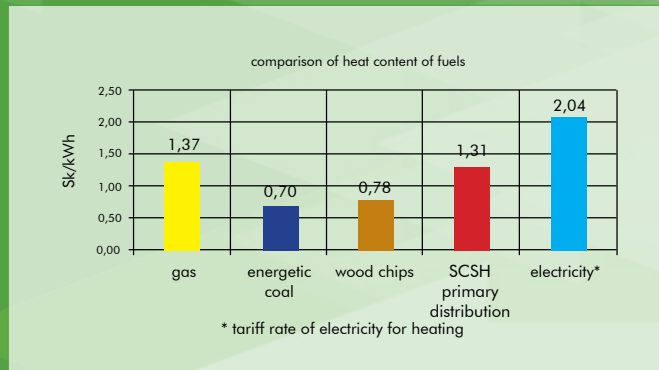
peripherals of the boiler were reconstructed and it was provided with a modern control system Siemens-Simatic. The emissions are continuously monitored by AMC connected to the control system of the boiler and with remote data transfer to the internet website. Within the plant's reconstruction, the need for a boiler with a lower output has also been solved. The K-02 boiler was reconstructed for the lower output of 65 MW. This boiler will be mainly put to use during winter consumption peaks and in periods out of the main heating season. The primary objective of this project was to ensure fulfilment of stricter emission standards valid in the EU and the SR after 1st January 2008, which was demonstrated by complex examinations, complete



operational test of AMC and by single-shot measurements of emitting pollutants in sense of valid legislation.

Equally important goal of the reconstruction was to ensure long-term sustainable competitiveness in the open market with heat in the area of Zvolen. The achieved results confirm that this goal has been fulfilled, too.

Zvolen belongs to those towns in which there is long-term development of a system of central supply of heat (SCSH). The heat supply from SCSH brings reliability, safety, certainty of deliveries, comfort, regular maintenance, service and renewal of facilities in the price of heat and also lower loading of environment. In the last couple of years the often repeated question was whether this way of central heating and preparation of hot service water is favourable for households, as well as deliveries of technological heat to industrial consumers. These questions were answered in the communal energetic concept of town Zvolen. The concept evaluated heat from SCSH as the most effective and as the most favourable for the final consumer. The experience from past few years has proven these claims right. Zvolen belongs to towns with the lowest price of heat and the lowest heat consumption per equivalent housing unit, which means, that the citizens of Zvolen belong to those with the lowest payments for heat. The cost of heat is mainly influenced by prices of fuels or actually energy carriers (65%). The competitive comparison is also complicated by the usage of different units, in which the contained heat energy is measured. By the new standards, the price of gas is set for delivered kilowatt-hours (kWh) of energy, the distribution companies set consumption of electricity directly in kWh, the heat supply is measured in GJ and solid fuels are bought in tons. For better orientation and comparison the prices of individual energy carriers are recalculated into the same unit (kWh) and same delivery standard in the next graph, i.e. on the primary distribution outlets.



From the graph it is obvious that the price of the heat from SCSH of Zvolenská teplárenská Inc. is competitive, the main reason of the favourable price is the fact, that ZT uses fuels with lower cost (coal, wood chips) and it is able to transform them into final products (heat and electricity) effectively in its facilities.

Finally let me thank to all of those who have helped to the successful course and completion of this Project. These are our project engineers from Mining projects Bratislava, our general supplier SES Ilmače and all the other suppliers of construction and technological parts of the Project and at the same time I would like to thank to our employees, who have contributed to the successful course of building operations by their work and active approach to execution of their duties,. I hope that the Work will be in service without any malfunctions and will work for the benefit of partners of Zvolenská teplárenská, Inc. and citizens of Zvolen and I also hope that the expectations of the operator and the provider of financial help will be fulfilled.

Ing. Július Jankovský
Director General
Zvolenská teplárenská Inc.

Slovak energetic machine-works Inc. (SES Tlmače) belongs to important producers of boilers for heating plants, power plants and incineration plants. The company provides for a complex system of services in the power industry: development, projecting, production, installation and start-up. SES is a company with 57 years of tradition.

Our company produces and supplies steam boilers for combustion of coal, oil, gas, and biomass, which satisfy the strictest standards of environment protection while working at high efficiency and long-term operation.

Project of ecologisation in Zvolenská teplárenská Inc. included a reconstruction of boilers K1 and K2 connected with change of fuel base to combustion of low-sulphur brown coal and wood chips to obtain lower amounts of emissions that would be under the emission standards valid in the SR and EU after 1st January 2008.

Modernization of K1 boiler was realized in the first phase of the Project of ecologisation, by substitution of the common combustion chamber for a new one, consisting of membrane walls. The technology of combustion was supplemented with powder burners, stabilization gas-burners and fan mills for processing brown coal into coal powder. The boiler features a fire grate for combustion of wood chips with the aim of decreasing the amounts of emission under the legislative standards. Part of the delivered technology is also the control system and the power-circuit wiring. The result of the reconstruction of the K2 boiler in the second phase of ecologisation is a modern concept boiler, also with co-burning of wood chips and having output of 90t/h.

The company SES projects and supplies complete energy products. It develops, produces, installs critical devices and provides complex maintenance services to its customers.

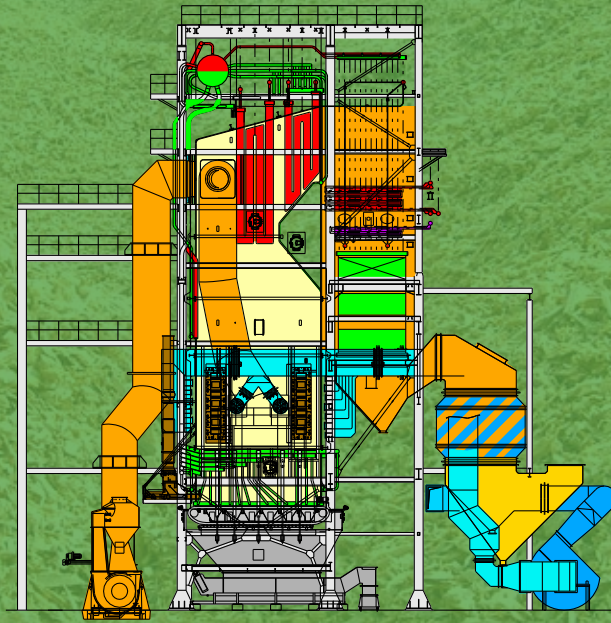
Progressive technologies ensuring high production efficiency of electrical and heat energy while respecting strict principles of environment protection applied in supplied energetic devices are results of our own development and international cooperation. By realization of the Zvolenská teplárenská project, the SES proves to be ready for participation on possible energetic projects in the area of new sources as well as reconstructions and modernizations of power plants and heating plants.



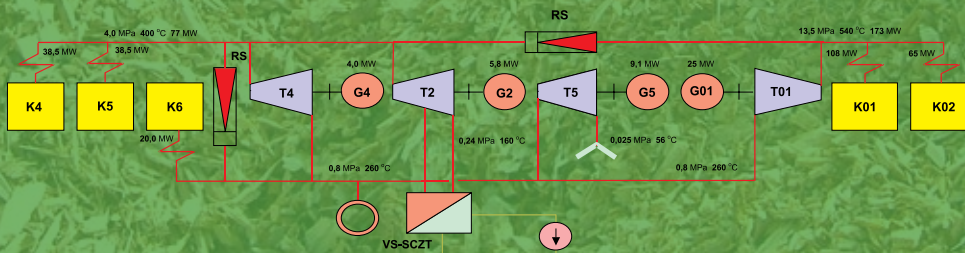
Ing. Martin Paštika, MBA
Director General
Slovenské energetické strojárne Inc.



scheme of K01 boiler



scheme of flow diagram of heating plant after reconstruction



coal dump before reconstruction



distribution of dump – building process



heating plant before reconstruction



heating plant after reconstruction

transportation of wood chips



technological control room of the plant



external transportation of wood chips



operational silos of wood chips in front of boiler room



wood chips dump





wood chips grate combustion

