

Thursday, 05th of October 2017

Location: Dubrovnik

Exploitation of waste heat potentials in Central Europe

CE-HEAT Special Session (13:30-17:30 h)

13:30 - 13:40 h	Introduction to waste heat session Matjaž Gerl, E-zavod (SI)
13:50 - 14:05 h	Presentation of the CE-HEAT Central Europe initiative MSc. Saša Erlih, E-zavod (SI)
14:05 - 14:30 h	Waste heat recovery using ORC for bottoming IC engine prof. PhD. Aleš Hribernik, University Maribor (SLO)
14:30 - 14:50 h	Czech Institutional Setting of Waste Heat Utilization and Construction of a Local Central Heating System in the Context of People's Preferences PhD Ondrej Vojacek, NCEU (CZ)
14:50 - 15:10 h	Recycling management in biogas plants by using waste and waste heat Johann Binder, BEA, Buergenlaendische Energieagentur (AT)
15:10 - 15:30 h	Utilization of waste heat from hydro-power plants generation units PhD Boštjan Gregorc, DEM, Dravske elektrarne Maribor, Saša Erlih (SI)
15:30 - 16:00	Short break
16:00 - 16:20 h	Industrial Urban Symbiosis (IUS) for sustainable energy supply: a case in Friuli Venezia Giulia, eng. Gellio Ciotti, University of Udine (IT)
16:20 - 16:40 h	Exploiting waste heat in Croatia, potentials and challenges Ilija Drmać, EIHP, Energetski institute Hrvoje Požar (CRO)
16:40 - 17:00	Current Status and Outlook of Waste Heat Utilization in Thuringia (Germany) Anton Wetzel, ThEGA (DE)
17:00 - 17:30 h	Panel discussion

Invitation to the special event on Exploitation of waste heat potentials in Europe - introduction

The special event marks waste heat as an important energy source, which should be valorized in existing and future energy systems. The project initiative [CE-HEAT](#) rephrases the waste heat as endogenous energy that should be actively recovered when possible and should become an indispensable part of all energy concepts in future. The main objective of the special event is to provide an improved, up-to-date understanding of the fundamentals, principles and practices associated with the operation of waste heat utilization systems.

In broader view, the exploitation of thermal energy as excess energy of industrial processes across Europe will be featured. The event will provide the dissemination of information concerned the exploitation of waste heat potentials in EU and developments in the field of waste heat recovery in specific industrial processes. The efforts of CE-HEAT initiative towards the common Central Europe (CE) waste heat sources cadastre and a waste heat platform will be presented. The event will be wrapped up by the panel discussion leading to the directions for enhancement of investment mechanisms and strategic guidelines for improvement of waste heat utilization in CE space.

More information to CE-HEAT initiative you may find here ([Link](#)).

Presentation of CE-HEAT initiative

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Short information - The project CE-HEAT (Interreg Central Europe Programme, www.interreg-central.eu/) aims to improve the governance of energy efficiency by focusing on field of waste heat utilization and increasing utilization of endogenous RES - waste heat in Central Europe. In order to improve governance in waste heat utilization, better and comprehensive planning, but also monitoring tools are needed. The CE-HEAT partnership will facilitate this process by:

- Providing an excellent analytical and monitoring platform through establishment of GIS based regional waste heat cadasters with waste heat sources classification and a monitoring tool;
- Providing a comprehensive solution for managing waste heat utilization projects and strategies based on the development of a waste heat utilization toolbox (leading stakeholders participation process, providing means to assess the feasibility etc.);
- Incorporating new approaches into local, regional and national strategies by integrating a novel cadasters and toolbox into existing spatial planning and energy management systems and spreading it throughout central Europe and beyond.

The transnationality of the approach will enable integration of different experiences of WH utilization through Central Europe space, ensuring utilization of knowledge in creating novel solution for a common challenge in a common legal environment. The multitude of tested solutions will provide an added value for the wider public and create a better transfer potential pan-European wide.

Waste heat recovery using ORC for bottoming IC engine

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Abstract - A bottoming ORC system for harvesting rejected energy of IC engine exhaust gases is presented in the paper. A simple model was developed to estimate the ORC system operating parameters, as well as system investment cost and electricity production cost. A parametric study was performed to study the influence of the main system parameters, such as evaporating pressure, heat exchangers pressure drop, and IC engine exhaust gas temperature and mass flow rate on thermal efficiency and electricity production cost. It was found that the economic viability did not only depend on the thermal efficiency of the ORC system but it is influenced highly by the number and size of applied heat exchangers, and by the pressure increase at the exhaust side of the IC engine caused by the pressure drop in the heat exchangers. Increased exhaust gas temperature and mass flow rate can improve the economic viability of an ORC system. Both increase the ORC power much more than the ORC system cost, which results in the reduced electricity production cost.

Key words: waste heat recovery, Organic Rankine Cycle, IC engine

Czech Institutional Setting of Waste Heat Utilization and Construction of a Local Central Heating System in the Context of People's Preferences

PhD ONDREJ VOJACEK

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Abstract - Utilizing waste heat represents one of the ways of increasing energy efficiency. Multiple programs that offer financial support in energy efficiency are available in the Czech Republic. However, none of them is aimed at waste heat utilization. Despite little attention from the government, the potential is significant and numerous projects can be found all over the country.

In this contribution, we describe the institutional settings of the waste heat utilization support in the Czech Republic and further concrete case study of a private company, which burns wooden chips (waste) to provide heating for local public buildings and households. So far, only few households have connected to the network. In the contribution we analyze the reasons of the low demand for heat and people's preferences towards the heat supply in the Skripov municipality.

Key words: waste heat, heat supply, central heating system

Recycling management in biogas plants by using waste heat materials and waste heat

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Abstract - Many Biogas plants in Austria and in the neighboring countries are operating with typical agricultural products like maize. By offering suitable feed in tariff these plants were running with cogeneration technology only or mostly using the electric power and "wasting" the heat which is produced in parallel. As soon as feed in tariff for power are reduced or phasing out these plants are coming in economic troubles.

Within the presentation 2 types of biogas plants situated in Burgenland will be presented which show up strategies with additional added values beyond just using feed in tariff for power.

The Biogas Plant of "Wolf pasta" is using dung of own hen which are producing eggs for the production of pasta at first priority. Together with agricultural crops biogas is produced. The biogas is used in a cogeneration machine. As well as the power as the "waste" heat are suitable for running the production of pasta. The extractable residues are used as fertilizer in the fields which are producing the agricultural crops for the biogas plant. A main goal of this project is to reach a full recycling process by using only local or regional inputs.

The biogas plant of Strem near Güssing in Burgenland is running as a research and demonstration plant by using only local resources including agricultural products as well as waste resources like grass and in future also residues from clarification plants. At present the produced biogas is running a cogeneration machine by using power with a feed in tariff and the waste heat for the local district heating system. The residues from the biogas plant are used as dung in the local fields nearby which produce crops for the biogas plant in order to fulfill the circle process in the region.

Key words: biogas plant, waste heat, recycling economy, local circle process, demonstration plant, recycling management

Utilization of waste heat from hydro-power plants generation units

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Abstract - The paper covers the utilization of waste heat of hydro power plant processes (HPP), with the aim of maximizing energy efficiency of energy generation facilities. Excess waste heat in HPP is formed in all energy generation processes and bearing systems. Operation of hydropower plants is mainly generating low temperature level waste heat stream that could be used in covering heating requirements of associated HPP buildings, nearby settlements, greenhouses and industrial applications. Due to the low temperature potential, the heat has to be moved to a higher temperature level i.e. over 60 °C, via heat pumps or other conversion technologies. The HPP waste heat stream is very much dependent on river flows and electricity generation plans, which are prone to adapt to fluctuation in electricity power markets (influence of solar and wind power generation). Recovery of waste heat in HPP is due to fluctuating operating regime associated with installation of additional heat storage systems, which additionally influences the investment size (costs).

The presentation is covering the existing waste heat investments into recovery of hydropower plant Mariborski otok generation units, where excessive heat is utilized in nearby DEM premises. The adequate waste heat utilization maximizes the total generators efficiency up to 1.5 %, which in turn lowers the energy needs for heating in the nearby power plant premises. The waste heat utilization provides a good alternative in both new and existing electricity generation facilities and as such represents a new opportunity for investors.

Key words: waste heat, hydro power plants, operation requirements

Exploiting waste heat in Croatia, potential and challenges

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Abstract - Waste heat is a form of energy which is a by-product of industrial processes, machine operation, electrical energy production or other energy transformation (for example, cooling energy as by-product of cooling process where heat energy is given to the surrounding environment). There are several examples where the heat is produced as by-product (this is the reason why is called “wasted energy”) and additional energy is consumed to take its heat in the environment. Therefore, instead of reusing already produced heat energy, companies are purchasing further energy for their own consumption which leads to additional CO₂ emission.

Main objective of the Interreg Central Europe CE-HEAT project is to identify and quantify largest waste heat sources in Croatia. However, the solely identification of waste heat sources is insufficient for further waste heat utilization purposes. The technical data such as quantity (kWh), availability (annually and seasonally), energy carrier (water, oil, air...) and temperature gradient of energy source are crucial for distinguish the most profitable waste heat utilization sources. Comprehensive understanding of waste heat utilization includes

awareness about specific technical solutions and technologies already implemented and verified in various industrial sectors, economic profitability analyses, legal constraints and obligations in project implementation.

In the Republic of Croatia cogeneration power plant as privileged electricity producers are obligated to reuse 50% of produced heat energy by law which makes them a promising target group. Furthermore, the remnant 50% will still be available for utilization. The focus of this paper are biomass power plants (17 plants with 31.35 MW total installed electric power), biogas power plants (30 plants with 34.734 MW total installed electric power) and other cogeneration plants (6 plants with 113.293 MW total installed electric power).

Hitherto waste heat is not fully recognized as a powerful asset and energy source in the Republic of Croatia. The CE-HEAT project aims to provide all indispensable information about waste heat utilization to producers and users of heat energy and ultimately will lead, in the near future, to more efficient energy consumption and further development of waste heat utilization projects.

Key words: biogas plant, waste heat, recycling economy, local circle process, demonstration plant, recycling management

Current Status and Outlook of Waste Heat Utilization in Thuringia (Germany)

ANTON WETZEL

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Abstract - The presentation gives an overview of the current state of waste heat utilization in the federal state of Thuringia and the first working results of the CE-HEAT project. Waste heat can be utilized in multiple ways, including reintegration into the industrial process as well as uses outside of the waste heat source, including conversion of waste heat into more useful products such as household heating, hot water or air conditioning. The theoretical potential for waste heat utilization in Thuringia is 4 TWh which could be used to supply 200.000 single family houses with heat and warm water. Within the presentation the approach for the estimation of the waste heat potential will be shown. Waste heat also has the potential to help meet the increasing demand for air conditioning that is projected due to climate change. Case studies for applications of waste heat technology within Thuringia have demonstrated that these projects can significantly improve energy efficiency and can have a quick return on investment. In this presentation, three case studies for current operating projects will be presented. The first case study examines the implementation of a heat exchange in a factory used to recycle heat within an industrial process. In the second case study, waste heat generated from computer servers is utilized to cool the servers as well as the building. The third case study utilizes heat generated during the production process for wafers to produce household heating and warm water for a nearby community. These case studies are representative of the areas in which the application of waste heat utilization technology has the largest payoff.

In the second part of the presentation describes the development of the waste heat cadaster. The cadaster depicts the sources of waste heat in Thuringia and acts as a resource for identifying candidates for waste heat projects. In order to find pilot projects ThEGA started a call for project ideas to identify promising proposals. Beside these starting points the presentation will demonstrate the ways waste heat utilization is embedded into the existing national funding framework.

Key words: waste heat, cadaster, case study, potential estimation, Thuringia, funding