

WEBINAR

FROM WASTE TO VALUE: HOW THE WASTEWATER TREATMENT SECTOR CAN CONTRIBUTE TO MITIGATING THE ENERGY CRISIS IN THE DANUBE REGION

On 11 May an expert panel sat down in the virtual space to discuss how the wastewater treatment sector could contribute to mitigating the energy crisis in the Danube region. Those who attended live were treated to some very interesting inputs. Those who did not find the time find a full event report here.

It seems the current energy crisis has come to stay, and the water and wastewater sector bear the brunt of rising costs. After an in-depth look at the overall impact of rising energy costs on the sector during a previous DWP KnowNow webinar, this next edition treated energy optimization and energy production in the wastewater treatment sector and the implications for sustainable water services in the Danube region.

To put the scale of the problem into perspective: Europe's wastewater treatment plants consume an estimated 25,000 GWh every year, making up for close to one percent of the former EU-28's total electricity consumption. Energy neutral or even energy positive wastewater treatment is technically possible, holds huge promises for a climate neutral, energy secure future in the water sector, and can do miracles for the bottom line of utilities struggling with their energy bills.

The highly popular KnowNow Webinar Format aims at providing everybody with a stake in the water sector with latest information, insights and experience in a very compact 75 minute expert discussion format, broadcasted live on the Zoom platform

Wastewater Plants as Net Energy Producers? It can be done.

The issue on energy and wastewater was hosted by Lyubomir Filipov, Strategic Partnerships and Projects Director at Sofia Water. Three experts formed the panel: Kris Welsien, World Bank Senior Water Supply & Sanitation Specialist treated the theme from a global perspective, Frosela Filo, Head of the Finance Department at Korca Water Supply and Sanitation JSC in Albania reported from a country that is working to overcome considerable infrastructural challenges, and Gerald Wandl, Head of Operations at the Wastewater Treatment plant in Vienna, Austria told of the situation in a fully developed infrastructure in a major EU capital.

In his introduction statement, Mr. Filipov mentioned that his company, Sofia Water, has successfully invested in green energy production from wastewater. He strongly recommends this approach, stating that in the reporting year 2021, his company produced green energy to the tune of 24 Gigawatt, covering 115% of the overall energy consumption of the plant and pushing Sofia Water to second place among the most energy-efficient companies in its group.

An ambitious Photovoltaic project

Mr. Filipov then handed the stage to panelists who looked at the theme from the business perspective. First Frosela Filo reported from Korca, Albania. Prices for medium voltage electricity in Albania rose by 60 to 70 per cent during the last 12 months, putting huge pressure on water and wastewater utilities and impairing their ability to make necessary investments. The upside is that the energy crisis is speeding up the formerly glacial pace of change. Renewable energy sources and producing their own energy have become very attractive for water and wastewater utilities. Ms. Filo's company is quite ahead of the curve here, being the first in Albania to run a wastewater plant on solar energy. With green gas production not being feasible because of the technical characteristics of the plant, Korca Water Supply and Sanitation JSC decided to make good use of the average 300 sunny days in the Korca region. Seven years ago, they installed a photovoltaic plant next to the wastewater treatment facility. It delivers 1,3 million Kilowatt, covering 97% of the wastewater utility's overall energy consumption. The success encourages Ms. Filo's company to extend the solar plant. Korca Water Supply and Sanitation JSC is currently preparing to add another two million Kilowatt capacity to cover the need of the water utility as well. The project is ambitious, and financing will be a challenge, but Ms. Filo hopes that in the current environment her company will find support to become Albania's first energy independent, full renewable energy-driven utility.

Dramatic Turnaround in Vienna

Next on the stage was Gerald Wandl, Head of Operations at the Wastewater Treatment plant in Vienna. This is a central installation with a capacity of 4 million population equivalents, currently treating an average of 3,2 million population equivalents and consuming 60.000 Megawatt hours per year, which is roughly one percent of Vienna's total electricity demand.

The company began looking into renewable energy use 15 years ago, cumulating in a major project that started ten years ago and is now complete, with altogether 200 million Euros invested in a multifaceted mix of energy consumption curbs and green energy production from own

resources. A Kaplan turbine and a wastewater hydroelectric screw produce 1,8 million Kilowatt hours per year from the effluent water flow of the plant, covering 2% of its overall energy use.

In search of other possibilities to cover a larger share of the plant's energy consumption, the team looked into green gas production. For a plant that was built in 1970ies and opened 1980, introducing an alternative technology is a bit of an uphill fight, not the least because it operates in a constricted urban space.

Originally, the plant concept relies on sludge incineration, with the resulting heat energy fed into Vienna's extensive heating grid. With the arrival of highly efficient gas turbines in the early 2000s, electricity production from green gas became interesting for the plant, and feasibility studies showed that switching the sludge system to anaerobic digestion and using the digestive gas in turbines would make sense. For a plant of this size, rethinking the system is quite an undertaking: Sufficient space to install the voluminous digestors was only found during a parallel renewal of the plants first biological treatment step, and the reduced energy content of the treated sludge had impact on the output of the adjacent incineration plant.

Yet the numbers were unambiguous: With aeration consuming originally two thirds of the plant's energy budget, reduced aeration energy needs had a huge impact on the bottom line. Reduced sludge retention times during the first biological stage also helped to reduce energy consumption. Introducing a biological sludge liquor treatment stage with energy-efficient nitrification also proved very helpful. Pilot plant experiments showed that feeding digestors with relatively high dry solids concentrations around 8% was possible. This helped to reduce both the digester volume and the heat energy consumption during the raw sludge treatment stage. Altogether, these measures produced a dramatic turnaround: While using 64 million kW per year, the plant now produces an average 78 million kW, feeding 15 GWh into Vienna's electric grid.

It also produces 82 million kW heat energy, and half of that is not used in the plant but fed into the district's heating grid. The resulting reduction in energy costs promises to pay the project budget back within 15 years; or faster if energy costs remain high and rising.

The Need for Cross-Sector Dialog

The bird's eye view on the topic came from a hotel room in Bangalore, India, where World Bank Senior Water Supply & Sanitation Specialist Kris Welsien stayed on that day. Mr. Welsien stated the inevitability of a transition from linear wastewater treatment to circular systems which turn waste into valuable resources, quoting a remark from a wastewater treatment plant manager in his hometown Washington, D.C., who predicted that at a certain point, utilities will pay citizens to contribute to our sludge system because that is how financially lucrative circular systems can become down the line. The Washington utility uses thermal hydrolysis, a complex, but space-saving system that doubles the solids loading capacity, reduces greenhouse gas emissions, produces biogas as a local energy source, reduces odor and provides marketable solids that earn money as fertilizers. The overall impact on the company's bottom line is enormous.

So, while transiting to advanced treatment technologies is the smartest thinkable move in terms of finance, Mr. Welsien acknowledges that the necessary upfront investments present a vast majority of utilities with unsurmountable challenges.

A possible solution could be the approach taken by Thames Water in Great Britain. After in-depth cost analysis, the company decided to centralize sludge treatment, collecting liquid sludge from

multiple communities in dewatering centers and transporting the dewatered cake over 100 and more kilometers to a central sludge treatment center for thermal hydrolysis treatment.

Examples like this show the need for a wide national or at least regional cross-sectoral dialogue that involves many municipalities, the water sector, agriculture, energy, public transport, general waste management etc. Such a dialogue can be difficult, but if it leads to agreement on a project and the necessary financing, the return on investment for all participants is stunning. The alternative for cash-strapped utilities is a gradual long-term approach like the one taken by Sofia Water. The company has taken carefully chosen small, affordable investments steps over a 14 year-period and has now managed to achieve energy self-sufficiency.

“We need to stay curious!”

Kris Welsien closed his presentation by reminding stakeholders that no matter what their current situation is, transition will be inescapable in the long run. He invited the audience to turn to the numerous case studies compiled by the World Bank for inspiration and to investigate World Bank funding possibilities for a holistic analysis on a regional or national level to investigate options for investments into advanced wastewater treatment.

The ensuing Q&A session focused mostly on regulatory incentives and frameworks which differ wildly across the Danube region, with questions of pricing and technicalities of sludge treatment in advanced plants. It was obvious that the energy crisis impacts every utility, and that there is a keen interest in solutions: “Everybody in the sector needs to stay curious”, Kris Welsien reminded the audience. “Mind that even the most basic system optimization steps can produce energy saving effects of up to 30 per cent without the need for huge investments.”

Further information, including the presentations and recording of the webinar, can be found on our [website!](#)