BEST – Better Efficiency for Industrial Sewage Treatment

Summary of project goals and outputs

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BEST
Better Efficiency for Industrial Sewage Treatment

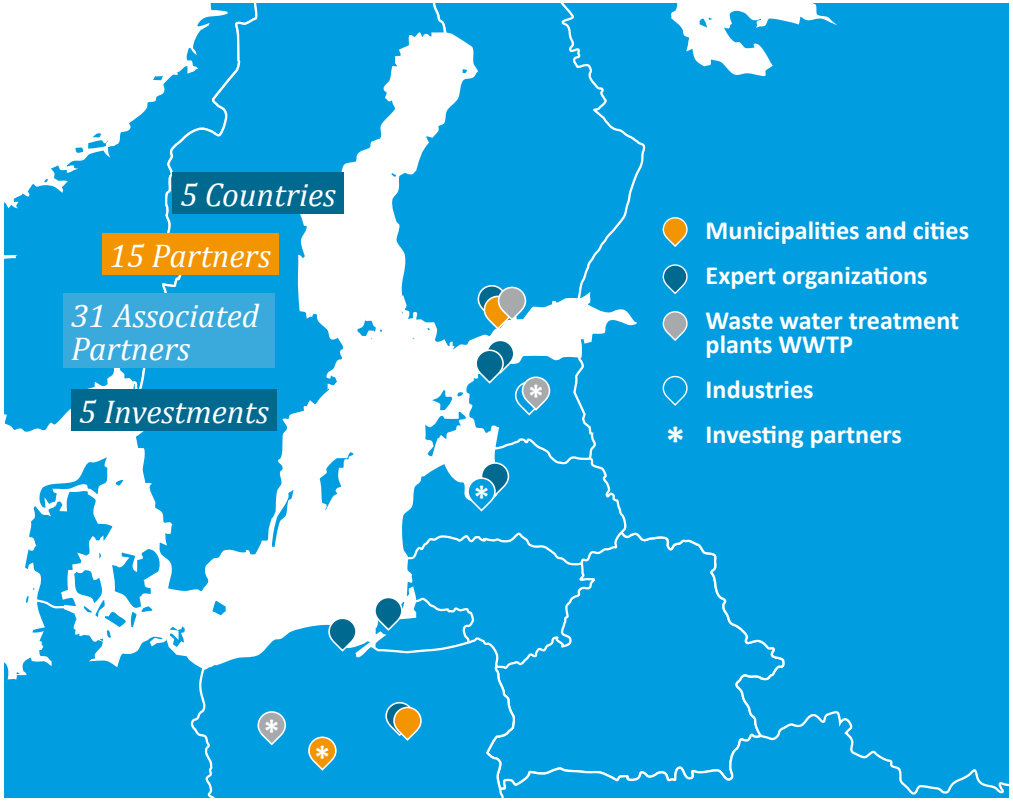
EUROPEAN UNION
EUROPEAN REGIONAL DEVELOPMENT FUND

Interreg
Baltic Sea Region

WITH FINANCIAL SUPPORT OF THE RUSSIAN FEDERATION

EU STRATEGY FOR THE BALTIC SEA REGION
FLAGSHIP

Project BEST – Better Efficiency for Industrial Sewage Treatment



BEST – Better Efficiency for Industrial Sewage Teatment was implemented from 2017–2020 to improve industrial sewage treatment in the Baltic Sea Region. The outcomes of the project help municipal wastewater treatment plants (WWTPs) handle industrial wastewater and provide industrial sectors with information on pretreatment methods and on the potential impact of their sewage at municipal wastewater treatment plants. Project outcomes enhance collaboration and best practices between municipalities, industries and water-works.

	City of Helsinki, Lead partner
	John Nurminen Foundation
	Helsinki Region Environmental Services Authority HSY
	Epiim Company
	Tallinn University of Technology
	Põltsmaa Vesi limited company WWTP
	Estonian Waterworks Association EVEL
	Riga Technical University
	Latvijas Piens LTD
	REC Poland
	Gdansk Water Foundation
	City of Warsaw
	Leszno Water Utility WWTP
	Doruchow commune
	ECAT-Kaliningrad

The current situation in the industrial wastewater treatment

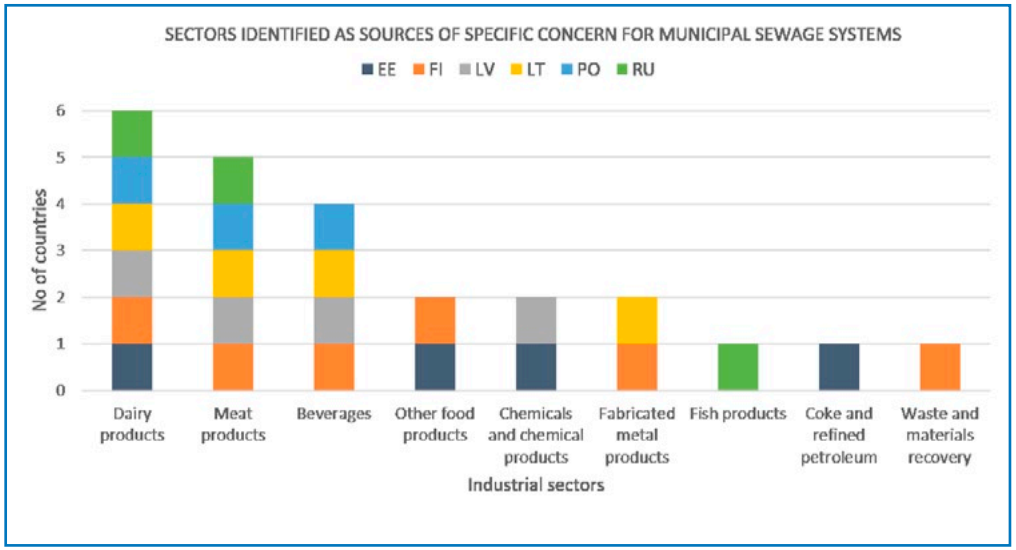
Responsible partner Riga Technical University

Goals

The project goal was to create an overview of the situation in the Baltic Sea Region about EU level and national legislation regulating indirect wastewater discharges from industries, as well as to identify the main polluting sectors in each country and their potential impact on the treatment processes at MWWTPs.

Main findings and outputs

1) Legislation on the EU, national and regional levels is mainly in order, but implementation is insufficient. Indirect discharges are often completely missing in the integrated permitting system for industries in many Baltic Sea Region countries (Estonia, Latvia, Lithuania, Poland, Russia), leaving responsibility for wastewater treatment efficiency to water utilities that have contracts with their client industries.
2) The main industrial sectors of specific concern in the Baltic Sea Region which could cause disruptions to operation and treatment efficiency at municipal WWTPs are
   - Processing and preserving of meat and the production of meat products
   - Manufacture of dairy products
   - Manufacture of beverages
3) The overall knowledge of industrial wastewater characteristics, treatment technologies and the impact on municipal wastewater systems is rather limited in both industrial organizations and water utilities.
4) In many Baltic Sea Region countries the priority and hazardous substances are not listed in contracts or integrated permits. Thus, they are not monitored by either water utilities or environmental authorities.
5) Investment in industrial wastewater pretreatment facilities should be motivated by an understanding on the part of industrial organizations of the impact of their wastewater, and not by a fining system. Formalizing the relationship between industrial organizations and municipal water utilities to ensure transparent co-operation in industrial wastewater management would improve the situation.



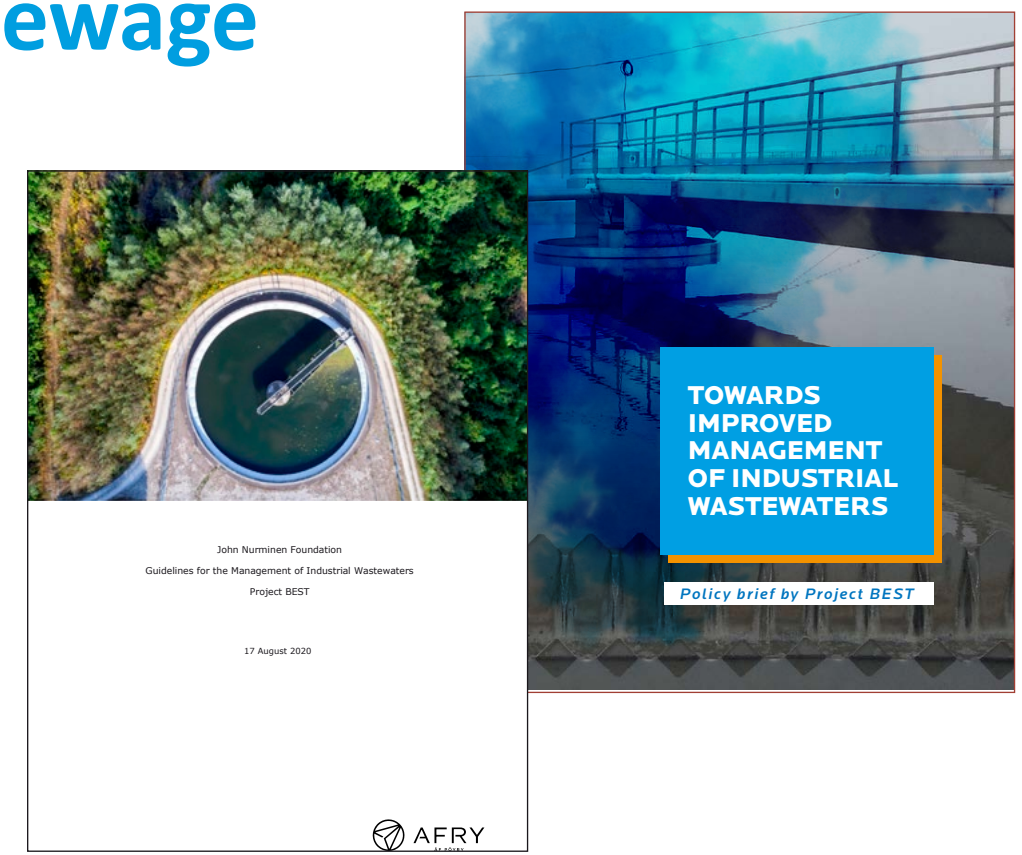
Industrial sectors identified as sources of specific concern for municipal sewage systems in Estonia, Finland, Latvia, Lithuania, Poland and Russia.

More information available on the BEST Project website at:
https://bestbalticproject.eu/about/assessing-the-current-situation-managment-of-industrial-waste-waters-in-bsr-wp2/
https://bestbalticproject.eu/wp-content/uploads/2020/09/WP2_Assessment-of-current-situation_FINAL.pdf

Information about national legislation was collected by interviewing experts in all countries that surround the Baltic Sea. Furthermore, in BEST Project partnership countries, the project partner organizations identified the industrial sectors of specific concern and interviewed individual companies from these industrial sectors, providing information about the regulation of industrial wastewater and cooperation between industrial facilities and municipal wastewater treatment plants.

Guidelines for co-treatment of industrial and municipal sewage

Responsible partner John Nurminen Foundation



Goals

The project goal was to give guidance to the legislative, permitting and supervising authorities at different levels, as well as water utilities that are affected by industrial wastewater, and industrial operators conveying industrial wastewater to the sewer, another goal was to identify the most important obstacles to the successful implementation of existing legislation and best practices, and identify potential solutions for overcoming these obstacles.

Main findings and outputs

According to the key challenges and recommendations, the guidelines are divided into four categories and into the national annexes for all BEST partnership countries (Finland, Poland, Estonia, Latvia, Lithuania and Russia).

- Guidelines for legislative and institutional developments
- Guidelines for the co-treatment and pretreatment of industrial wastewater
- Guidelines for industrial wastewater contracts
- Guidelines for cooperation

The policy brief provides specific recommendations for industrial operators, environmental authorities, wastewater treatment plants and policy makers.

Guidelines document and Policy Briefs in different languages are available at: *https://bestbalticproject.eu/outputs/guidelines-for-management-of-industrial-wastewaters/*

The guidelines are based on the workshops, interviews and meetings conducted by BEST project partners and their national groups of experts representing, for example, water utilities and industrial associations, environmental authorities, consultants and universities. The John Nurminen Foundation and AFRY Finland Oy gathered this gained information in the guidelines and policy brief documents.

Examples of recommendations in Policy Brief

Recommendations for industrial operators

Industrial operators are responsible for monitoring the quality of their wastewater and for meeting set limit values.

Increased industrial wastewater fees cover increased treatment costs for water utilities caused by industrial wastewaters.

On-site pretreatment is necessary if the industrial operator is unable to meet limit values and restrictions. If hazardous substances cannot sufficiently be removed, the wastewater should be delivered to a hazardous waste treatment plant.

Industrial operators must immediately inform the water utility on exceptional emissions into the sewer.

Recommendations for environmental authorities

Environmental permitting should be free from economic and political interests.

Water utilities should be heard in the permitting of industries.

Environmental permits should include relevant requirements for industrial wastewaters.

The dilution strategy is not an acceptable method of dealing with pollution.

Monitoring should be planned case-specifically according to the amount and quality of wastewater, and pollutants and hazardous substances potentially ending up in the wastewater.

Recommendations for wastewater treatment plants

WWTPs must prepare for possible problems caused by industrial wastewaters and plan and rehearse needed actions beforehand.

Water utilities should set up yearly meetings with industrial operators and environmental authorities.

Water utilities should be aware of the source, amount and type of industrial wastewaters and conclude contracts with industrial customers with the highest loads and risks.

Water utilities should keep contracts up-to-date.

Recommendations for policy makers

In addition to industrial wastewater contracts, permits with limit values are necessary for industries discharging considerable loads or causing risks.

Economic and industrial policies should not be made at the cost of water utilities, WWTPs and the environment.

Authorities should have sufficient resources and power to intervene with misconducts and non-compliance. Legislation should not prevent sampling of industrial wastewaters without prior notice.

The main purpose of controlling industrial wastewaters should not be in achieving financial benefit, but preventing pollution.

To support the utilisation of the best available knowledge in the regulation of industrial wastewaters, limit values and terms of sanctioning should be harmonised nationwide.

Toolbox of best practices

Responsible partners Gdansk Water Foundation and Estonian Waterworks Association

Goals

Project BEST aimed for increase knowledge and cognitive capacity of wastewater treatment plants (WWTPs), industrial companies, as well as local and regional authorities, in order to support more efficient co-treatment, management and monitoring of industrial wastewater.

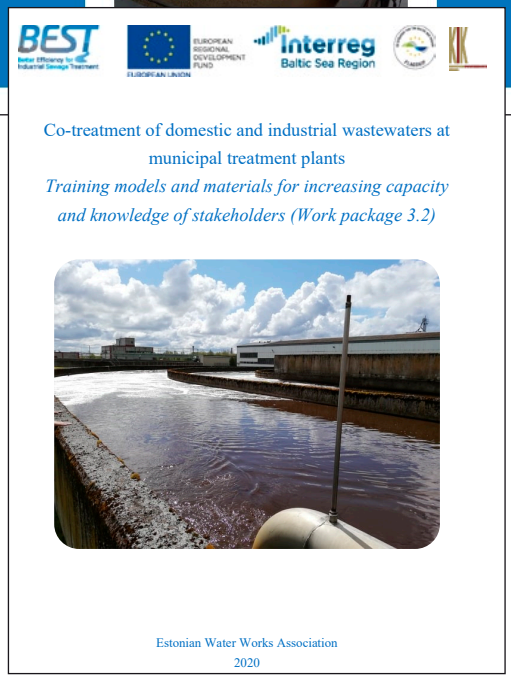
Produced outputs and documents

Good practices and achievements collected during the project were stored in a Toolbox of best practices. The best practices are presented in the Toolbox as tool cards, each card representing one good practice. The themes of the Toolbox are automation and monitoring, cooperation, education and training, phosphorus recovery, pretreatment practices and methods for industries and the utilization of sludge.

Ideas, experiences and examples of arranging seminars, workshops and training were collected in a Training concept manual.

Toolbox and Training concept manual available on the BEST Project website at:
https://bestbalticproject.eu/outputs/toolbox/
https://bestbalticproject.eu/wp-content/uploads/2020/09/Training-Concept_FINAL-with-tools.pdf

The capacity-building work included six international thematic workshops and study visits. The project partners also organized national capacity-building events. This work resulted in best practice tools, learning materials and training models to facilitate further training events and more efficient management and co-treatment of industrial wastewater nationally and in the Baltic Sea Region.



Examples of the toolsheets in categories ”Cooperation” and ”Automation and monitoring”

MEETINGS BETWEEN WWTP AND INDUSTRY

CHALLENGE

When industrial waste water is released to municipal sewers, a lack of cooperation between the industry and municipal waste water treatment plant (WWTP) can lead to misunderstandings of local circumstances and the process capacity of both parts, deficient industrial contracts and fines, barriers to communication, as well as a lack of trust and knowledge transfer. Regular cooperation in the form of site visits and meetings at both facilities benefits both parties and results in overall better and more stable management of industrial waste waters.

For more info: Project BEST- Better Efficiency for Industrial Sewage Treatment
www.bestbalticproject.eu

Project BEST- Better Efficiency for Industrial Sewage Treatment

SOLUTION: REGULAR MEETIN AND SITE VISITS BETWEEN AND INDUSTRY

Helsinki Region Environmental Service Authority the Helsinki metropolitan area in Finland) and its gular meetings. These meetings and site visits bet dustry help in creating a common understanding ter management. The WWTP receives information knowledge of where the waste water is formed, a in process control. Industry increases its awaren to the co-treatment of industrial and municipal kind of loading (quality and quantity) is especiall kind of pre-treatment could be suitable.

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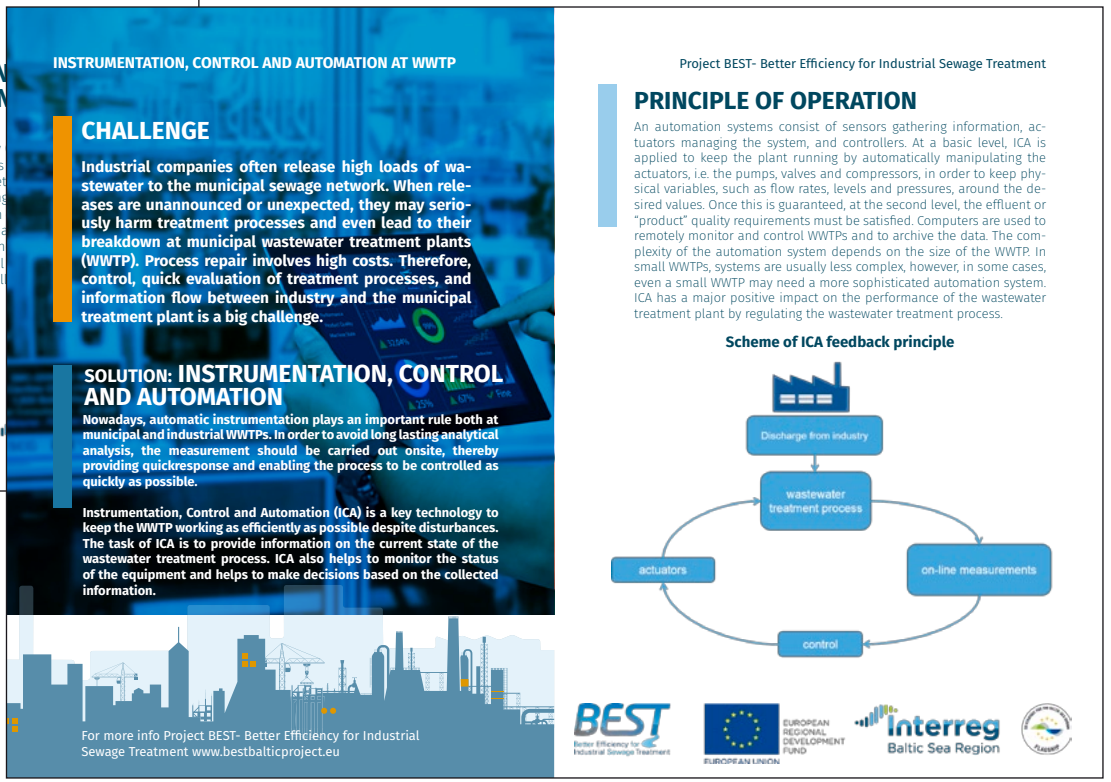

INSTRUMENTATION, CONTROL AND AUTOMATION AT WWTP

CHALLENGE

Industrial companies often release high loads of wastewater to the municipal sewage network. When releases are unannounced or unexpected, they may seriously harm treatment processes and even lead to their breakdown at municipal wastewater treatment plants (WWTP). Process repair involves high costs. Therefore, control, quick evaluation of treatment processes, and information flow between industry and the municipal treatment plant is a big challenge.

SOLUTION: INSTRUMENTATION, CONTROL AND AUTOMATION

Nowadays, automatic instrumentation plays an important rule both at municipal and industrial WWTPs. In order to avoid long lasting analytical analysis, the measurement should be carried out onsite, thereby providing quickresponse and enabling the process to be controlled as quickly as possible.

Instrumentation, Control and Automation (ICA) is a key technology to keep the WWTP working as efficiently as possible despite disturbances. The task of ICA is to provide information on the current state of the wastewater treatment process. ICA also helps to monitor the status of the equipment and helps to make decisions based on the collected information.

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PRINCIPLE OF OPERATION

An automation systems consist of sensors gathering information, actuators managing the system, and controllers. At a basic level, ICA is applied to keep the plant running by automatically manipulating the actuators, i.e. the pumps, valves and compressors, in order to keep physical variables, such as flow rates, levels and pressures, around the desired values. Once this is guaranteed, at the second level, the effluent or "product" quality requirements must be satisfied. Computers are used to remotely monitor and control WWTPs and to archive the data. The complexity of the automation system depends on the size of the WWTP. In small WWTPs, systems are usually less complex, however, in some cases, even a small WWTP may need a more sophisticated automation system. ICA has a major positive impact on the performance of the wastewater treatment plant by regulating the wastewater treatment process.

Scheme of ICA feedback principle

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Investments and pilots

Responsible partners Doruchów Commune, Põltsamaa Vesi, Latvijas Piens, Epiim, Leszno Water Utility WWTP, Tallinn University of Technology and Riga Technical University

BEST Project partners invested in new solutions for industrial wastewater treatment and created and tested pilot devices and methods for enhancing wastewater treatment and sludge utilization. The investments and pilots were conducted at municipal wastewater treatment plants (WWTP) and in the dairy and food industries. Concurrently, the work aimed to improve cooperation between WWTPs and their industrial clients.

All investments are presented on the BEST Project website: *https://bestbalticproject.eu/about/pilots-at-wwtps-and-industries-wp4/*

New wastewater treatment line with calcium silicate filtering

Doruchów Commune's municipal WWTP separated the treatment of industrial and municipal wastewater and built a new treatment line for industrial wastewater. The new treatment line includes the tertiary filtration of phosphorus based on calcium silicate, which removes phosphorus without any chemicals and enables full phosphorus recovery because the used filter media can be utilized as a fertilizer.

Portable sampling equipment for a municipal WWTP

A portable automatic water sampler was purchased to increase the wastewater monitoring capacity at Põltsamaa municipal WWTP. As the sampler is portable, it enables the municipal WWTP to monitor its customers' wastewater discharges in situ with increased reliability around the whole catchment area, which helps the municipal WWTP achieve better and more efficient process control.

Investments and pilots

Flocculation pretreatment process for a dairy company

The Latvijas Piens cheese factory and dairy in Latvia discharges its wastewater to the Jelgavas Udens municipal WWTP. The wastewater contains a high concentration of BOD and nutrients. Thus, pretreatment and better process control were needed at the dairy company's production facilities in order to enhance the treatment results at the municipal WWTP.

Latvijas Piens invested in a flotation and flocculation wastewater pretreatment process. Wastewater from the dairy plant is directed to the buffer tank to equalize of the concentration and flow. After equalization, the wastewater stream is pumped into the flocculation- flotation system for the removal of suspended solids, fat, oil and grease. After pretreatment, the generated sludge and the collected flocs can be utilized for biogas production.

Regulation tank for a cheese factory

The Epiim cheese factory and dairy in Estonia discharges its effluent wastewater to the Põltsmaa Vesi municipal wastewater treatment plant. Epiim pretreats its wastewater through a flotation process before discharge. However, the process was not functioning optimally due to inefficient regulation.

Epiim invested in a regulation tank in order to equalize the water flow for optimal functioning and capacity of the flotation process. The regulation tank reduces hydraulic peaks to the pretreatment facility, balances the industrial wastewater content and quality and increases the accuracy of chemical dosing. The collected flocs are utilized for biogas production.

Invest-ments and pilots

Pilot-scale fermentation unit to utilize industrial sewage for biogas production

At the water utility company in Leszno, Poland, the energy potential of the sludge produced at the municipal WWTP was previously unused. Thus, the municipal WWTP studied the possibilities of producing biogas from the sludge together with biodegradable waste from the food processing industries in the vicinity. In order to optimize quality and amount of substrates used in the co-digestion, the process was studied on a pilot scale. The pilot installation allows the interference resistance of the process to be tested, the susceptibility and efficiency of the process to be determined for individual substrates, the prediction of biogas and methane production, and the prevention of process inhibition via the early detection of adverse changes.

Testing methods for tertiary wastewater treatment

The Tallinn University of Technology in Estonia tested methods for tertiary wastewater treatment to enable the efficient removal of harmful substances and excess phosphorus from treated wastewater. Efficient tertiary treatment prevents the contamination of sewage sludge, thereby allowing it to be reused and ensuring that the wastewater treatment plant meets the phosphorus limits set for the cleaned sewage. The work was conducted using pilot scale equipment to test different filter technologies (e.g. granular filter and disk filter) for efficient removal methods for harmful substances. The equipment was tested in different WWTPs in Estonia and Latvia and the applicability of the methods was estimated using wastewater samples from Poland.

Inhibitors in biological waste water treatment processes and testing MBBR technology for treating industrial wastewaters

Riga Technical University in Latvia ran laboratory scale tests in order to study the inhibitory effect of different substances on biological wastewater treatment processes. The food industry generates high-strength wastewater containing, for example, highly variable nutrient, hydrogen or salt concentrations resulting from the disinfection of equipment, among other things. Shock loads of high salinity or other substances may disrupt biological treatment processes due to osmotic pressure shock and cell lysis, thereby compromising the effluent water quality. Furthermore, a pilot scale moving bed biofilm reactor (MBBR) was tested that aimed to evaluate the effectiveness of this technology for industrial wastewater treatment and test the effect of the short-term discharge of high concentrations of sodium chloride on the biomass in MBBR.

Local cooperation models

Responsible partner John Nurminen Foundation

Goal

The project goal was to improve cooperation and communication between local stakeholders such as water utilities, industrial companies, permitting authorities and decision-makers involved in the co-treatment of industrial and municipal wastewater. Project investments and pilots provided a platform for creating new cooperation models and practices.

More information available on the BEST Project website at:
https://bestbalticproject.eu/about/cooperation/

Main findings and outputs

A summary of the work carried out by BEST partners representing WWTPs and dairies suggests that there was interest in improving knowledge of the origin and quality of industrial wastewater. Moreover, the partners considered that increased cooperation between water utilities and industrial companies was beneficial and offered opportunities for risk prevention and the joint planning of technical improvements. Their feedback was incorporated into the Guidelines for the management of industrial wastewater and its national annexes, as well as into the Toolbox for best practices.

Cooperation practices WWTPs and industries found useful and topics needing improvement

- Regular communication between operators at factories and municipal WWTPs
- Fair transfer of information about technological processing or malfunctions
- Hiring professional operators to work in the treatment plan and regular employee training
- The on-site inspections and wastewater sampling by WWTPs at industrial facilities were considered to work well as a preventive measure. Regular inspections significantly decreased the number of contractual penalties.
- The volume of industrial liquid waste transported to septage receiving stations via vacuum trucks was often seen as a problem. Industrial wastewater suppliers need more information about the procedure and they should be more aware of their duties regarding the discharge of this type of wastewater into the sewage system.
- In addition, municipal wastewater treatment plants and industrial wastewater suppliers were encouraged to
  - exchange knowledge of pretreatment in order to improve the quality of the discharged wastewater
  - consider the gradual automation of industrial wastewater quality control directly at the suppliers' premises

The project was co-financed with support from the Interreg Baltic Sea Region Programme 2014–2020 (European Regional Development Fund ERDF and the European Neighbourhood Instrument ENI and with financial support from the Russian Federation). The project's total budget was EUR 3.4 million.
https://www.interreg-baltic.eu/home.html

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