



PURE ACTIONS FOR BALTIC SEA PROTECTION

–Reducing phosphorus load from municipal waste waters



Photo: Shutterstock/Skyfish

CONCRETE JOINT ACTIONS FOR BETTER SEA

The Baltic Sea suffers from overload of nutrients that causes severe eutrophication with symptoms like algal blooms, overgrowth of reeds and dead sea bottom. Good state of the water environment is important for attractiveness, living conditions and welfare of the local communities. Advanced phosphorus removal and proper sludge management in municipal waste water treatment are fast and cost-efficient ways to reduce the eutrophication problem of the unique and sensitive Baltic Sea. The Baltic Sea countries are committed to reach the HELCOM Recommendation 28E/5 for municipal waste water treatment, aiming at strict 0.5 mg/l concentration of phosphorus in treated sewage .

In PURE project, partner waste water treatment plants have implemented investments and operational fine-tuning in Belarus (Brest), Estonia (Kohtla-Järve), Latvia (Riga and Jurmala) and Poland (Szczecin and Gdansk). The exemplary forerunners have provided benchmarking of advanced sewage and sludge treatment practices (Lübeck from Germany) and data management (Mariehamn from Finland). PURE aim is an annual reduction of 300-500 tons of eutrophying phosphorus load to the Baltic Sea.

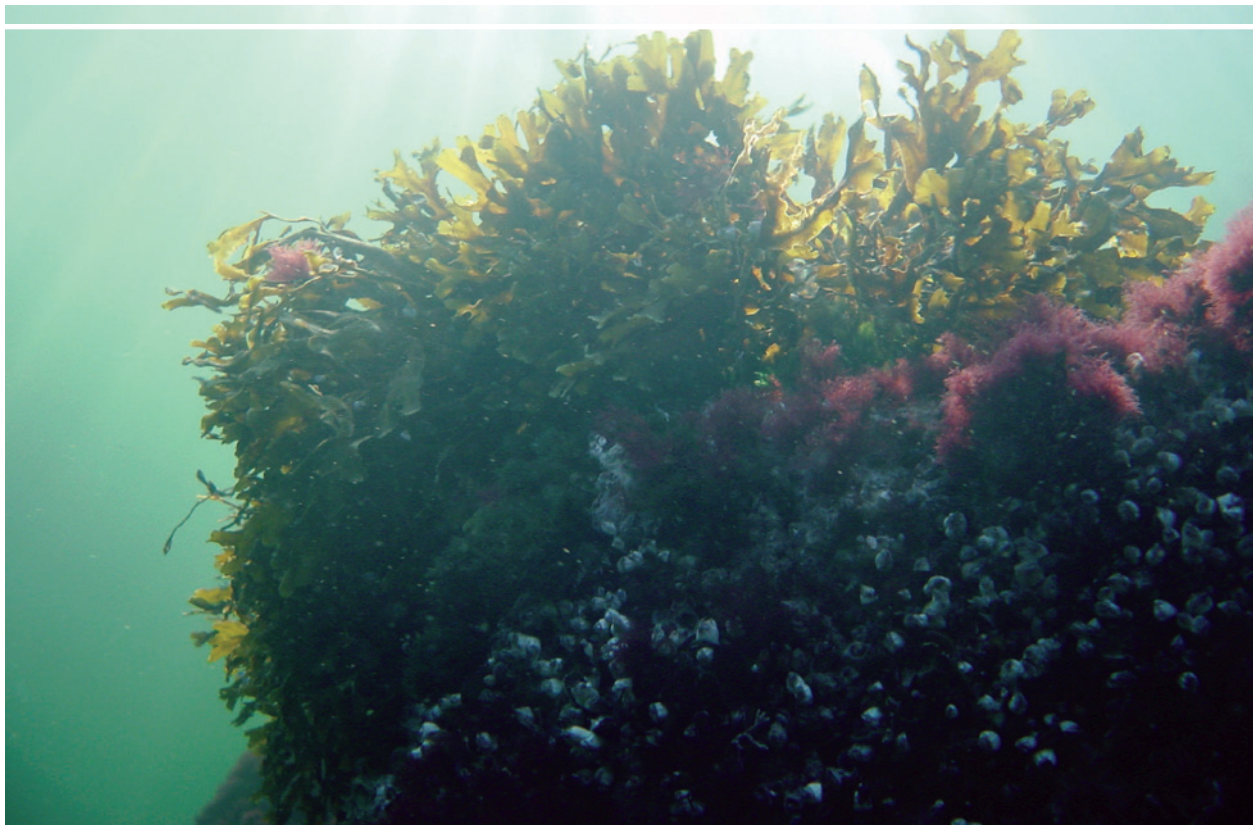


Photo: Samuli Korpinen, HELCOM.



Photo: SIA Rigas Udens.

INVESTMENT IN RIGA DAUGAVGRIVA WASTE WATER TREATMENT PLANT

When joining the PURE project, Riga Water had identified three rapid measures to reduce the amount of phosphorus discharged to the Gulf of Riga from Riga Daugavgriva waste water treatment plant (1 000 000 population equivalents). These measures were to purchase and install:

- storage and dosing tanks for phosphorus precipitation chemical to improve the phosphorus removal efficiency;
- magnetic flow meters to provide exact waste water flow measurements needed in steering of the process, and
- an additional sludge thickening centrifuge to achieve the necessary capacity for excess sludge removal and to prevent wash-outs of activated sludge.

The flow meters and a chemical storage and dosing tank were purchased within PURE Project with Baltic Sea Region Program funding and put into operation by Riga Water in spring 2012. The centrifuge was delivered and installed in early autumn 2012. Another chemical storage and dosing tank will be purchased by funding from John Nurminen Foun-

dation in 2012 to allow both pre- and simultaneous precipitation of phosphorus and to ensure full implementation of the HELCOM recommendation on phosphorus removal.

The effect of these investments in phosphorus load reduction is significant: in comparison with the situation without chemical precipitation, over 100 tons less phosphorus is discharged annually from Daugavgriva waste water treatment plant. In addition, sludge wash-outs that have been estimated to contain up to 10 tons of phosphorus each, will be avoided.

During 2012, Daugavgriva waste water treatment plant is self funding the major renovation works that will introduce the enhanced biological nitrogen removal process. After the reconstruction has been completed, the chemical treatment will continue to support the phosphorus removal process and be a part of overall treatment to achieve the required results.

Daugavgriva waste water treatment plant was presented to PURE partners in autumn 2010 when Riga water hosted a technical workshop of the project.

INVESTMENT IN JURMALA SLOKA WASTE WATER TREATMENT PLANT

In PURE project, Jurmala Sloka waste water treatment plant represents a small waste water treatment plant: it treats the waste waters of approximately 30 000 inhabitants. Sloka has been taken into operation in 2008 and it has enhanced biological nitrogen and phosphorus removal. The purified waste waters are discharged from Sloka to river Lielupe that flows to the Gulf of Riga. Within PURE project, a technical study was commissioned at Sloka to identify ways to further improve the waste water treatment performance of the plant.

On the basis of the technical study, following investments were chosen to be realized within PURE project:

- to purchase and install new measurement and control instrumentation;

- to divide the anaerobic and aerobic zone to internal zones and to lower the walls between the anaerobic and aerobic zones, and
- to purchase and install new polymer unit to improve sludge treatment.

These investments help the Sloka treatment plant operators to balance the nitrogen and phosphorus removal performance and to achieve more constant results, to prevent problems with bulking sludge and sludge washouts and to achieve better energy efficiency. The measurement equipment has been taken into operation in spring 2012 and the project is completed during autumn 2012 with the installation of the new polymer unit and walls. After the PURE project, the problem of insufficient nitrification at low temperatures is planned to be tackled with tank insulation.



Photo: PIU Jūrmalas Udens.

INVESTMENT IN BREST WASTE WATER TREATMENT PLANT

Brest waste water treatment plant treats the waste waters of the city of Brest with over 300 000 inhabitants and several industrial installations. The waste waters are discharged to river Bug – a tributary of river Vistula that flows to the Baltic Sea. Brest waste water treatment plant has a conventional activated sludge process for the removal of biologically degradable organic matter.

In a technical audit that was carried out in PURE, the introduction of chemical phosphorus removal was identified as the most cost efficient way to improve the treatment efficiency of Brest waste water treatment plant. With chemical precipitation it is possible to remove up to 200 tons of phosphorus from the outgoing waste waters annually.

PURE investment in Brest waste water treatment plant consists of:

- renovation of old pre-aeration tanks to chemical dilution, storage and dosing tanks;
- supply and installation of instrumentation for chemical dosing and its controlling, and
- laboratory equipment.

Construction works in the chemical tanks and pumping room are to be completed in November 2012. Supply and installation of equipment (e.g. pumps, pipes, analyzers) will take place in spring 2013. The facilities for chemical precipitation will support the waste water treatment in Brest also after the expected reconstruction of the treatment plant for biological nutrient removal has been realized.



Photo: John Nurminen Foundation.



Photo: Entsorgungsbetriebe Lübeck.

LÜBECK CENTRAL WASTE WATER TREATMENT PLANT AS AN EXAMPLE OF GOOD PRACTICES

Lübeck Central waste water treatment plant is operated by the organisation Entsorgungsbetriebe Lübeck, responsible for waste water and waste management as well as street cleaning in the city. The Central waste water treatment plant treats the waste waters of 350 000 population equivalents with biological nitrogen and chemical phosphorus removal. In addition, the plant is equipped with a modern 2-step filtration enhancing the waste water purification results. HELCOM recommendations of nutrient removal are achieved constantly: in 2011, the average nutrient concentrations in outgoing waste waters were 0.18 mg/l for phosphorus and 6.95 mg/l for nitrogen.

The sludge handling process in Lübeck consists of large primary sedimentation units, belt thickeners for excess sludge, digesters for stabilising and chamber filter presses for sludge dewatering. The sludge fed to dewatering is conditioned with lime and after dewatering the sludge is completely disposed to agriculture. Constant development work is done at the waste water treatment plant to improve the purification results as well as to increase the sustainability and energy efficiency of the processes of waste water treatment and sludge handling. Recent development work and future plans include, for example, the optimisation of the biological process for



Photos: Entsorgungsbetriebe Lübeck.

more efficient nutrient removal and lower energy consumption. Also ways to improve the mixing of sludge in the digesters and new solutions for sludge disposal (e.g. mono-incineration) have been considered.

In PURE project Entsorgungsbetriebe Lübeck has been active in sludge related activities; hosting a sludge workshop in autumn 2011 and providing content for the book of good sludge handling practices. The publication is available online at www.purebalticsea.eu.

PURE BENCHMARK

– New data tool for water companies and municipalities

PURE has produced a new web-based benchmarking service for municipal water companies and cities in the Baltic Sea region. The user-friendly PURE BenchMark has been developed by PURE partner Mariehamn town. The PURE BenchMark is developed for practical local needs like reporting, and an individual water company or a municipality has a direct access to the service through internet with a possibility to add and update its own data whenever there is a need to. The best treatment plants and municipalities are highlighted and promoted in public BenchMark graphs for their exemplary work.

The PURE BenchMark gathers descriptive information about the technology used and nutrient contents of the treated waste waters from individual waste water treatment plants. It encourages to benchmark by showing the best results, and assists in updating of the HELCOM monitoring of municipal

pal waste water treatment and loading in the Baltic Sea region.

Treatment plant information needed:

- Year of data, location & contact info, capacity, waste water treatment & sludge management as check boxes, nutrient data, energy management data

Municipality information needed:

- Year of data, location & contact info, which treatment plant and how many population equivalents are connected (one record for each treatment plant contracted by the municipality)

The screenshot displays the PURE BenchMark web application in a Mozilla Firefox browser. The page has a header with the PUREBM logo and a navigation bar with links: WELCOME, ADD RECORDS, FIND RECORDS, and BENCHMARK. Below the navigation bar, there are two main sections. On the left, the 'ADD RECORD' section includes expandable menus for 'GENERAL', 'NUTRIENTS', and 'SLUDGE ENERGY', a 'Source of data' dropdown menu set to 'annual report', a 'Notes' text area, and a section for 'ACTIVITIES FOR IMPROVEMENT OF WASTEWATER TREATMENT/SLUDGE HANDLING AT THE WWTP'. On the right, the 'ADD GENERAL INFORMATION' section contains form fields for 'Year' (1999), 'Country' (Åland/Finland), 'Waste water treatment plant' (Uusika), 'Process' (with checkboxes for 'Primary treatment (e.g. silt removal, sedimentation)', 'Conventional activated sludge treatment', 'Enhanced phosphorus removal, chemical', and 'Enhanced phosphorus removal, biological'), 'In Operation since, year' (1980), and 'WWTP Capacity (person equivalents)' (100000). A blue tooltip bubble points to the 'Year' field with the text: 'Indicate the year when the last essential upgrading was made: YYYY (Numbers, only)'. The browser's address bar shows 'http://www.purebenchmark.net/'.

www.purebenchmark.net

www.purebalticsea.eu

PROJECT PARTNERS

- Union of the Baltic Cities Commission on Environment Secretariat, UBC commission on Environment
- John Nurminen Foundation
- Baltic Marine Environment Protection Commission HELCOM
- Riga Water
- Jurmala Water
- Brest Municipal Water and Wastewater Enterprise Vodokanal
- Järve Biopuhastus
- ZWIK - Water and Sewage Company of Szczecin
- Municipality of Gdansk
- Sewage Management Facilities Lübeck
- City of Mariehamn



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