Water & Wastewater Management for 31,150 PE within 314 km²
1. Project Description

The overall objective of the IWPM-Project is to demonstrate how wastewater management and treatment technologies could be improved, increasing the quality of effluent and simultaneously reducing costs for the treatment.

The specific objective is to integrate wastewater purification through a new combination of electronic link and physical connection of sewage treatment plants (STPs). Therefore, two STPs have been selected in the Lake Duemmer Area based on a preliminary feasibility study. STP1 in Bad Essen demonstrates IWPM with modified innovative technologies and STP2 in Oster­cappeln with conventional technologies, both operated by the Wasserverband Wittlage (WVW), a public water and wastewater association.

Lake Duemmer is a registered natural habitat, where WVW has to meet stringent technical standards in compliance with the EU-Wastewater Directive, the EU-Directive on Integrated River Basin Management (IRBM) and the EU-Directive on Flora, Fauna and Habitat (FFH).
2. Project Participants

The IWPM-Project is carried out by five project participants. The WVW (Wasserverband Wittlage) is IWPM-Investor and operator of the demonstration facilities. BiW (Biwater Treatment Ltd., UK), an international leading contractor and service provider for water supply and wastewater facilities, acts as deliverer and supervisor of parts of the IWPM-technology. IEEM, the Institute of Environmental Engineering and Management at the University of Witten/Herdecke gGmbH, has lead research work with technologies to be used for IWPM. IEEM supports WVW as Scientific Advisor and contributes to project documentation and co-ordinates reporting to the EU-Life Unit.

CTU, the Czech Technical University in Prague, Department of Sanitary and Ecological Engineering, is responsible for assessing the transferability of IWPM in the EU-new member states. The same role, but focused on the EU-accending and candidate countries as well as selected developing and transformation countries, is played by STELLA Consulting, Paris.
3. Tasks

In total, nine Tasks are being carried out within duration of the Project.

Task A includes the Management and Reporting while Task B is for Preparations.

The Installation of IWPM-Components is split into three Tasks, Task C being for Installations of the Pipe Connection and Control System, Task D is for Installations regarding the Modified Wastewater Purification while Task E includes Installations for Enhanced Sludge Treatment.

Tasks F, G and H are the Operational Phases regarding IWPM-Components (Task F), Operation of the IWPM-System (Task G), as well as Demonstration of IWPM-facilities (Task H).

Task I is for the Dissemination of Project Results.

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Projectcalendar
4. Installation of Pipe Connection and Control System (PCC)

The PCC includes a 16.5 km pressurised (1 x 300 mm and 1 x 250 mm) twin pipe with bi-directional pumping stations connecting the two STPs.

The pipe equipment, which works with wastewater as well as with liquid sludge, is operated as biologically activated pipe reactor with a volume of approximately 1,950 m³. The wastewater in the pipe can be enriched with activated sewage sludge to drive the biological hydrolisation for phosphorus removal and denitrification for removal of nitrogen.

Included is an on-line monitoring and remote control system to steer pumps, valves, aerators etc. for optimum IWPM operation and to steer an optimal distribution of wastewater flows and contaminants between the two STPs, to minimise the overall discharged load.
5. Installations for Modified Wastewater Purification (MWP)

As soon as the PCC was in place, advanced purification technology became applicable and had been installed at STP1, including activated pre-sedimentation (sludge settlement and sludge pumping controlled to best hydrolysis effect) as well as a multifunctional sequencing batch reactor (MSBR).

The MSBR can be operated with great flexibility according to different inflow situations and allows simultaneous retention and degradation of nutrients.
6. Installations for Enhanced Sludge Treatment (EST)

Via the PCC, liquid sludge is transferred from STP2 to STP1 during peak periods, though STP2 continues simultaneous sludge stabilisation as far as capacities in the existing activated sludge tanks are sufficient.

Operating at better economies of scale, it became feasible to apply more ambitious technologies, including equipment for high rate anaerobic digestion and biogas utilisation.
7. Test Operations

Four main measurement campaigns were undertaken during the IWPM-Project. The first measurement campaign was to determine the status quo of STP1 in Bad Essen. The second measurement campaign was undertaken to evaluate the efficiency of the additional MSBR at STP1.

By measuring the cleaning capacity of STP1 in standard operation mode without the use of the MSBR as a first step and later in combination with the additional MSBR, the results show an improvement in cleaning efficiency regarding all relevant parameters (COD, N, P). It is to say that the MSBR is now a significant part of the enhanced treatment capacity.
In measurement campaign 3, the maximum capacity of STP1 in Bad Essen has been determined while the biological activity in the pressure pipeline between the two STPs has been evaluated in measurement campaign 4. The first part represents the standard operation mode of STP1, in the second part wastewater was pumped from STP1 to STP2 and back to STP1, while in the third part a sewage-sludge-mix was used. A biological activity in the pressure pipeline has been detected in every part and regarding all relevant parameters. However, if sewage is pumped in combination with wastewater, the biological activity is intensified.
8. Dissemination

The IWPM-system as such, the first of its kind world-wide, is an attractive target for demonstration. To disseminate the IWPM-Project results in order to prepare a further transfer of the IWPM method and technology for the best advantage to the EU environment and economy, the Project has been reported to the local and regional press and communicated during several conference visits such as at the IFAT Fair in September 2010 in Munich.

The Beneficiary WVW also invited other plant operators in the region and from outside to an Open-Door-Day. Project Partner IEEM disseminates the scientific documentation and project results via refereed journals, international conferences and expert groups (preferably expert groups of the EWA, European Water and Wastewater Association). Additionally, a website has been prepared (http://www.eu-life-iwpm.de), which is regularly updated.
9. Results

The Project demonstrates the improvement of wastewater treatment through IWPM with a reduction of nutrients discharged to the environment exceeding 40% at a cost reduction of nearly 20%.

Not only the EU-Wastewater-Directive has been fulfilled and even surpassed, but furthermore the requirements of EU-IRBM and EU-FFH in the Project area, the Lake Duemmer, a very sensitive EU-listed eco system.

The measurement campaigns undertaken state a clear improvement of cleaning efficiency with the MSBR being a significant part of the enhanced treatment capacity.

To open IWPM for all water utilities, the Project results have been documented and accompanied by a Cost:Benefit-Analysis and an Environmental Impact Assessment.

The Project delivered a transferability analysis, elaborated by CTU, Prague, and STELLA, Paris, verifying where and how IWPM could be reproduced in the growing EU and developing countries.
Sponsored by:

EU - Life - Environment Demonstration Project
Life 06 ENV/D/000478

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