

Performance analysis of combined sewage treatment plants

What technologic equipment do storm-water tanks need to have when current and future requirements are taken into account? What evaluation methods are appropriate for the reliable assessment, using standardised criteria, of the performance of combined sewage treatment plants on the basis of operational data?



The storm-water tanks in the German states of Baden-Württemberg and North Rhine-Westphalia will be categorised, to enable analysis of the performance of the tanks. A survey to compare the available data and actual operational conditions will then be undertaken on random samples. Average sedimentation efficiencies will be recorded using water samples and on-line measurements for a selection of these tanks. Performance in terms of sedimentation will be analysed in detail.

Theoretical analyses, semi-commercial-scale model tests and commercial-scale tests on lamella clarifiers, will be undertaken in order to improve sedimentation performance. The potential for improved performance will be evaluated, and proposals drafted for future dimensioning and design aimed at assuring the reliable operation of these systems.

The conclusions will consider the potential for rationalisation and improvement of all the tanks.

Project title

“Monitoring and optimisation of combined sewage treatment performance”

Project management

Karlsruhe Institute of Technology (KIT)

Project participants

- Aggerverband (water authority)
- Dahlem – Beratende Ingenieure GmbH & Co Wasserwirtschaft KG (water-management engineering consultancy)
- University of Applied Sciences Münster, Faculty of Civil Engineering, Laboratory for Hydroengineering and Water Management
- IKT - Institute for Underground Infrastructure
- UFT Umwelt- und Fluid-Technik Dr. H. Brombach GmbH (environmental-engineering consultancy)

Client

Ministry for Climate Protection, Environment, Agriculture, Nature Conservation and Consumer Protection of the German State of North Rhine-Westphalia (MKULNV)

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Inspection of culverts and pressure pipes



Field research: Inspection of a pressure pipe

This is a two Phase project examining the inspection and condition-surveying of pressure sewer pipes and culverts.

In Phase 1, the methods of use, preconditions for use and costs of available technologies for surveying the condition of pressure sewer pipes were collated. Their potential for use in pressure sewer pipes was evaluated and recommendations made.

In Phase 2, the emphasis here will be on the implementation of the recommendations for action drafted in Phase I. Factors that might cause damage to pressure sewer pipes are to be identified, order to provide operators with specific aids to enable more reliable evaluations of condition. The extent to which general principles can be evolved for the determination of condition-survey intervals will be clarified.

Inspection procedures tailored to pressure sewer pipes and recommendations for action for hydraulic pressure tests are also to be developed. A requirement profile for inspection technologies will be drafted, in order to induce manufacturers to further develop technologies adapted to suit pressure sewer

pipes.

Project title

“Inspection and condition-surveying of pressure sewer pipes and culverts: Recommendations for action on technical and economic criteria – Phase II”

Project management

IKT - Institute for Underground Infrastructure

Project participants

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Client

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Trenchless

installation

methods for district-heating piping systems



Open-trench installation of district-heating piping

Ever greater importance is being attached to the expansion of district-heating networks as energy development progresses. Costs can be saved and resources conserved by installing new piping systems using trenchless technologies.

However, the trenchless installation of district-heating systems frequently encounters scepticism due to a lack of basic knowledge about its use. A research consortium consisting of AGFW, IKT and seven other partners, now intends to identify and eliminate existing technical and non-technical factors limiting trenchless district-heating piping installation.

IKT is performing tests on wear-protection for the plastic jacket of district-heating pipes, and is also participating in market research into products and procedures for trenchless installation of district-heating piping systems.

Project title

“Identification of potentials for and limitations on the use of trenchless installation methods for district-heating piping

for comparative tests at points of material changeover/transition”

Project management

AGFW – Projektgesellschaft für Rationalisierung, Information und Standardisierung mbH

Project participants

The German federal economics and energy ministry is the client

- Brugg Rohrsysteme GmbH
- Institute for Geotechnical Engineering, Leibniz University of Hannover¹
- Weimar Research Institute for Underground and Piping Engineering
- IKT - Institute for Underground Infrastructure
- Hanover District Heating Research Institute.
- Hannover University of Applied Sciences
- Tracto-Technik GmbH
- Veenker GmbH

Client

Federal Ministry for Economic Affairs and Energy (BMWi)

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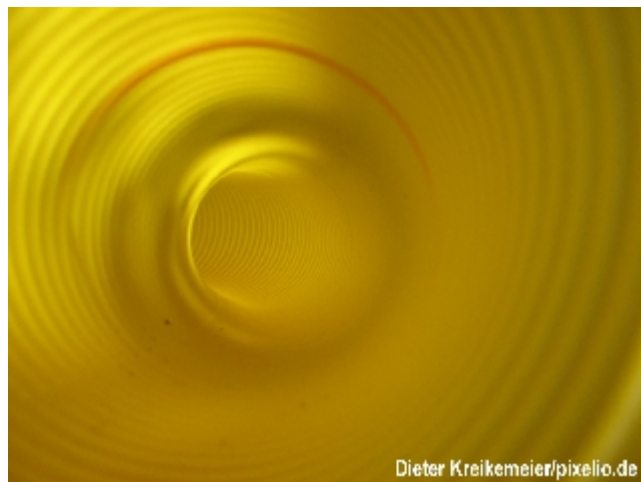
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Handling of water drainage from private sites

This study has provided guidelines for municipalities and system operators on pragmatic solutions for handling water drainage from private sites comprising:



- Recommendations and examples for assessing drainage water situations
- Conceptual solutions and methods for the assessment and selection of suitable pragmatic provisions
- Tools for supporting the implementation solutions
- Advice on communication with stakeholders in order to achieve higher acceptance of planned provisions by both the public and politicians, and to facilitate advance dialogue with supervisory authorities.

Project title

“Handling of water drainage from private sites – pragmatic conceptual solutions and aids to argumentation”

Download report

(German version only)

Long version (288 pages)

Short version (19 pages)

Project management

IKT - Institute for Underground Infrastructure

Project participants

- NRW Municipal Agency GmbH
- Billerbeck municipal waste-water utility
- Municipality of Borcheln
- City of Datteln
- Stadtwerke Essen AG municipal utility
- Immobilien und Abwasserbetrieb Herford property/waste-water utility
- Stadtentwässerung Herne AöR municipal drainage utility
- City of Iserlohn
- Municipality of Kirchlengern
- City of Plettenberg
- Rheda-Wiedenbrück municipal waste-water utility

Client

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Optimising sewer cleaning, exploiting operational synergies



Conserving resources: Sewer cleaning only when and where necessary

Cleaning is an important factor in maintaining the correct functioning of sewer system, and absorbs a significant portion of municipal budgets in North Rhine-Westphalia. It is, however, often the case that system operators' resources are not used efficiently, or that, due to inadequate knowledge of the condition of sewer systems, lengths of sewer are cleaned without this being really necessary.

The introduction of optimising sewer cleaning strategy is frequently cited as an obvious solution, against the background pressure of rising cost. However, the restructuring of cleaning strategies is not always easy for system operators since there is no universally applicable concept for implementation. Also, the effects of such changes on the drain/sewer system and on the environment can in many cases not be estimated in advance.

The basic principles of optimising sewer cleaning strategies and their operational procedures and potentials for

enhancement of efficiency have been elaborated in this research project. A large number of workshops and working meetings with sewer-system operators from all over Germany have been held to facilitate these changes for system operators. These provided an opportunity to compile and discuss the operators' problems, wishes and requirements, and their experience with the use of various cleaning strategies. These findings have been compiled to provide other system operators with assistance in the optimisation of their own cleaning strategy.



Discussing measured data: How efficient is the sewer flushing vehicle?

Comprehensive findings on the performance of HP nozzles and on the behaviour of depositions subjected to HP jetting have already been compiled in "Sewer cleaning – Nozzles, pressures, high-pressure jetting" project (Bosseler and Schlüter, 2004). The loads exerted on various pipe materials by HP jetting were also examined.

The current project examined the technical aspects of the formation and removal of depositions, with a view to optimised planning of cleaning operations (when, how often).

Scientific tests performed on a test length of sewer were used to determine how quickly depositions accumulate under defined conditions, how they change and the forces necessary to erode them. Supplementary laboratory-scale investigations studied

the generation of hydrogen sulphide and the erosion-resistance of such depositions.

The results were used to draw conclusions concerning the selection of cleaning intervals, the aim being to reduce cleaning input and effort without risking blockages or other impairment of correct sewer-system functioning.

Project title

“Investigations of optimising sewer cleaning, exploiting operational synergies – Phase 1”

Download report

(German version only)

Report (194 pages)

Annex: Materials for communications activities for promotion of strategy change (252 pages)

Working aid (9 pages)

Project management

Ruhr University Bochum, Chair of Urban Water Management and Environmental Engineering

Project participants

IKT - Institute for Underground Infrastructure

Client

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Adhesion properties of short-liners



Tensile-adhesion testing of short-liners

Short lengths of selected repair systems were tested under external water pressure to examine their potential for sealing pipes against groundwater pressure. Comparative tensile-adhesion tests were undertaken using four short-liner systems on eleven different surfaces in order to determine the factors influencing performance and any need for surface preparation when refurbishing using short-liners.

The systems predominantly exhibited good performance, and confirmed that repairs aimed at sealing against external water pressure are possible in principle. However, the extent to which differing results might be found in the case higher

water pressures and/or larger volumetric water flows remains to be determined.

Project title

“Validation of the adhesion properties of short-liners on variously pre-treated substrate surfaces”

Download Report



External water-pressure test indicating ingress of water

Concluding report (99 pages)

Project management

IKT - Institute for Underground Infrastructure

Client

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