

PiReM | Systems



PiReM DRINKING WATER



Why Rehabilitation Management?

Water supply mains in industrialized countries have grown over many decades and present complex systems today. In addition to continuous expansion they have been affected by the use of different pipe materials, variable installation techniques and exogenous environmental factors. The requirements for systematic maintenance of the pipe networks have increased due to the aging of the pipes, rising repair costs and failure rates. At the same time, legal requirements demand regulative measures in order to guarantee the security of supply for future generations (see DVGW W 401 and OVGW W 100).

Proactive rehabilitation management ensures the reliability of every pipe section. Information regarding the inspection of the networks, measures previously taken concerning damage repair and meticulous documentation in compliance with the applicable regulations provide the basis for professional planning. The close connection between asset management and asset service is considered to be the vital success factor in efficient rehabilitation management.

Why?

- Increasing pipe age
- Rising repair costs
- Increased non-revenue water
- High costs due to pipe bursts
- Growing failure rates

Goals:

- Low failure rates
- Little non-revenue water
- Quick damage repair
- Optimization of the useful life
- High supply level with low maintenance costs

An expert opinion on rehabilitation management

“The maintenance of water-pipe networks is without a doubt one of the most significant future challenges of the water suppliers. Long-term goal and condition-oriented approaches which enable optimized maintenance from both a technical and economic standpoint must be developed. For that purpose, it is necessary to create an inventory valuation system as well as regularly check the efficiency and success of measures taken. From my point of view, failure rates, non-revenue water rates and rehabilitation rates including the corresponding financial key figures are among the significant actual state and target state indicators of effective asset management systems”, DI Dr. Daniela Fuchs-Hanusch, scientific head of the PiReM project at Graz University of Technology (Austria).



Preservation of net asset values

The asset value of the pipe networks presents the most cost-intensive investment in the municipal infrastructure. Since underground pipe networks can only be assessed conditionally through direct inspection, indirect means, such as analyses of significant failure statistics, provide valuable information concerning the current state and future development of pipe networks.

Based on the decision support system PiReM (Pipe Rehabilitation Management), both the long-term and mid-term rehabilitation requirements are calculated and the financial resources required can be planned proactively.



Cost savings as a result of efficient rehabilitation management with PiReM

The software PiReM is a decision support system for the rehabilitation management of pipe networks on the basis of efficient processing of existing geoinformation. PiReM primarily answers two questions regarding rehabilitation management:

When is it economically the ideal time for the rehabilitation of a pipe leg?

How can you plan for the financial resources required in order to ensure accumulating investments in a sustainable modality?

Examining the annual failure rates is one of several key figures used in professional rehabilitation management and enables an important efficiency control by means of long-time interpretation and comparative evaluation with executed maintenance measures. The risk of failure (incidence rate x extent of damages) acts as an indicator for the calculation of the economical ideal time for the rehabilitation of a pipe leg. The efficient rehabilitation management with PiReM allows for the exploitation of economic and socio-economic benefits. Considering the ideal time for rehabilitation from an economic standpoint promotes on the one hand the reduction of repair and maintenance costs for old pipes and on the other hand the reduction of social costs, such as traffic jam resulting from repairing a pipe burst, which could permanently damage the public image of businesses. The following is an example that shows the cost saving potential using targeted rehabilitation management with PiReM:

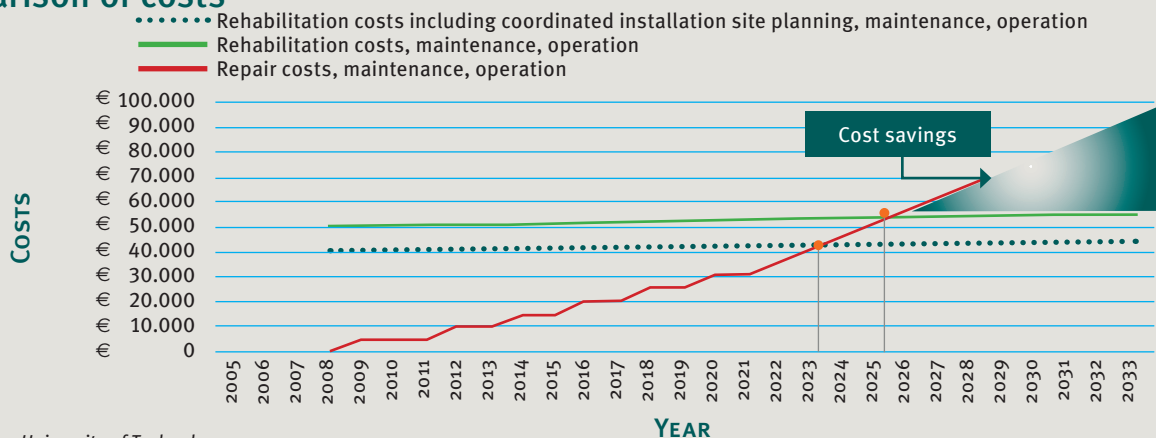
Pipe material cast iron (CI) Ø 100 mm, installation year 1933, length 200 m

Recorded failures: in the years 1975, 1997, and 2005, Ø repair costs/failure € 4,000.00 (reference date 2008).

200 m GG Ø 100 mm, 1933	Time period: 25 years Cash value rate: 2,5 % Consumer price index: 1,9 % Building-cost index: 3,500 %	Exclusive of installation site coordination	Including installation site coordination
Costs of new pipe	Installation costs 200 m x 250€/rm Reduced operation and maintenance costs	€ 65.000,-	€ 52.000,-
Repair, maintenance and operation costs of old pipe	Total of repair costs*= $\sum_{i=2008}^{2033}$ Actual cash value of repair costs, maintenance and operation	€ 94.100,-	€ 94.100,-
Costs savings		€ 29.100,-	€ 42.100,-

* Provision for building key and consumer price index

Comparison of costs



* Source: Graz University of Technology

Using existing GIS data effectively

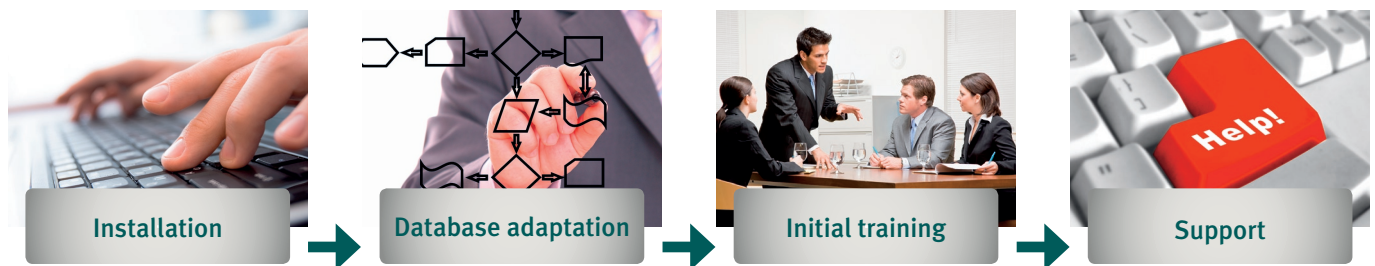
Individual GIS data is integrated into the PiReM database system through a simple interface. After the evaluation of the existing data, the water supply system is subdivided into main groups which exhibit similar attributes (see the DVGW W 401 requirement). For these homogenous main groups, suitable aging functions are modeled and initial analyses are made, such as material distribution in the pipe network and annual failure rates. Missing GIS data can be compensated for through the integration of existing standard groups and findings from scientific research projects (Graz University of Technology, Institute of Urban Water Management and Landscape Water Engineering). Supplementing the main groups with information on costs facilitates an economic examination using PiReM.

Simple use – immediate implementation – big effect

PiReM is an easy-to-use decision support system which can be directly integrated into the ongoing rehabilitation management of a business. The optimization of the rehabilitation management guarantees more security and sustainability in the planning process as well as the secured maintaining value of the important municipal infrastructure for future generations.

► ALL-IN-ONE SOLUTION PiReM

In addition to the software tool, PiReM Systems includes an extensive service package which completes the rehabilitation management with PiReM. The following services are contained in the product pack:



► ADD-ON SERVICES WITH PiReM

Years of experience of the scientific experts on the development team at Graz University of Technology and the innovative implementation by specialists from GUEP Software GmbH assure the continuous further development of PiReM.

The continuous improvement and expansion of the software is brought to the market in the form of updates. Through the return of data from the field, on the one hand, the improvement of standard groups is made possible, and on the other hand, practical findings in the improvement process are incorporated into the software tool.

In addition to maintenance, service and support of the software PiReM, the service contract comprises an annual subscription fee, which contractually ensures the software updates with add-ons and new developments as well as new versions of the software. Extensive consultation concerning data preparation, data analysis and interpretation of the analyses is provided in continuing professional trainings.

Subscription

Service contract

Standard groups

Professional training



Long-term rehabilitation management with PiReM

The annual failure rates for the different main groups are calculated using statistical methods (Herz, Weibull, log-normal and logic functions). This allows an improved estimation of the annual rehabilitation need in the entire pipe network.

The flexible choice of function parameters using PiReM and the adaptation to the specific data of the particular business enable, moreover, transparency in the scenario calculation and show the effect of individual parameters on the development of the pipe network.

The long-term rehabilitation management with PiReM helps to estimate future failures and thereby to estimate costs. Based on failure prognoses which are for individual networks as well as standardized, scenarios for individual pipe groups and the entire pipe network can be compared. Repercussions as to failure trends, middle pipe network age, or net book value can be shown. Should sufficient data regarding age-related failures not be available, values from standard groups can be drawn on for the calculation.



- Required long-term capital expenditure
- Early detection of investment requirements
- Scenarios of delayed measures
- Effect of individual factors in the pipe network

Mid-term rehabilitation management

For each pipe network operating company, internal cost data regarding renewal, rehabilitation and repair is integrated into the mid-term rehabilitation management with PiReM. Precise pipe legs within the network which are in need of renewal are filtered out by means of a criterion catalogue in the form of a priority list for necessary action. The priority list establishes a ranking of the annual rehabilitation need. Thus, PiReM enables an objective risk constraint and supports the pipe network operating company's security of supply.

PiReM does not require complex data recording in order to be able to create significant pipe network analyses and comprehensive findings for the rehabilitation management. The function table provides the necessary asset service data about the pipe network on the basis of possible pipe network analyses using PiReM.

- Internal cost data
- Prioritization of annual measures
- Cost savings of coordinated installation sites
- Economical ideal time for rehabilitation

	BASIC DATA*	FAILURE DATE	PRODUCTION COSTS
Material distribution	x		
Cohort lengths	x		
Development of network lengths	x		
Rehabilitation need (Herz)	x		
Scenario analysis/comparison (Herz)	x		
Rehabilitation need (statistics)	x	x	
Scenario analysis/comparison/statistics)	x	x	
Durability distribution, calculation with empirical data	x	x	
Failure and secondary failure rates	x	x	
Failure prognosis	x	x	
Economic rehabilitation time**	x		x
Mid-term priorities	x	Continuative network data is useable in evaluation ***	

* Material, length, diameter and installation year of the pipes

** If there are incomplete data records, failure costs can also be generated using average values or entered manually

*** User-specific pipe network data which is used in PiReM: year of installation, potential risks to pipes from stray current, corrosion or traffic load

Continuative analyses with PiReM are possible depending on how detailed the records of the asset service are. This way, local boundary conditions such as failure rates, diameters, material, public transport, stagnation zones, incrustation, corrosion, age, risk of breakage, non-revenue water and stray current are incorporated into the calculations. The defined rehabilitation priorities, visualizable in GIS, can be tested for possible synergies in the execution of construction work.

Decision support using PiReM – Pipe Rehabilitation Management

Decision support using PiReM

- Rehabilitation at the economical ideal time
- Efficient rehabilitation management by way of cost projection
- Decision support for site coordination
- Long-term maintenance of value
- Security of supply and sustainability
- Objectivity and transparency due to software-supported planning
- All-in-one solution through technical and scientific support

Online demo at www.pirem.net

Businesses that have successfully implemented the PiReM software:

Graz AG – Water Division
Wasserwerksgasse 10, A-8045 Graz

Linz AG – Water Division
Wiener Straße 151, A-4021 Linz

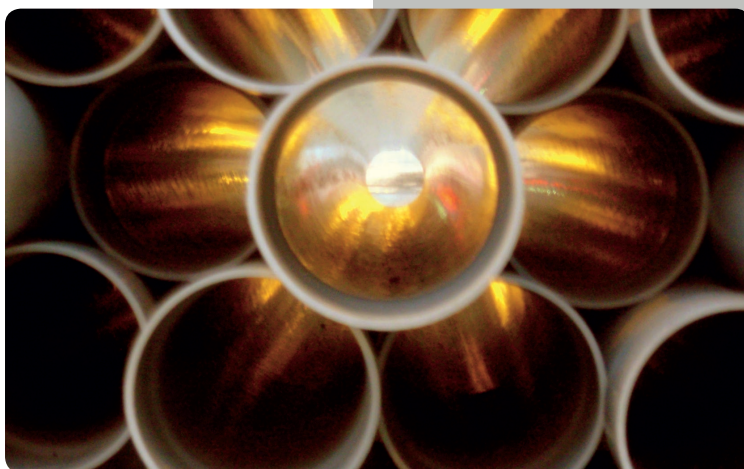
Salzburg AG – Water Division
Bayerhamerstraße 16, A-5020 Salzburg

Stadtwerke Heilbronn GmbH
(Public Utility Company)
Weipertstraße 49, D-74076 Heilbronn

Stadt Villach – Wasserwerk (Waterworks)
Klagenfurter Straße 66, A-9500 Villach

Stadt Wien
MA 31 – Wiener Wasserwerke
(Vienna Waterworks)
Grabnergasse 4-6, A-1060 Wien

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