# Cost reduction by efficient pipe rehabilitation
# with PC-programme PROFI

Failure analysis - Rehabilitation strategy - Rehabilitation planning

**P i p e   n e t w o r k**

| Failure data | Pipe data | Network grafic-GIS |

Pipe groups

Pipe sections

**Results:**
Asset analyse
Failure analyse
Service life time

**Results:**
Prognose of needs
Needs of rehabilitation
Rehabilitation strategy

**Result:**
Asset value and
its preservation

**Results-
selective maps
presentation in the GIS:**

Condition of the pipes
and the network

Priorities of
rehabilitation projects

Type of pipe material
System of rehabilitation

Network hydraulic
Diameter of new pipes
Several scenarios

**Result:**
Risc potenzial

# Safety and Economy by
# selective and planned pipe rehabilitation

# Selective rehabilitation of pipes

The results of the failure statistics are basis fort he various pipe groups:

to determine the minimum inspection intervals according to G 465/I

to determine the service life of pipe material groups

for the renovation and replacement of pipes according to G/W 401

By analyzing failures, current information on the condition of the pipe network, pipe groups, supply zones, single pipes and street sections are shown. The analysis of failures is done with lists, tables, graphical maps for different views and comparisons. The analysis of the failure dynamic (failures per km and time unit) is done for all pipes in one street or for single pipe segments to estimate local weak points in the network as a basis for replacement decisions.

Influencing factors fort he evaluation of the pipe condition are basically:

no. of failures - type of failure - long-term development of failures - and the local environment, e.g. soil, loading factor of the street.

**PROFI** analyzes the failures according to the requirements of the annual statistics of the DVGW and allows a multi-year comparison of the failure dynamics as the basis for prognoses of the network condition development.
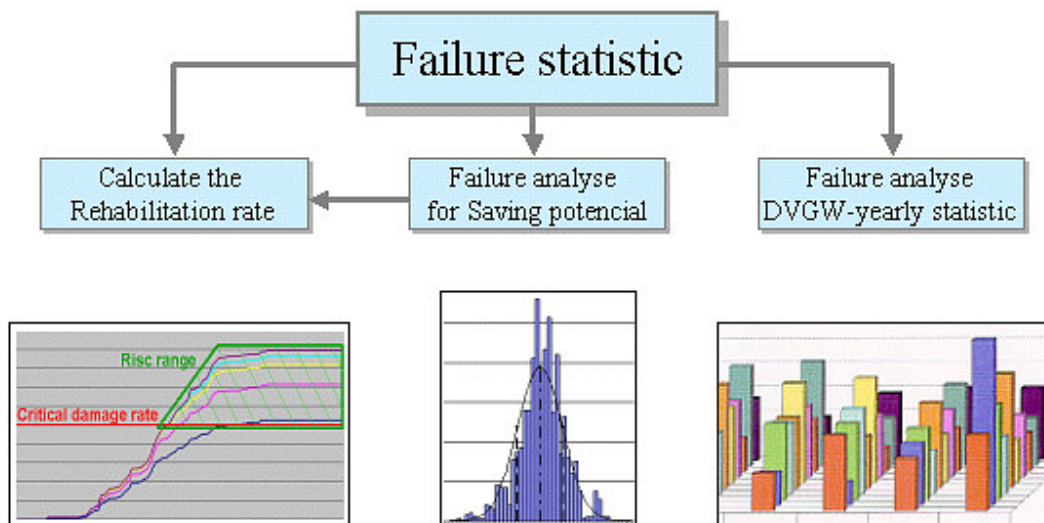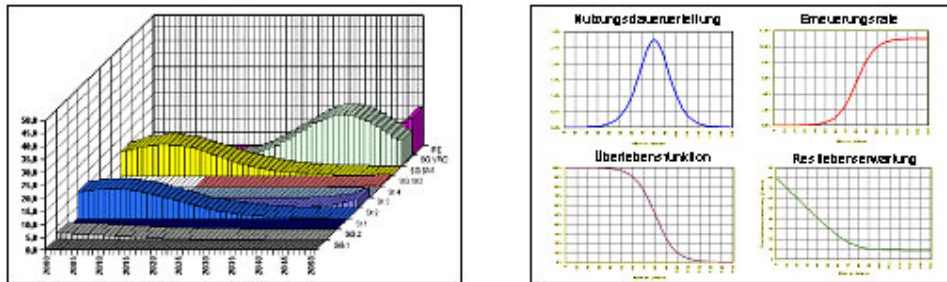
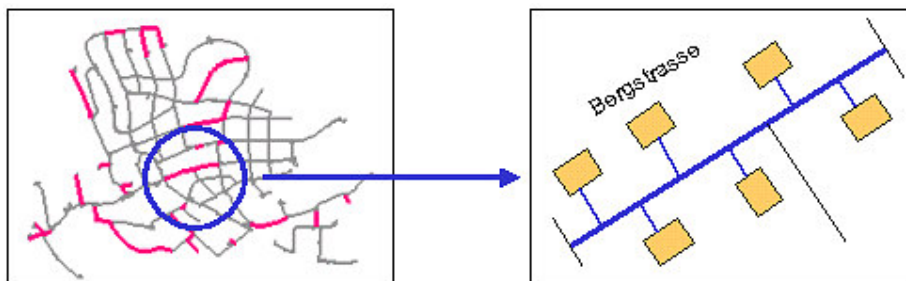# Selective rehabilitation of pipes

The rehabilitation needs in pipe networks depend on the network length and essentially on the failure dynamic (failures per km and year) and a variety of single evaluations. In addition, the costs for maintenance and inspection and other expenses are faced with the rehabilitation of a specific pipe. The software module **profi** allows the calculation of future rehabilitation needs of a pipe group within a time horizon of 20-50 years, using information on survival function, renewal rata and residual service life of specific pipe groups. Hence, appropriate rehabilitation strategies are developed and evaluated. In the software module **profi.plan** single pipes are selected for an efficient annual replacement and displayed in the GIS. By the setup of a condition-based rehabilitation management, the persons in charge get a transparent, comprehensible and documented decision basis for an economic and technical rehabilitation of pipes.

**Results in profi**



Annual replacement rate with detailed information for pipe groups within 50 years

**Results in profi.plan**



Overview and detailed annual rehabilitation programme displayed in GIS

# Selective rehabilitation of pipes

Beside the criteria for renovation and replacement of pipes mentioned below

- ➢ Condition of pipe material
- ➢ Failure rate/ Failure dynamic of pipes
- ➢ Age of pipes

The current and future hydraulic loading of a pipe is of importance. The loading and the resulting necessary dimension is calculated within real pipe network simulations. Real pipe network simulation means a mapping of the real conditions in the computer model (calibration is done by measuring). The pipe segments in the computer model comply with the real ones. Since the rehabilitation planning process for pipe networks assesses the GIS-databases, a connection between the hydraulic modelling tool and the GIS-System is necessary.

The hydraulic modelling tool **ROKA GS** has this data connection:

- ➢ a special interface to Smallworld-GIS
- ➢ a common interface to other GIS
- ➢ pipe-specific allocation of water usage
- ➢ facilities for network tracing and zone switching in **ROKA GS**

## Detail of a computer-aided renovation programme
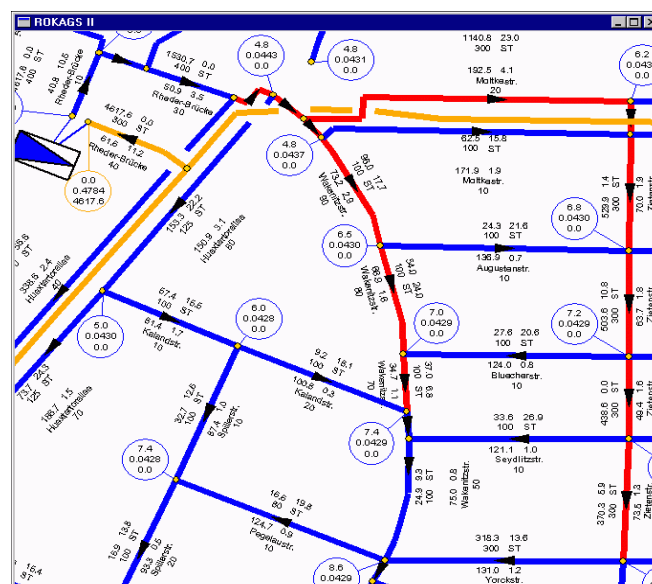


ROKA GS: Rechenzentrum für Versorgungsnetze Hartl/Wehr, Düsseldorf