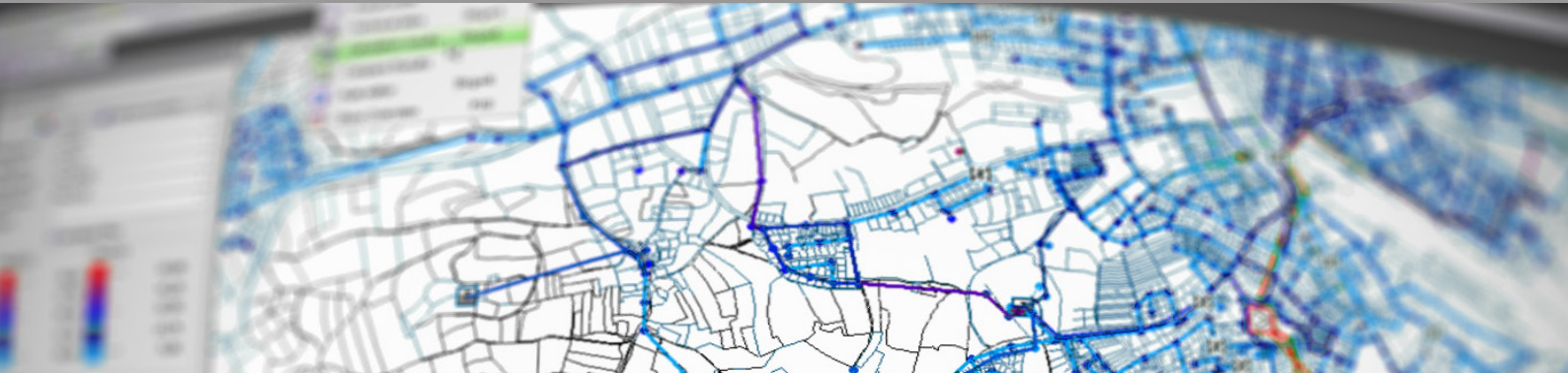




# Fraunhofer

## SYSWASSER

FRAUNHOFER WATER SYSTEMS ALLIANCE (SYSWASSER)



## HYDRODYN: DYNAMIC CALCULATION OF WATER AND GAS DISTRIBUTION NETWORKS

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### Background

Any system for the provision to customers of piped gas or drinking water must be effective in ensuring total continuity of supply, both as to quality and quantity. For any regulation program, computational modelling of the supply system will involve mathematical descriptions and consideration of the various operational constraints and technical limits. In tackling the task, it is a valuable strategy first to optimise all the operational processes, referring to system data already recorded and using computer-assisted simulation tools. From 1995 to 2007, it was an ongoing project of the Fraunhofer AST in Ilmenau to work with numerous suppliers of drinking water and design a decision support system which would be suitable for use in optimal management of piped drinking water or natural gas.

### Results

Models and their simulated results are compared in practice with data captured online, so that they can be validated. When supply systems are attempting to fulfil very varied demands, this simulation is of especial significance. Such systems defy even the experts attempting to find an approximately optimal strategy on the basis of experience and/or mental modelling. Any attempt to regulate different parts of the system separately as a means of optimising the whole is doomed to failure. The models available in HydroDyn can be used in conjunction with simulation and optimisation methodology will find the best ways of managing daily operation, planning and improvement for the supply network. They also help with less ordinary situations or bursts and with the calculation of scenarios for imagined operational conditions.



**Result**

It is only possible to operate water utility networks (which are so varied in nature) reliably and efficiently if the operator has a vast amount of experience. The aim of the project has therefore been to present operators and managers with a decision support system to speed up professionally valid choices. The Fraunhofer AST now provides powerful simulation tools capable of calculating grid conditions on a dynamic, timed basis, reflecting not only the hydraulic conditions and the water quality but also how complex pipe-work systems and their associated machinery can be used most economically. In actual use, there are five steps to follow:

1. Recording and analysis of the relevant data
2. Schematic representation and modelling of the supply network
3. Initial simulation
4. Calibration of the model
5. Simulation, regulation, commercial management, scenario proposals, unified planning, proposed reconstruction work

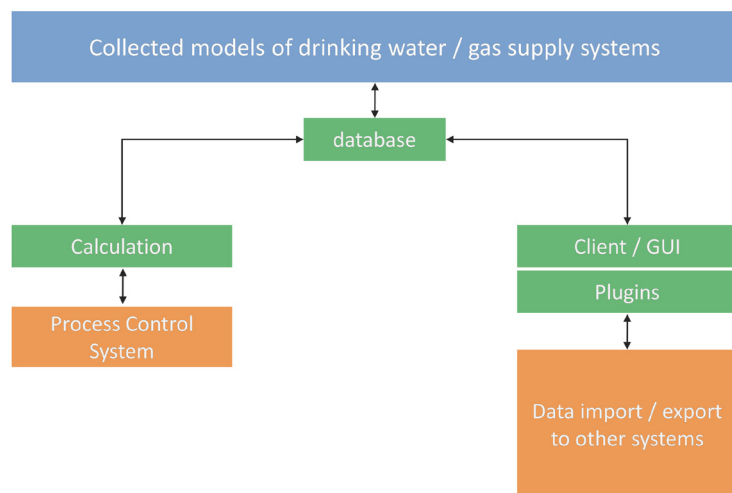
The results of this procedure are analysed and used by the customer directly in the relevant water supply situation. This opens for the operator of supply networks new possibilities of simulation and monitoring and thus of optimal management of all stages. Once this optimal strategy and technology has been incorporated, companies will be able to focus on better sustainability and economy in the use of both gas and water as resources.

**Future prospects**

When the system has been connected to the overall supply system, online data collection and management of various relevant process measurements will provide a basis for continued realtime monitoring and regulation of daily operation. It will be necessary to design the interface (with OPC, for instance) by which this connection to the overall supply is made. There are optimisation algorithms and methods by which HydroDyn can be extended to permit optimal management of operations and reduce operational costs.

**Customers**

HydroDyn is already being used internationally, in, for example Mongolia, Libya and Saudi Arabia, as well as in such German towns as Hof and Marburg. The actual users of the system are those providing utilities, both water and gas and both public, private and communal enterprises.



**2** *HydroDyn supports an automated leak detection system in a big water distribution pipework in Libya*