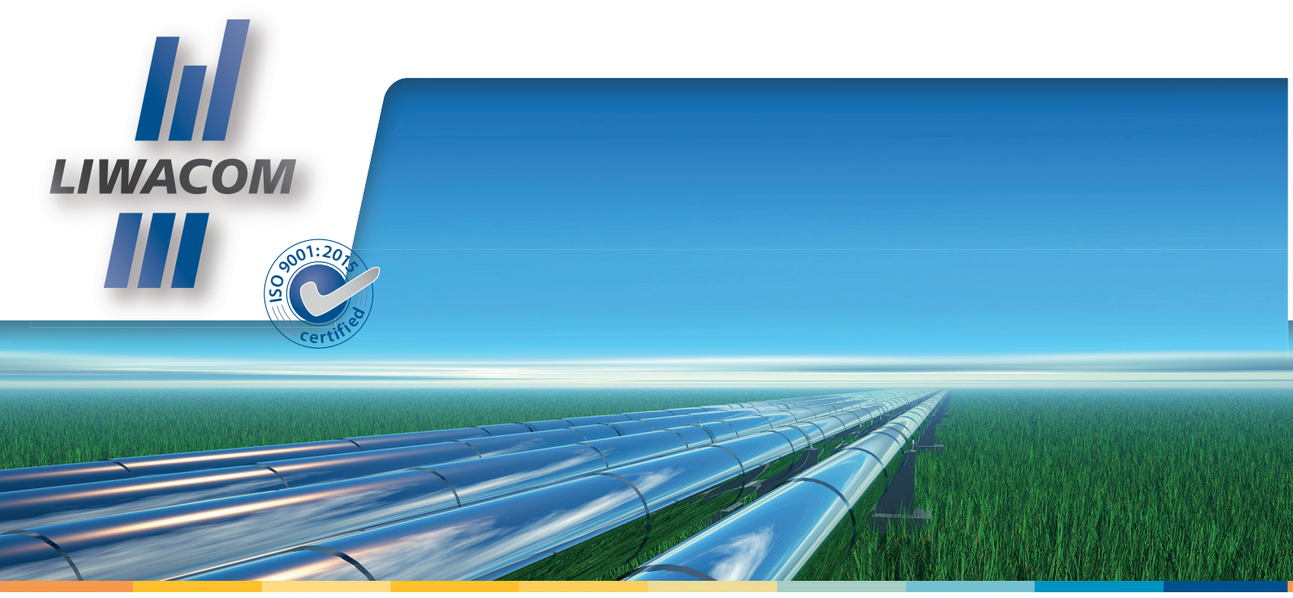

Pipeline Simulation is Our Mission

About us

LIWACOM is the leading global supplier of pipeline application software.

LIWACOM was founded in Germany in 1988. Our customers are the major gas transmission companies such as Open Grid Europe, GasUnie, GRTgaz, FLUXYS, National Grid, SWISSGAS.

Three decades of focal commitment to the pipeline industry results in the unmatched SIMONE standard software product. SIMONE is a joint product of LIWACOM and of SIMONE Research Group.

Our Product

Product standardization is unique and covers all applications, computer platforms and customized installations.

Outstanding ease of product installation and configuration considerably cuts down system implementation and maintenance cost.

Value Features

- fully integrated package over all applications
- common database and common user interface
- compatible transient and steady-state simulation engines
- industry-leading GUI
- Web Interface
- robust, accurate, stable and fast real-time model
- field proven on more than 200,000 km gas pipelines
- statutory approval for energy billing use
- highest fidelity of compressor modeling and optimization
- excellent scalability
- metric and imperial units

Our Expertise

The excellence in customer satisfaction and quality creation are the cornerstones of our success. Our customers benefit from more than thirty years of sustained commitment to the pipeline industry.

Contact and Product Support

SIMONE SOFTWARE

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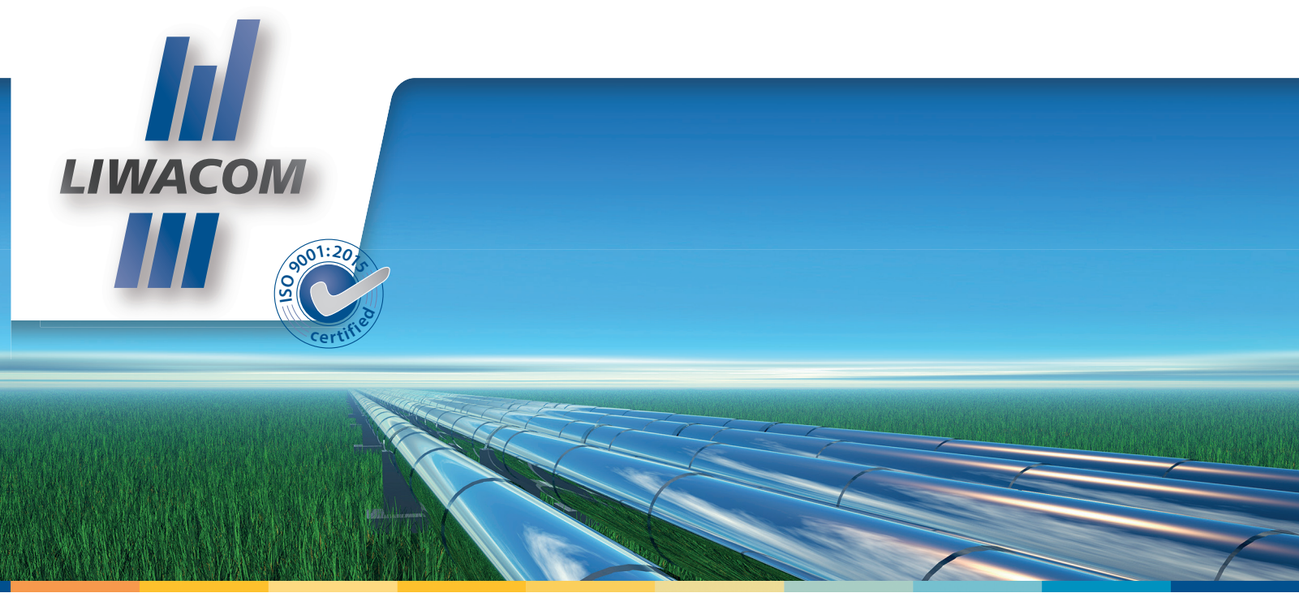


Simulating in Real-Time

Operating a pipeline system safely and efficiently requires the control room personnel to have full information about the system's current and near-future hydraulics (e.g. pressures and flows).

Real-time (or on-line) simulation (or model) provides this information. It alerts unacceptable or even dangerous operating conditions, such as an imminent supply shortage or a pipeline leak, and it can even reveal measuring faults. A special task of real-time simulation is leak detection and location.

Real-time simulation typically includes what-if-simulation to predict the consequences of an intended control action.

In a pipeline system, measurement devices are installed at certain locations only, and only certain hydraulic parameters are metered. Hence, the first and most important task of real-time simulation consists in computing the complete current system state (all hydraulic values for all locations) – given the hydraulic model of the pipeline system and the incomplete set of measurements.

Modern real-time simulators like SIMONE use state estimation technology. This is a filtering algorithm resulting in a hydraulic state closely matching the measurements within the meter accuracies, if possible. This also yields arbitrary derived hydraulic quantities such as line pack or flow speed.

By applying the calculated flow speeds, the propagation of changes in fluid composition and parameters are tracked from the supply points to the system's exits, taking into account the fluid blending that may occur en route.

Similarly, real-time simulation keeps track of pipeline inspection or cleaning gauges (so-called pigs) being pushed by the flowing gas through the pipelines.

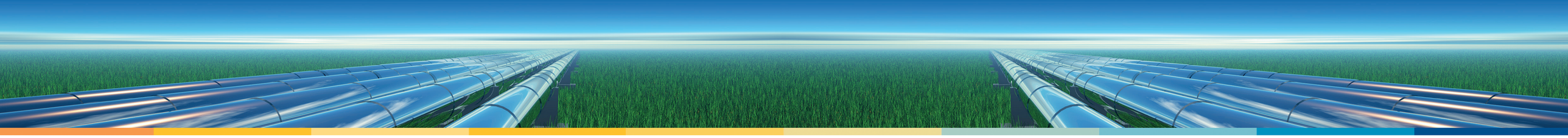
Look-ahead simulation periodically assesses near-future system states based on nominations or predictions of the system's entries and exits. It mainly provides the system's survival time, i.e. how long the hydraulic parameters will remain acceptable.

SIMONE Software

By using SIMONE, numerous leaders in the pipeline industry ensure the operation of their transmission and distribution networks.

Our billing application is approved by German Bureau of Standards for use in commercial transactions.

SIMONE SOFTWARE
Simulation and Optimization on Networks



SIMONE SOFTWARE • Basic Package

The seamlessly integrated standard package includes the following modules:

● Real-Time Model

The SIMONE real-time model is an advanced transient state estimator. It is extremely robust (fault-tolerant), hydraulically accurate, numerically stable and fast. By using all available meter readings SIMONE exploits meter redundancy to optimize solution fidelity, and to reveal wrong meter readings and incorrect model parameters. The estimated pressures and flows match the meter readings within their respective accuracies.

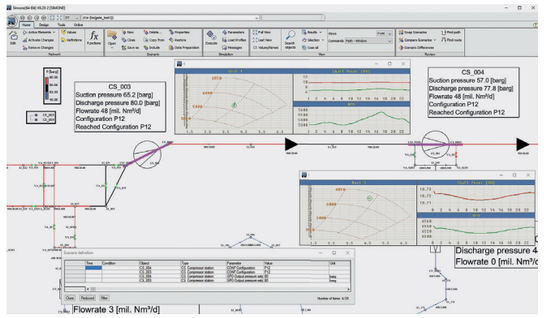
SIMONE keeps on running, if a meter should be grossly erroneous or temporarily unavailable, or if the model description should be corrupted (e.g. by an incorrectly transmitted valve status); SIMONE facilitates trouble-shooting by pinpointing the affected network section.

● Gas Tracking

SIMONE tracks gas compositions en route through the pipeline system, as well as physical gas properties, user defined gas attributes (e.g. ownership, receipt location). SIMONE gas tracking is so accurate and reliable that it has received statutory approval for use in commercial energy billing.

● Dynamic Simulation

Forecasts of pressure, flow, gas composition and line pack (e.g. to predict survival times), are provided by look-ahead, predictive, what-if, and training simulations. Predicted receipts and deliveries, scheduled system controls, and unexpected events are simulated. Simulations are executed in an automatic cycle, or on user request, or are triggered by an external application.
Arbitrary networks can be simulated, with up to 120,000 elements and 120,000 nodes, ranging from low pressure distribution up to highest pressure transmission systems. A look-ahead simulation can be started from an arbitrary initial state, including a state which has been computed by the real-time model. A logic control allows solving complex event driven tasks.
Heat transfer coefficients and heat capacities enable simulating gas temperatures. Using the gas temperature, SIMONE provides various methods to calculate specific heat, isentropic exponent, Joule-Thomson coefficient, and viscosity. These parameters enter into calculating pipeline flow, compression, pressure reduction, and heat exchange.



● Graphic User Interface

SIMONE's unique object-oriented user interaction concept does not require customization, nor configuration. It is centered on a pipeline system's schematic world picture, which provides dynamic network coloring, user defined object sets (arbitrary object clusters or network paths), object search, and graphic layers. The world picture allows to access any object's simulation results, e.g. as trend or profile display, compressor wheel map, or spread-sheet. Likewise, simulation parameters are defined, or the external data transfer (e.g. SCADA import/export) is controlled. SIMONE includes a graphic network editor for creating and maintaining a network. The editor is integrated in the run-time user interface.

● Software Technology

SIMONE is a single source software for Windows, Unix and Linux systems. It supports multi-user applications, local languages, and metric and imperial units. The SIMONE application programming interface (API) allows to read from, and to write to, external systems (e.g. Scada) or databases (e.g. GIS), and to control program execution. Network descriptions including graphic coordinates and arbitrary object attributes can be imported from, and exported to, external systems.

● Product Support and Services

LIWACOM and qualified local partners offer global product support. It includes first-level support, user helpdesk, training seminars, and ongoing software upgrade service.

SIMONE SOFTWARE + Options

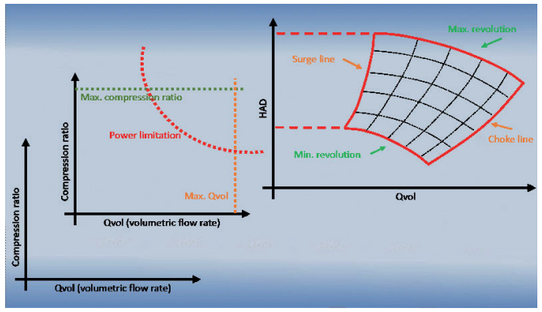
The following options are available at your choice:

+ Leak Detection and Location

SIMONE leak detection uses several field proven techniques. These are transient model compensated mass balance error method, statistical data analysis, and parallel imbalance analysis over various time intervals. Use of several techniques insures fast response, high sensitivity and minimum false alarms under all operational conditions: flowing, shut-in, steady state, transient. Hypothesis testing provides location possibility even in case of a smaller leak. The performance of leak detection and location can be evaluated a priori in a leak sensitivity study.

+ Enhanced Compressor Modeling

The detailed compressor model provides considerably more modeling fidelity. It considers the compressor station's individual devices (compressors, drives, coolers) and their interconnection and interaction. Device constraints are accurately modeled by envelope diagrams. These allow to specify nonlinear device characteristics. Thus, the detailed compressor model is being used, where high modeling fidelity is required, e.g. for the operation support of existing pipeline systems. For checking out the model parameters or in a planning environment, the results of the model can also be investigated without a network environment using the configuration test function.



+ Pig Tracking

If a pig is run in a pipe that follows the speed of gas, the simulation can be used to estimate its position and arrival time. The pig tracking in SIMONE is based on estimating the pig travel process on the basis of the simulation results, namely the calculated speed of gas (and accounting for a definable slippage factor).

+ Hydrate Formation Risk Analysis

The Hydrate Formation Risk analysis is based on the detection of the three-phase equilibrium condition gas – free water – hydrate within the pipeline system, as calculated from gas, water dewpoint and hydrate equilibrium temperatures.

+ Steady State Simulation

This module has been designed to provide reliable and very fast convergence of a steady-state solution. It uses the same network modelling features and the same GUI as the transient simulation. This makes it possible to share network models, equipment description and input data seamlessly between real time model, steady state analysis and any other applications in the business environment.

+ Hot Standby Support

A SIMONE online system may be required to have a high availability and hence may be implemented using redundant computers. For such a case, SIMONE provides several support elements for ensuring license service availability, data synchronization, and directing clients to the proper master server within a group of redundant computers.

+ Full Pipeline Model Integration

If the business or SCADA environment already manages the pipeline model shape and parameters, this option provides the tools for seamless integration with the respective data system(s), thus saving the effort of maintaining the simulation model separately. This extends to even more opportunities to integrate simulation functionality with existing work flows and environment.

+ Training

The SIMONE Training Simulator enables to train control room engineers for the safe and efficient gas system operation, where trainees solve practical gas control tasks using the SIMONE Training Simulator. The software provides an offline simulation environment that realistically mimics the gas transport process, as if it were online. It allows realistically simulating scheduled tasks as well as emergencies.

+ Web Interface

Server-side computation makes it possible to use SIMONE on devices with minimum hardware specifications.