Net-Pipe: Hydraulic Analysis of Flow in Liquid Pipe Networks

- One dimensional steady-state and unsteady-state flow model for liquid pipe networks
- Virtual unlimited number of pipeline and pipe network topologies
- Transient analysis based on method of characteristics
- Over 20 types of time dependent behavior selectable for valves, pumps, vessels etc.
- Other user defined hydraulic functionality insertable at any point into the network
- Recalculation of friction coefficients in every pipe during steady-state and unsteady-state simulation

Get a comprehensive view of your hydraulic model!

Net-Pipe shows what you want to see while simulating unsteady flow: The propagation of pressure waves, damping and reflection at valves and pumps and other hydraulic equipment. Several types of display screens are active during the simulation runs which allows focusing on the model’s critical sections.

Net-Pipe Version 3 Special Features

- Graphic network layout editor based on Microsoft® Visio®
- Display of geodetic height and max. allowable pipe pressure profile
- Simultaneous view of pressure wave and flow propagation
- Pre-selected pumps to be imported via Microsoft® Excel®
- Simulation recorder for export of simulation data
- Fluid property changes (density, viscosity) at any point in network
- Two phase flow monitor during unsteady-state calculation
- Calculation of pressure wave speeds based on pipe and fluid data
- Adjustments of fluid properties to oil temperature changes
- Additional time functions for valve closing and opening
The entire world of fluid flow analysis at your desktop!

A wide range of hydraulic engineering problems can be solved with Net-Pipe steady-state simulation and unsteady-state simulation: Water-hammer studies for hydroelectric power plants, analyses of surge pressure alleviation for oil pipelines, layout studies for pipe installations, or capacity calculations for water distribution networks, to name a few. Net-Pipe is designed for the hydraulic engineer and for the technical specialist with a background in fluid mechanics.

**Water distribution networks**

Water collection and distribution systems are complex, and their dimensioning can be a time-consuming task. With Net-Pipe, networks are created and updated quickly. The network layout is modified by simply dragging and dropping hydraulic objects to the network layout screen.

**Hydroelectric power plants**

Net-Pipe lets you easily verify the maximum pressures in power plant installations during transient flow. By studying the water-hammer effects with vessels, valves, and other equipment, increases in the plant's safety levels are achieved.

**Oil pipeline design & operations**

With Net-Pipe, special additions for oil pipelines improve switching procedures for pipelines. This ranges from adjustments in pump and valve settings, optimization of closing times, tank farm switching procedures to emergency shut-down sequences.

**Training tool for the operating personnel**

With its graphical user interface based on the latest GUI concepts and with its use of intuitive drop-down menus and toolbars, Net-Pipe is easy to learn, even for the less experienced user. Net-Pipe is ideal for studying the operational behavior of your network in an offline training environment. Pre-prepared demo models help with the visualization of time-dependent effects on the network, thereby strengthening the hydraulic understanding and the awareness levels of the operators.
Select whatever you may want to monitor during flow simulation ....

Pressure and flow developments can be monitored during the simulation run:
Every output screen of your model can be customized and saved individually.

- Toolbar with edit, scale, legend, zoom, print functions helps to select the important information. For documentation purposes every graphic view can be saved as an image file.
- Save to disk function to record the simulation.
- Choose from a variety of display options: actual pressure levels, max-pressure and min-pressure lines, geode-tic heights, pressure limits, etc.

Selected display path: Several display screens may be displayed at the same time during simulation.

Simultaneous view of pressure and flow developments along the chosen display paths.

... and drill down to the critical element in your model!

Numeric displays for data at cross-hair cursor location.

Selected display path:

Select a set of pumps, valves, or vessels and monitor their unsteady-state behavior by recording pressure levels, flow rates, pump speeds, valve openings, and much more.
Design your network layout with a standard graphic editor …

Use Microsoft® Visio® and simply drag-and-drop the pipe network objects from the customized stencil containing pictorial representations of the Net-Pipe hydraulic objects.

… and simply import the layout into Net-Pipe with the program menu functions.

Net-Pipe automatically checks the network topology, builds a list of pipes and pipe connection points (nodes), and issues an import protocol. Existing Net-Pipe models can be altered easily with these menu functions as well.

Orange coloured nodes are selected for the input of time dependent hydraulic behavior. Other node colors indicate missing data input or configuration mismatches.

Every Net-Pipe object (pipe, node, pipeline, display path etc.) is identified by a unique object key based on the object’s name. This makes it possible to reuse the same object in different model versions.
Preparing for simulation runs: editing pipes and nodes

Hydraulic equipment is inserted at any point into the model with Net-Pipe nodes. Nodes comprise steady-state data and unsteady-state data. For each node type - such as block valve, fitting, pump, PCV, relief valve, etc. - a variety of time dependent behavior (“Time spec”) can be selected. For pumps a predefined pump selection table is used to quickly insert pump parameters into the model.
Get the relevant information of your model: Defining display paths

Complex pipe networks can easily be divided into single pipelines and/or display paths. A display path is edited by simply clicking to the pipes in the network layout view. Every pipeline in the network can be configured individually and up to 20 pipelines and display paths can be selected for a simulation model.

Putting it all together: Net-Pipe Version 3

After 10 years of experience with the previous version Net-Pipe is now available in Windows. The developers have focused on the easy creation and the quick redesign of hydraulic networks of any size and complexity. The algorithms are based on proven procedures for fluid flow mechanics. This ensures reliability of the software and its application in a variety of fields.

System requirements

Net-Pipe is a single user, stand-alone program and runs on MS-Windows® 2000, NT and XP. MS-Excel® version 2000 or thereafter and MS-Visio® standard edition 2002 are required. Net-Pipe comes with an installation procedure and demo examples on CD-ROM either in

- English or
- German

Online documentation is selected with the info function from the program main menu. Net-Pipe is available as

- Limited demo version (restricted in the number of network nodes) or
- Unlimited version (license key required)

Net-Pipe customization options:

- User-specific parameter table for pumps
- Pre-defined hydraulic models for oil pipelines
- Data link to SCADA system for offline simulation of a specific hydraulic network.