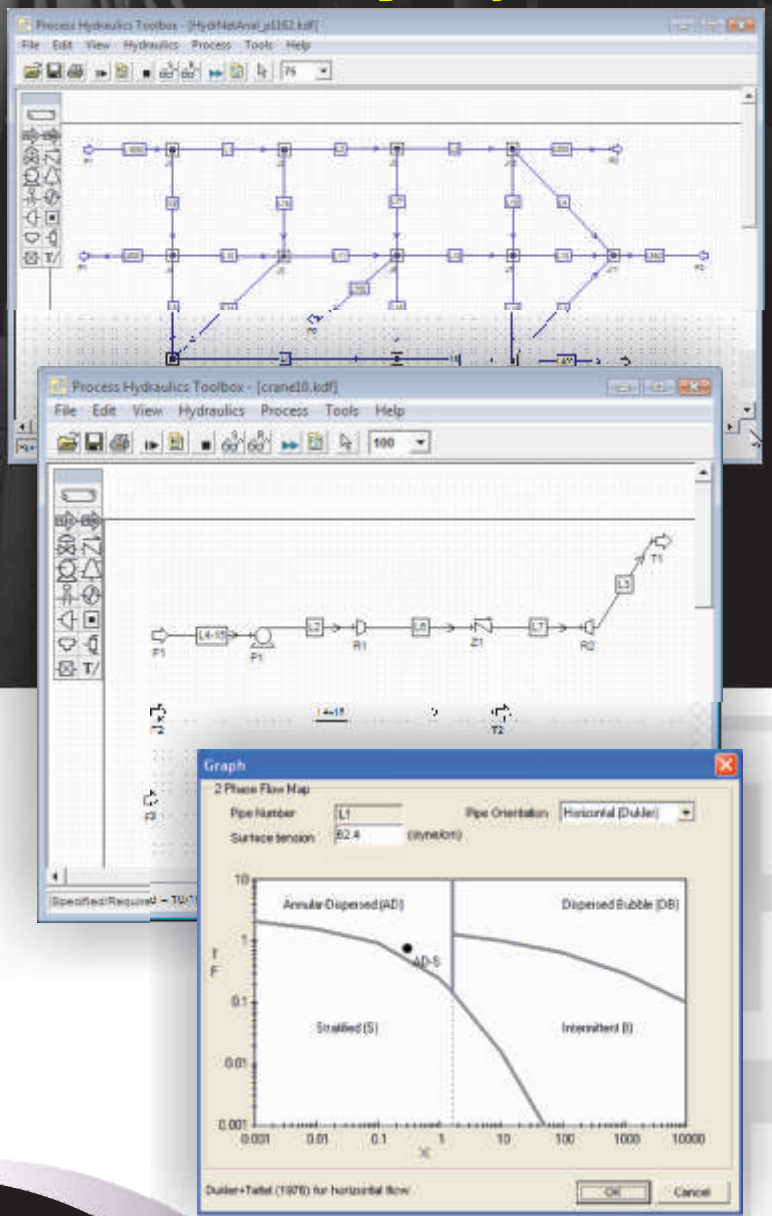
Pipeline & Process Simulation Made Easy

PROCESSHYDRAULICS TOOLBOX

Why spend tens of thousands of dollars for the software and have to invest hundreds of hours learning to use the product to complete pipeline and process simulation tasks?

Try it for FREE!



The Process Hydraulics Toolbox (PHT) from Technical Toolboxes, Inc. (TTI) is an extremely easy-to-use, very low cost, gas, liquid or multi-phase pipeline network steady-state process simulation model that is suitable for hydraulic calculations from the simple to the very complex.

The PHT incorporates a simple, clear and uncluttered advanced graphical user interface. Equipment is selected from a palette, placed on the screen and connected with pipes using the mouse. The resulting drawing resembles a simplified PFD including title block(s) and other professional engineering features.

Version 3.0 is now available and support the following key features:

- ☑ Liquid, isothermal compressible and several 2-phase methods.
- ☑ Multiple pipe databases, including non-cylindrical pipes.
- ☑ Flexible pipe sizing routines, and ability to ignore non-standard sizes.
- ☑ Advanced equipment sizing and rating facilities (flow meters, control valves, etc).
- ☑ Built-in flash calculations and facilities to import data from simulators (Hysys, Aspen, etc) and text files.
- ☑ Support for multiple cases (normal, rated, etc).
- ☑ Quick calculation tools for pipes, orifices and control valves.
- ☑ Advanced graphical interface and extensive reporting facilities.
- ☑ Vista support.

TECHNICAL TOOLBOXES
Industry Leader in Pipeline Software Tools

www.ttoolboxes.com

PROCESSHYDRAULICS TOOLBOX

Benefits – Performance & Cost; The PHT can significantly improve the efficiency and accuracy of hydraulic calculations at a cost significantly less than that of other more well know products. The PHT ensures a uniform, consistent approach and documents all hydraulic data necessary for pipe, equipment and instrument specifications.

Methodology – The PHT is based on a very flexible methodology and only requires the user to specify sufficient flow rates, pressures, pressure drops and/or sizes (Cv's, Beta ratios, etc.) so that a unique solution is theoretically possible. Convergence for most circuits is quick and does not require initial estimates.

Simulation Capabilities – Single phase gas, single phase liquid and multiphase (6 different equations to select from) within single pipe segments or complex networks. The PHT provides equation based mole and heat balance (HMB) for compositions and properties from Hysys, Aspen and/or text files. Hydraulics and HMB can be run simultaneously or separately to improve convergence for difficult complex network systems. The PHT supports multi-component, 2-phase flash calculations and includes a pure component database.

Hydraulic Capabilities:

- Multiphase Calculations – The PHT supports liquid phase flow, two models for gas flow (incompressible and isothermal compressible models) along with six (6) separate two-phase flow methods and regime maps.
- Pipe Sizing & Databases – Three (3) pipe databases (steel, ductile iron and PVC) are included and others can be added by the user. Sizes can be input in nominal diameter or ID in either English, Metric or user defined units. Non-cylindrical flow sections are supported and non-standard sizes can be ignored if required. The PHT flexible pipe sizing routine can be used to determine the NPS or ID based on any combination of five (5) criteria.
- Equipment & Instrument Calculations –Instrument sizes can be specified and preliminary sizing is done for all instruments. The PHT supports two-phase flow, valve characteristics, perforated plates, different orifice types, etc. Equipment such as vessels, pumps/compressors and T-pieces are supported including different vessel elevations, densities, nozzle elevations, pump/compressor curves and NPSH calculations as well as supporting a semi-rigorous approach for T-pieces to account for branch areas and relative velocities.

Reporting Capabilities – Results can be shown on the drawing, viewed on equipment dialogs and/or saved in a report file. The report file is presented in a professional engineering format for review, approval and documentation purposes. The pressure profile report lists the pipe segments and equipment in the same order as the major flow(s) making it easy and convenient to trace the pressure through the system network.

Case Management – Multiple scenarios are made easy. The PHT supports a flexible and logical case management philosophy that allows all cases required for pump and instrument datasheets to be incorporated into a single simulation. For multiple cases the user simply enters a semi-colon separated list of specifications and indicates which cases to run, order in which the cases are to be run and the extent of reporting required for each case.

PROCESSHYDRAULICS TOOLBOX

FEATURES

Process Hydraulics Toolbox is based on a novel method for solving hydraulic problems. It regards all flow rates and equipment inlet and outlet pressures as unknowns or variables. The user only need to specify sufficient pressures, flows, Cv's, etc. to enable the program to calculate the unknown pressures and flows (amazing isn't it?). Any valid combination of specifications may be used. As far as we are aware, Process Hydraulics Toolbox is the only program with this flexibility.

Features	Version 3.0
Principals and Algorithm	
Specify flows and/or pressure anywhere	Yes
No initial estimates required	Yes
Fast (resume facility, sparse matrices	Yes
Networks size	Limited by GUI
Windows Vista supported	Yes NEW
Graphical User Interface (GUI)	
PFD with Drag & Drop interface	Yes
Copy, paste, delete, drag multiple equipment	Yes NEW
Snap to grid	Yes NEW
Add text, lines, circle to drawing	Yes NEW
Cancel/undo facility	Yes NEW
Display results on drawing	Yes*
Program and equipment defaults	Yes
Selectable units of measure	Yes
Map overlay and GIS coordinates	No
Pipes	
Multiple pipe databases	Yes
Non-cylindrical pipes	Yes
Pipe sizing (5 criteria)	Yes
Exclude non-standard sizes	Yes
Pipe diameter as ID or Nominal	Yes
Heat loss from pipes	Yes
Multiple segments allowed for pipes	No
Fluids	
Liquids and Gases (isothermal compressible)	Yes
2-Phase flow (several methods and maps)	Yes
Fluid properties can differ between pipes	Yes
Directly input properties (density, etc.)	Yes
Import properties from text files	Yes
Import properties from simulators	Yes**
Thermodynamics	
Built-in flash calculations	Yes
IF97 Steam Tables	Yes
Heat and Material Balances	Yes
OLE link to simulator flash calculations	Yes***

Features	Version 3.0
Equipment	
Orifices, nozzles, perforated plates	Yes
Control valves	Yes
Vessels and tanks with multiple fluids levels, nozzle elevations and dPs	Yes
Pump/compressors head,efficiency and NPSH curves	Yes
Semi-regorous T-pieces (critically reveiwed)	Yes NEW
Choke flow at equipment (orifices, nozzles, valves)	Yes
Choke flow at expansions (pipe exits, expanders)	Yes NEW
Sizing and rating of equipment/instruments	Yes
Tools for quick sizing/ rating of pipes, orifices, valves	Yes
Built-in vendor data (pump curves, etc.)	No
Case Management	
Flexible support for multiple cases	Yes
“Unlimited” cases. Run in any sequence	Yes
Use results from first case in others	Yes
Case input dialog	Yes
Reporting	
Runlog	Yes
Comprehensive text reports	Yes
Easily trace pressure profile	
Quality control (review/approve) facilities	Yes

* dialogs only
** Hysys/Aspen
*** Hysys

TECHNICAL TOOLBOXES

FLOW MODELS

A. Single phase (liquid) - Liquid phase pressure drops are calculated from the Darcy equations as presented in CRANE 410.

B. Single phase (gas) - Two models are available for gas phase pressure drop calculations.

> *Incompressible model.* With this model, the pressure drop is calculated from the Darcy equations as presented in CRANE 410. The average of the inlet and outlet density is used (based on calculated pressures). If acceleration pressure drop is included, the accuracy is comparable with the isothermal compressible method.
>
> *Isothermal compressible model.* With this model, the pressure drop is calculated from the isothermal compressible equations as presented in CRANE 410.

C. Two-phase calculations (0.9999 < liquid fraction > .0001)

Pipe pressure drop is based on the average of the inlet and outlet properties and conditions. For pipes with significant changes in liquid fraction or properties, this may lead to erroneous results, and the pipe should be split into multiple pipes. Process Hydraulics Toolbox supports 6 different methods for 2-phase pressure drop calculations.

Homogeneous model (Dukler Case 1) - This method uses the Dukler Case 1 homogeneous (no slip) model (AIChE, 1964). Also refer to the notes below.

Dukler's constant slip model (Dukler Case 2) - This method uses the Dukler Case 2 constant slip model (AIChE, 1964). The liquid holdup can be calculated from the Hughmark method (Chem Eng Prog, 1962 and Chem Eng, 1970) or graphs presented in the GPSA manuals (10 th edition) and attributed to Dukler. The user can use smooth pipe or rough pipe friction factors. In previous versions, the "GPSA" holdup method was called the "Dukler" holdup method.

Lockhart-Martinelli model - This method uses the empirical Lockhart-Martinelli model (Chem Eng Prog, 1949).

Chisholm modification of the Lockhart-Martinelli equation - This method uses the semi-empirical modifications proposed by Chisholm (Int J Heat Mass Transfer, 1967) to the Lockhart-Martinelli method.

Chenoweth-Martin method - This method uses the empirical model presented by Chenoweth-Martin (Petroleum Refiner, 1955). The graphs were extrapolated to cover a wider range.

Beggs-Brill model - This method uses the Beggs and Brill model (J of Pet Tech, 1973/1991) for horizontal pipes. The user can use smooth pipe or rough pipe friction factors. For all 2-phase methods the acceleration pressure drop is estimated based on the homogenous inlet and outlet density.

PARTIAL CURRENT LIST OF CUSTOMERS

USA

Ambitech Engineering Corporation, Downers Grove, Illinois, USA
Bill Johnson, Fairfield, Ohio, USA
Boeing, Kennedy Space Centre, Florida, US
Effective Project Corporation, Overland Park, KS, USA
Greg Cullers, Cincinnati, Ohio, USA
IQA Solutions, Long Beach, California, USA
Kensington Consulting, Kensington, California, USA
KPI, Houston, Texas, USA
PCS, Houston, Texas, USA
Quotient Engineering Inc., Houston, Texas, USA
SNC Lavalin, Houston, Texas, USA

Canada

Amec, Graham Moss, Ontario, Canada
BP, Pat Cullen, Ontario, Canada
Colt, Sarnia/Calgary, Canada
SNC Lavalin, Calgary/Edmonton, Canada
Terasen, Surrey, Canada
Triad Engineers Limited, Calgary, Canada
Phil Del Rosario, Calgary, Canada

UK/Europe

Alain Baillod, Trin Mulin, Switzerland
C.P.Q. Ingenieros S.L., Barcelona, Spain
Foster Wheeler, Reading, Berkshire, UK
Linde, Hoellriegelskreuth, Germany
Opus Maxim Ltd, Guildford, UK
WorleyParsons, Brentford, Middlesex, England

Rest of World

Adrie Visser, Vanderbijlpark, South Africa
Dragon Oil, Dubai, United Arab Emirates
Foster Wheeler, Midrand, South Africa
Rajan Shah, Strathfield, Australia
Saeed Al Zahrani, Jubail, Saudi Arabia
SNC Lavalin, Mumbai, India
Tinus Erasmus, Vanderbijlpark, South Africa
WorleyParsons, Brisbane, Queensland, Australia
WorleyParsons, Atyrau, Republic of Kazakhstan

PROCESSHYDRAULICS TOOLBOX

FREQUENTLY ASKED QUESTIONS

Q: Does Process Hydraulics Toolbox support compressible flow?
A: Yes, Process Hydraulics Toolbox support isothermal compressible flow for pipes and adiabatic compressible flow for nozzles and control valves.

Q: Does Process Hydraulics Toolbox support adiabatic compressible flow for pipes?
A: No.

Q: Does Process Hydraulics Toolbox support 2-phase flow ? If so, which methods?
A: Yes, Process Hydraulics Toolbox supports Dukler no slip, Dukler constant slip, Lockhart-Martinelli, Chisholm, Beggs-Brill horizontal, Chenowet-Martin.

Q: Does Process Hydraulics Toolbox produce 2-phase flow map?
A: Yes, Process Hydraulics Toolbox support the Fair, Mandane, Dukler-Taitel and Golan maps.

Q: Does Process Hydraulics Toolbox support flash calculations?
A: Yes, but only for mixtures of pure components. Psuedo components are not supported yet. You can perform the simulation in Hysys and import results directly into Process Hydraulics Toolbox using OLE.

Q: Can Process Hydraulics Toolbox simulate flare headers?
A: Yes, but if flash calculations are required, it can only be used for mixtures of pure components.

Q: How many users are allowed with a site license?
A: Unlimited number of users at a single business site.

Q: Does Process Hydraulics Toolbox support pump/compressor curves?
A: Yes.

Q: Process Hydraulics Toolbox complains that the specifications are not independent?
A: Process Hydraulics Toolbox is extremely flexible in what you can specify, as long as a solution is theoretically possible. But, for complex circuits it becomes increasingly difficult for a user to use independent specifications. The most common mistakes are (a) not specifying a pressure anywhere and (b) specifying the overall mass balance directly and (c) provided two specifications that are contradictory or a duplication of each other.

Q: Process Hydraulics Toolbox does not converge?
A: For the vast majority of cases Process Hydraulic Toolboxes converges quickly based on default settings. Some circuits, such as complicated Tee arrangements and multiple parallel pumps with pump curves, sometimes fail to converge and the user may need to adjust the default settings to achieve convergence.

Q: Does Process Hydraulics Toolbox support gas choked flow?
A: Yes, through orifices, control valves and at pipe expansions (pipe exit and expanders).

Q: Does Process Hydraulics Toolbox support flashing liquid choked flow?
A: No.

Q: Can pipes be automatically divided into segments?
A: No, where required, manually split the pipe into multiple pipes connected with expanders/reducers.

Q: Can Process Hydraulics Toolbox be used for condensate systems?
A: Yes, providing flashing liquid choked flow is not encountered.

Q: What is Process Hydraulics Toolbox used for most often?
A: Process Hydraulics Toolbox is most often used for complex cooling water and hot oil piping networks. However, Process Hydraulics Toolbox is equally well suited for applications ranging from a single pipe to multiple cases of complex two phase piping circuits.

Q: Can Process Hydraulics Toolbox be used for sizing pipes?
A: Yes, pipes can be sized based a combination of velocity or pressure drop/length criteria.

Q: Does Process Hydraulics Toolbox have sales offices in India, Europe or the Middle East?
A: Yes.