

PASS/HYDROSYSTEM Webinar

What's new in PASS/Hydrosystem 4.4

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PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

PASS Suite

The PASS software tools provide smart simulation & sizing tools for every piping and equipment engineer /designer



PIPING AND EQUIPMENT
ANALYSIS & SIZING SUITE

Company Overview

- > 50 years history
- > 3,000 active users worldwide
- Best in class modern methods, algorithms and software libraries
- Embedded knowledge and support/training from industry experts
- User-friendly interface and flexible CAD integration
- Affordable price and flexible licensing



PASS Suite Users



PIPING AND EQUIPMENT
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Hydrosystem

Diameter selection, heat and hydraulic analysis of steady state flow for real liquids, gases, and multiphase mixtures in piping systems of any complexity



PIPING AND EQUIPMENT
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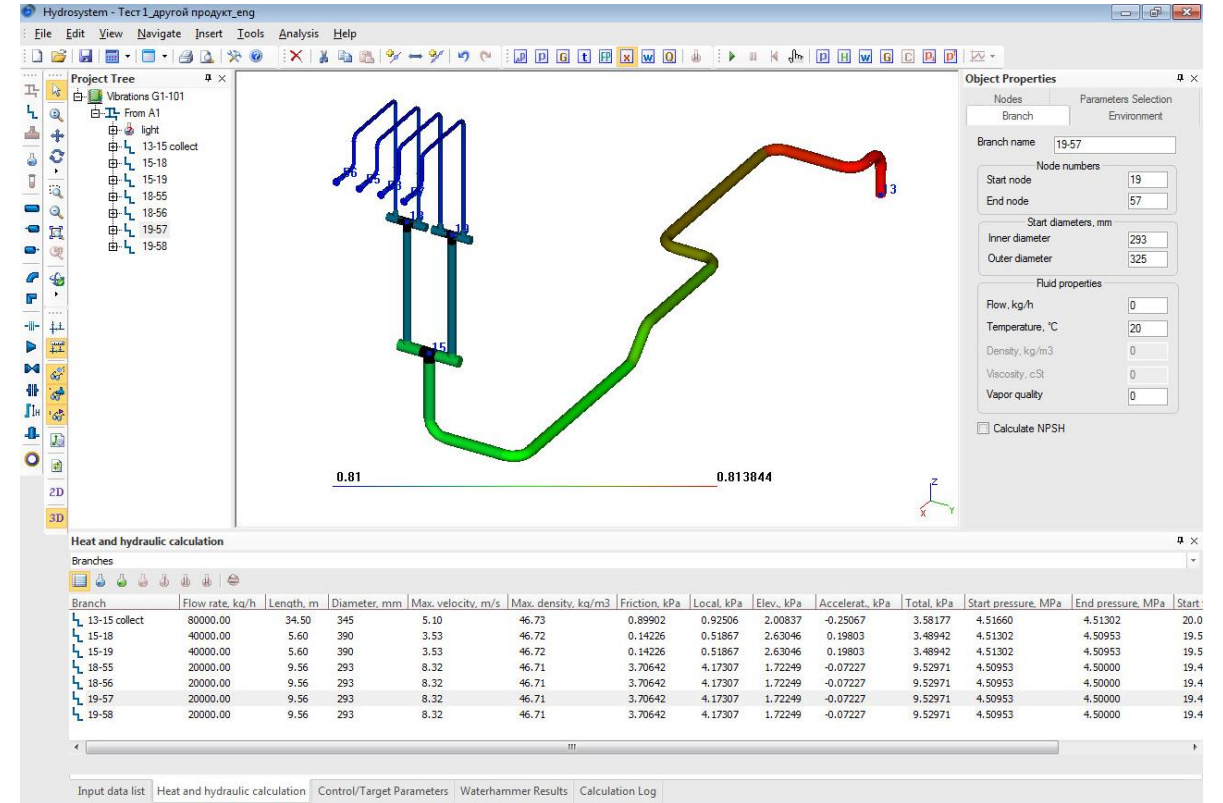
Piping Hydraulic & Thermal Analysis

- Broad Applicability
- Unsurpassed Usability
- Powerful Capabilities
- Flexible Configurations
- Widely Used



PASS/Hydrosystem | Experience and popularity

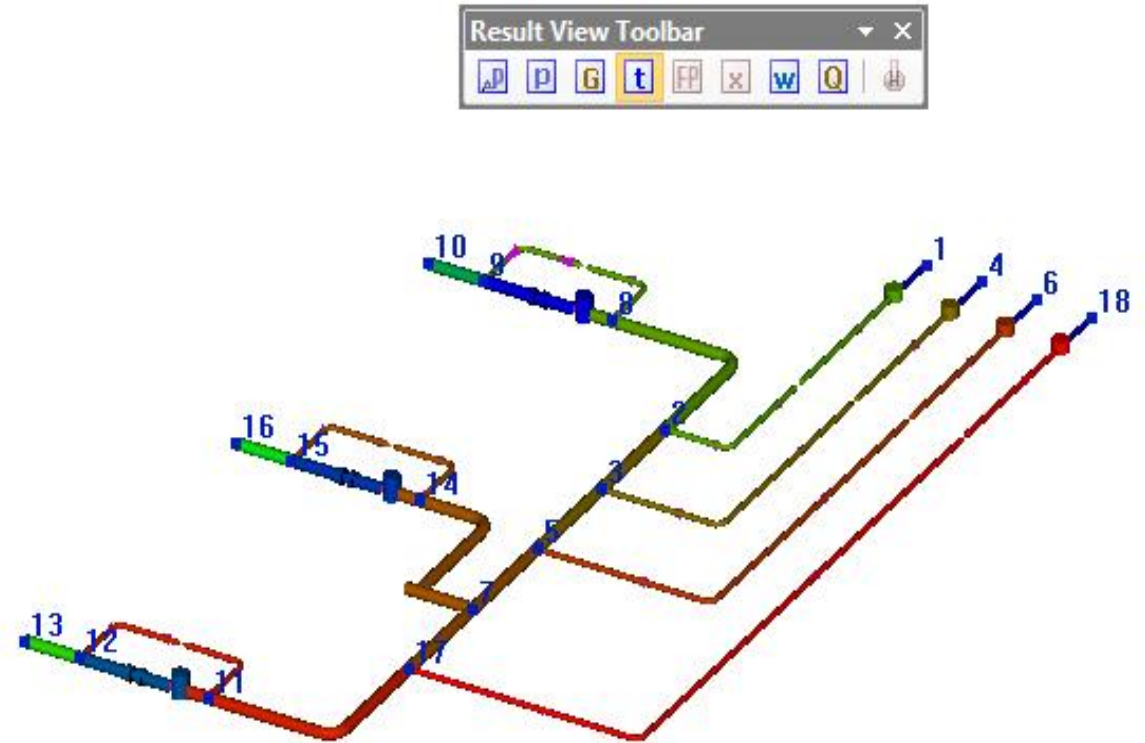
- First introduced in 1977
- Blessed by piping hydraulic world-known “guru” Idelchik
- Used by more than 600 companies worldwide
- Ideal tool for “day-to-day” operations in designing of any piping systems



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PASS/Hydrosystem | Calculation capabilities

- Heat and hydraulic calculation of steady-state flow for:
 - Liquids
 - Real gases
 - Gas-liquid mixtures
 - Gas-liquid-liquid mixtures
 - Liquid-solid mixtures (a.k.a. 'slurry' flow)
- Surge analysis of transient liquid flow – waterhammer calculation
- Suitable for piping systems of any complexity

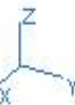


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89.99

180.07 °C



PASS/Hydrosystem | Calculation capabilities

Different calculation tasks:

- Both "upstream" and "downstream" pressure drop calculation
- Flow distribution calculation
- Pipeline nominal size selection

Customizable reports with calculation results:

- Fluid properties
- Fluid velocities
- Pressure losses (friction, minor losses, static pressure drop)
- Heat losses (considering heat insulation etc.)
- Flow pattern (for multiphase flow)
- Pressure and temperature in any point in the pipeline

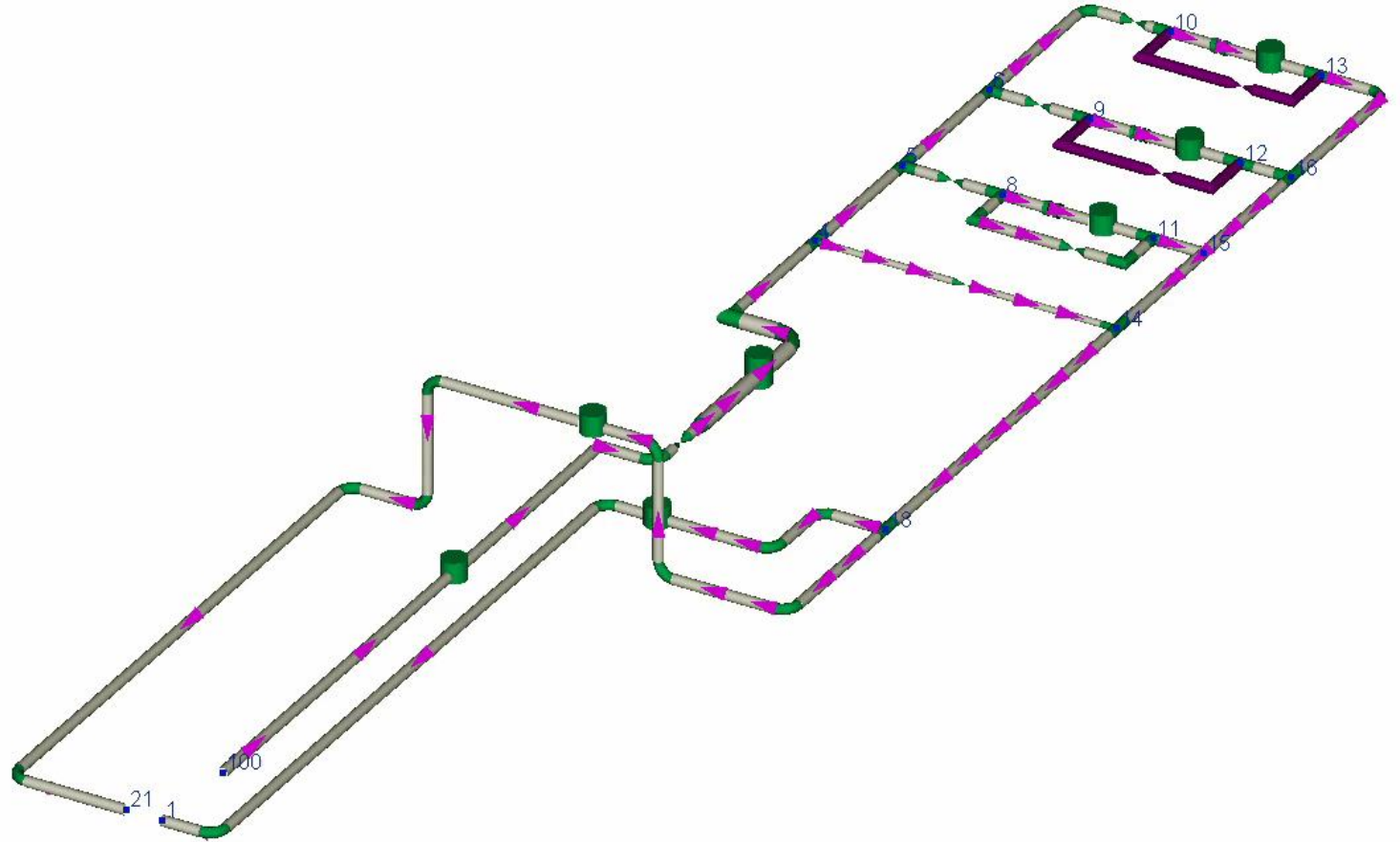


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Pipeline name: Tech.water Hydraulic calculation																													
№	Component	Qty	Length m	Elev m	D, mm	V m/s	Density kg/m ³	Viscosity cSt	Pressure losses, kPa			P MPa	NPSH m	Temp, °C	Heat losses, kW														
									Friction	Local	Elev.																		
Tech.water, Branch 5-7																													
0					200							2.723																	
1	Tee (main leg)	1			200	6.50	918.28	0.20				2.723		150.0															
2	Straight pipe	1	2.00		200	6.50	918.28	0.20	4.304			2.719		150.0															
3	Tee (main leg)	1			200							2.719		150.0															
Tech.water, Branch 8-9 by																													
0					100							2.724																	
1	Tee (side leg)	1			100	9.42	918.28	0.20		43.66		2.680		150.0															
2	Straight pipe	1	1.00		100	9.42	918.27	0.20	12.387			2.668		150.0															
3	Elbow	1	0.24		100	9.42	918.28	0.20	2.918	14.08		2.651		150.0															
4	Straight pipe	1	1.00		100	9.42	918.28	0.20	12.387			2.639		150.0															
5	Knife gate valve	1			100	9.42	918.28	0.20				2.639		150.0															
6	Straight pipe	1	1.00		100	9.42	918.28	0.20	12.387			2.629		150.0															
7	Elbow	1	0.24		100	9.42	918.24	0.20	2.918	14.08		2.609		150.0															
8	Straight pipe	1	1.00		100	9.42	918.23	0.20	12.387			2.597		150.0															
9	Tee (main leg)	1			100							2.569		150.0															
Tech.water, Branch 8-9																													
0					200							2.724																	
1	Tee (main leg)	1			200	2.48	918.28	0.20		0.891		2.723		150.0															
2	Straight pipe	1	0.50		200	2.48	918.28	0.20	0.177			2.723		150.0															
3	Component with known change of pressure and/or temperature	1			200	2.34	986.48	0.33		70.00		2.653		90.00															
4	Straight pipe	1	0.80		200	2.34	986.48	0.33	0.268			2.653		90.00															
5	Orifice	1			200	2.34	986.44	0.33		78.38		2.574		90.00															
6	Straight pipe	1	1.00		200	2.34	986.44	0.33	0.328			2.574		90.00															
7	Tee (side leg)	1			200					4.978		2.569		90.00															
Tech.water, Branch 7-11																													
0					200							2.719																	
1	Tee (side leg)	1			200	1.69	918.28	0.20		17.24		2.702		150.0															
2	Straight pipe	1	2.00		200	1.69	918.28	0.20	0.291			2.701		150.0															
3	Tee (main leg)	1			200					7.932		2.693		150.0															
Tech.water, Branch 17-11																													
0					200							2.693																	
1	Tee (main leg)	1			200	4.81	918.28	0.20				2.693		150.0															
2	Straight pipe	1	2.00		200	4.81	918.28	0.20	2.358			2.691		150.0															
3	Elbow	1	0.47		200	4.81	918.28	0.20	0.838	3.874		2.687		150.0															
4	Straight pipe	1	2.00		200	4.81	918.28	0.20	2.368			2.684		150.0															
5	Tee (main leg)	1			200							2.684		150.0															
Tech.water, Branch 11-12																													
0					200							2.684																	
1	Tee (side leg)	1			200	2.30	918.28	0.20		9.014		2.675		150.0															
2	Straight pipe	1	0.50		200	2.30	918.28	0.20	0.154			2.679		150.0															
<table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td style="width:5%;">Rev. No</td> <td style="width:5%;">Qty</td> <td style="width:5%;">Page</td> <td style="width:5%;">Doc #</td> <td style="width:5%;">Signature</td> <td style="width:5%;">Date</td> <td style="width:60%; text-align: center;">detailed results</td> <td style="width:5%; text-align: right;">Page</td> </tr> <tr> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td style="text-align: right;">3</td> </tr> </table>														Rev. No	Qty	Page	Doc #	Signature	Date	detailed results	Page								3
Rev. No	Qty	Page	Doc #	Signature	Date	detailed results	Page																						
							3																						

PASS/Hydrosystem | Flexible 3D graphic

- Full-featured pipeline 3D model representation
- Different graphic modes (isometric “one-line” drawing, solid representation, “simplified” drawing etc.)
- Raster background image support
- Calculation results representation right on the pipeline model



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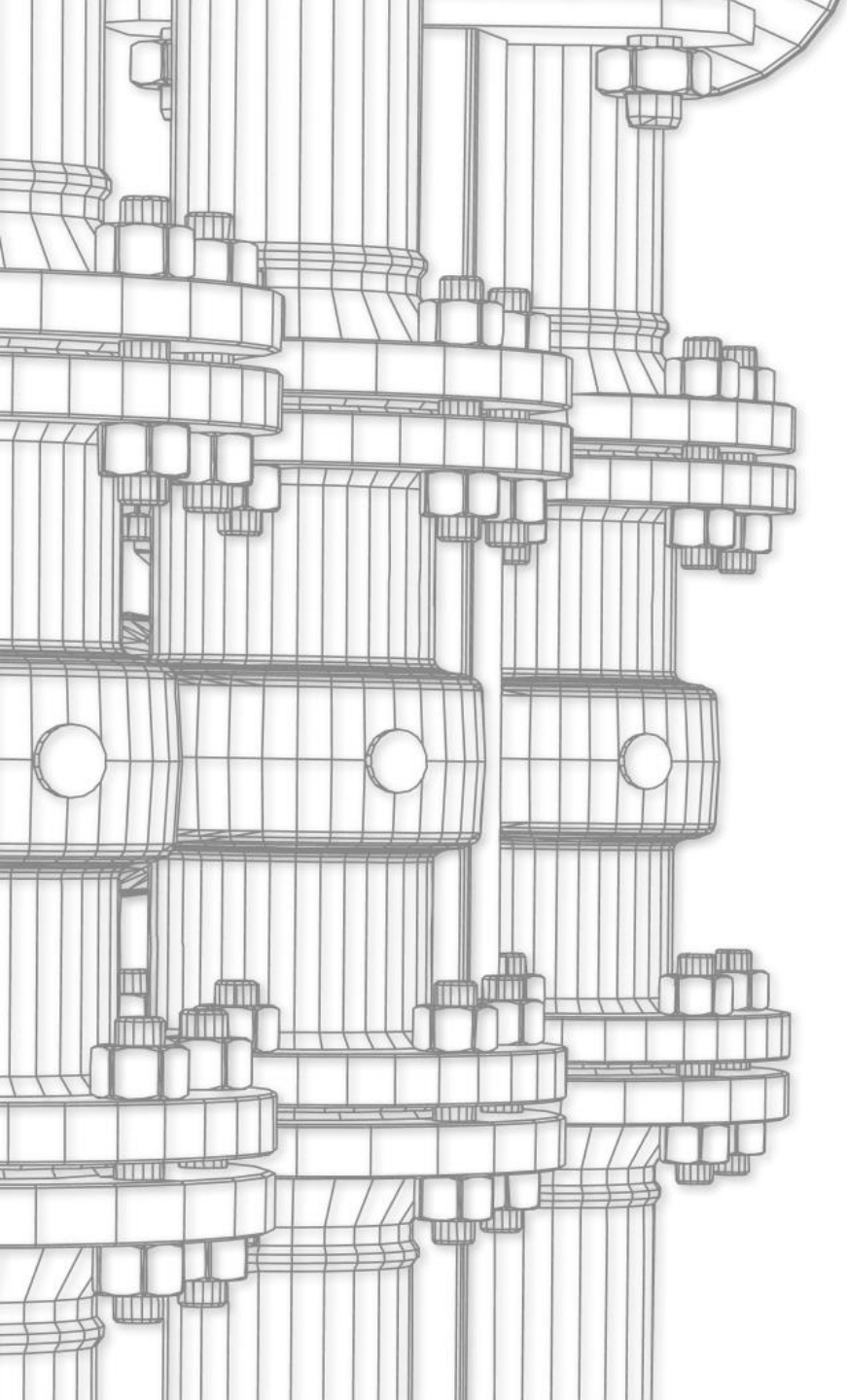
PASS/Hydrosystem | Broad Applicability

- Process Industry pipelines
 - Oil refinery and gas industry
 - Chemical industry
 - Metallurgy
 - Food industry
 - Power industry
 - many more
- Oil and Gas pipelines
- Utility network pipelines (heat, water, natural gas networks)



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PASS/Hydrosystem Advantages



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PASS/Hydrosystem

Very simple and easy-to-use, suitable even for entry-level engineers and designers

New users can begin performing piping hydraulic and thermal analysis in days

The screenshot displays the PASS/Hydrosystem software interface. The main window shows a 3D model of a piping system with various branches and nodes. The interface includes a menu bar (File, Edit, View, Navigate, Insert, Tools, Analysis, Help), a toolbar, and a Project Tree on the left. The Project Tree lists the following items:

- Vibrations G1-101
 - From A1
 - light
 - 13-15 collect
 - 15-18
 - 15-19
 - 18-55
 - 18-56
 - 19-57
 - 19-58

The Object Properties panel on the right shows the following settings for Branch 19-57:

- Branch name: 19-57
- Node numbers: Start node 19, End node 57
- Start diameters, mm: Inner diameter 293, Outer diameter 325
- Fluid properties: Flow, kg/h 0; Temperature, °C 20; Density, kg/m³ 0; Viscosity, cSt 0; Vapor quality 0
- Calculate NPSH

The Heat and hydraulic calculation table is shown below:

Branch	Flow rate, kg/h	Length, m	Diameter, mm	Max. velocity, m/s	Max. density, kg/m ³	Friction, kPa	Local, kPa	Elev., kPa	Accelerat., kPa	Total, kPa	Start pressure, MPa	End pressure, MPa	Start
13-15 collect	80000.00	34.50	345	5.10	46.73	0.89902	0.92506	2.00837	-0.25067	3.58177	4.51660	4.51302	20.0
15-18	40000.00	5.60	390	3.53	46.72	0.14226	0.51867	2.63046	0.19803	3.48942	4.51302	4.50953	19.5
15-19	40000.00	5.60	390	3.53	46.72	0.14226	0.51867	2.63046	0.19803	3.48942	4.51302	4.50953	19.5
18-55	20000.00	9.56	293	8.32	46.71	3.70642	4.17307	1.72249	-0.07227	9.52971	4.50953	4.50000	19.4
18-56	20000.00	9.56	293	8.32	46.71	3.70642	4.17307	1.72249	-0.07227	9.52971	4.50953	4.50000	19.4
19-57	20000.00	9.56	293	8.32	46.71	3.70642	4.17307	1.72249	-0.07227	9.52971	4.50953	4.50000	19.4
19-58	20000.00	9.56	293	8.32	46.71	3.70642	4.17307	1.72249	-0.07227	9.52971	4.50953	4.50000	19.4

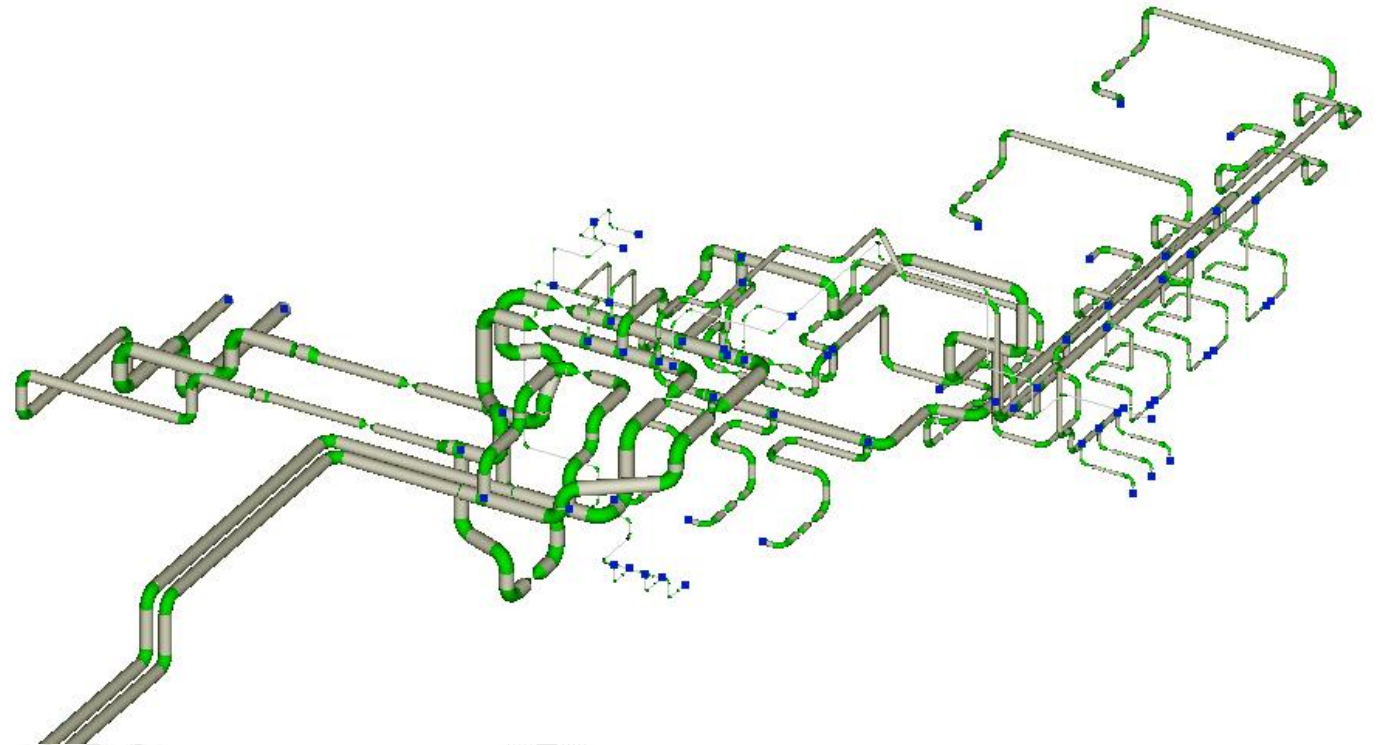
The bottom of the interface shows a navigation bar with the following tabs: Input data list, Heat and hydraulic calculation (selected), Control/Target Parameters, Waterhammer Results, and Calculation Log.



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PASS/Hydrosystem | Advantages

No limitations for pipeline complexity and/or length - every pipeline (including pipelines with loops, recycles etc.) can be calculated very quickly and easily



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PASS/Hydrosystem | Integration capabilities

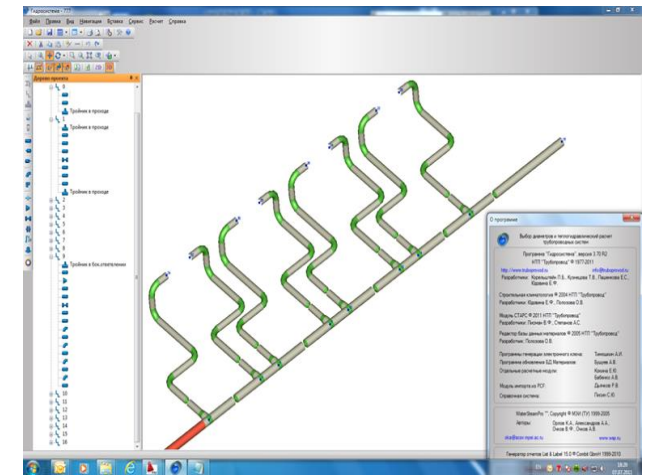
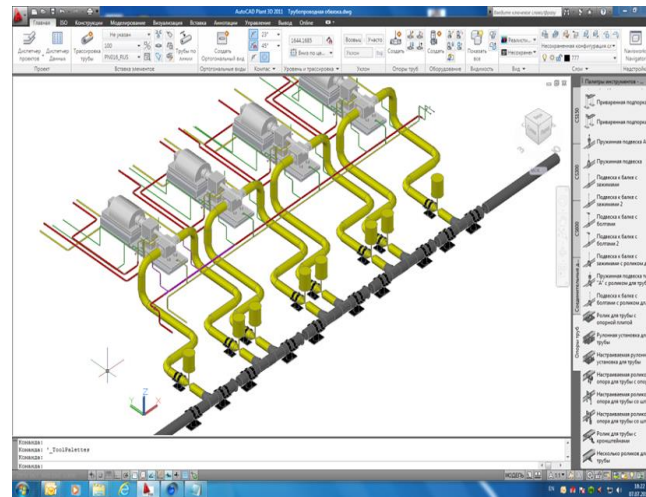
PASS/START-Prof

PASS/HYDROSYSTEM

DXF files
(AutoCAD,
Microstation etc.)

PCF (Isogen)

- SmartPlant 3D
- CADWorx
- AutoPlant
- PlantSpace
- OpenPlant
- Autodesk Plant3D
- CADISON
- etc.



XML files
(neutral format)

Autodesk Revit

AVEVA PDMS and E3D



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PASS/Hydrosystem | Fluid properties & equilibria

STARS library

properties and phase equilibria calculation for over 1600 substances and their mixtures

WaterSteamPro library

water and steam properties and equilibria calculation basing on IAPWS-IF97 equations

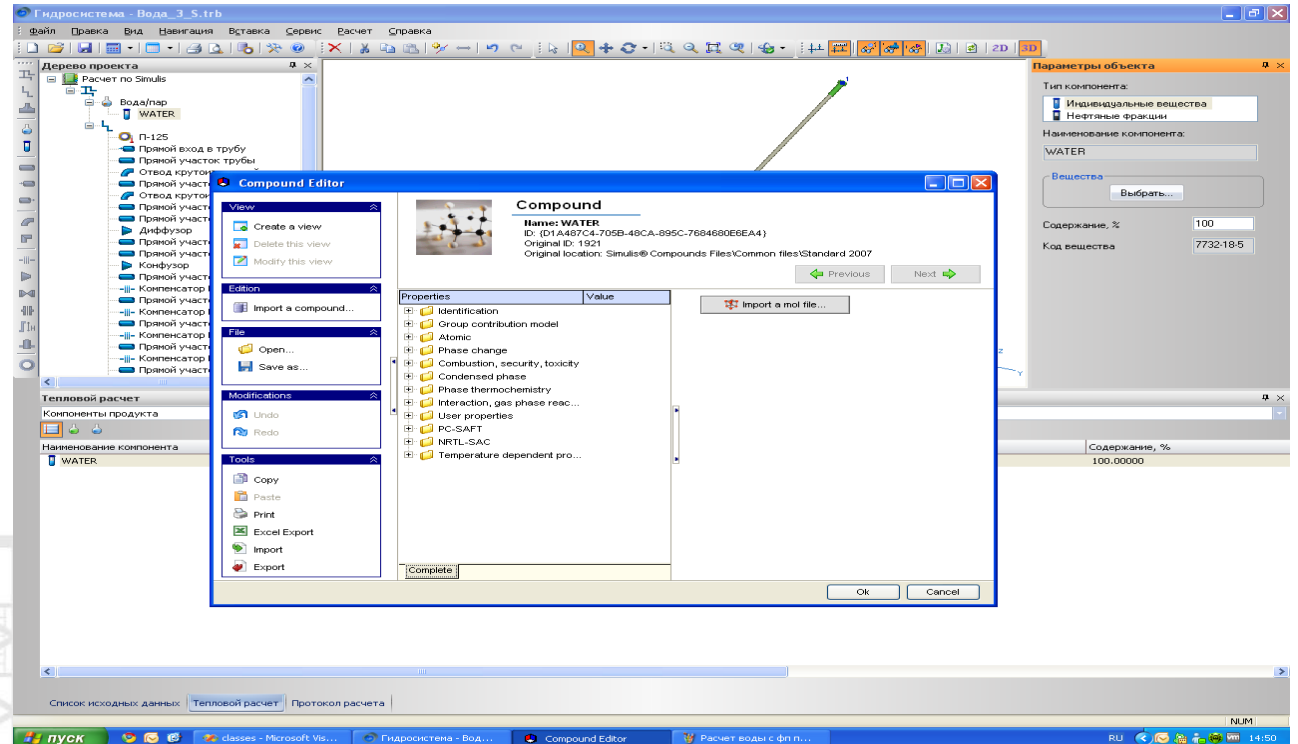
GERG-2008 library

natural gas properties and phase equilibria calculation

gas mix

- HYDROGEN
- METHANE
- ETHANE
- ETHENE
- PROPANE
- PROPENE
- 2- METHYLPROPANE (ISOBUTANE)
- BUTHANE
- BUTENE-1
- 2- METHYLBUTANE (ISOPENTANE)
- PENTANE
- HEXANE

+ integration with Simulis Thermodynamics and PVTsim



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PASS/Hydrosystem | Pumps selection in Spaix

The screenshot displays the PASS/Hydrosystem software interface. The main window shows a 3D model of a pipe system with a red pump component. A dialog box titled "Hydraulic selection: Search result [Dialog 2/3]" is open, displaying a table of search results. Below the table, the performance curves for the selected pump (SM 100-65-200-2) are shown, including Head (H), Shaft power (P₂), Hydraulic efficiency, and NPSH-values. The "Current configuration" panel on the right shows the selected pump and motor (AIR160S2).

Product name	Design	n 1/min	D ₂ mm	Q m ³ /h	H m	P ₂ kW	η %	Energy costs ...
Recommendation								
SM 100-65-200-2		2900	185	95,32	32,82	10,77	65,84	
SM 125-80-315-4		1450	300	93,19	31,36	10,24	64,05	
SM 150-125-315-4		1450	320	98,12	34,77	15,69	48,38	

SM 100-65-200-2: Pump performance curves

Diagram layout | Diagram options | Performance curve | Duty point | Text alignment | Export

Head (H) / m: 0 to 50
Shaft power P₂ / kW: 0 to 10,77
Hydraulic efficiency: 0 to 65,84
NPSH-values: 0 to 4,457

Application range: 32,82 to 33,09 m

Motor safety: req. 1,05 avail. 1,39

Current configuration: A1 [Q: 95,72m³/h --- H: 33,09m]

Show more options

Name	Value
Hydraulic selection	
Performance curve	100-65-200t
Motor	
Main category	3- motor
Motor	AIR160S2
Type of installation	
Name	Pump

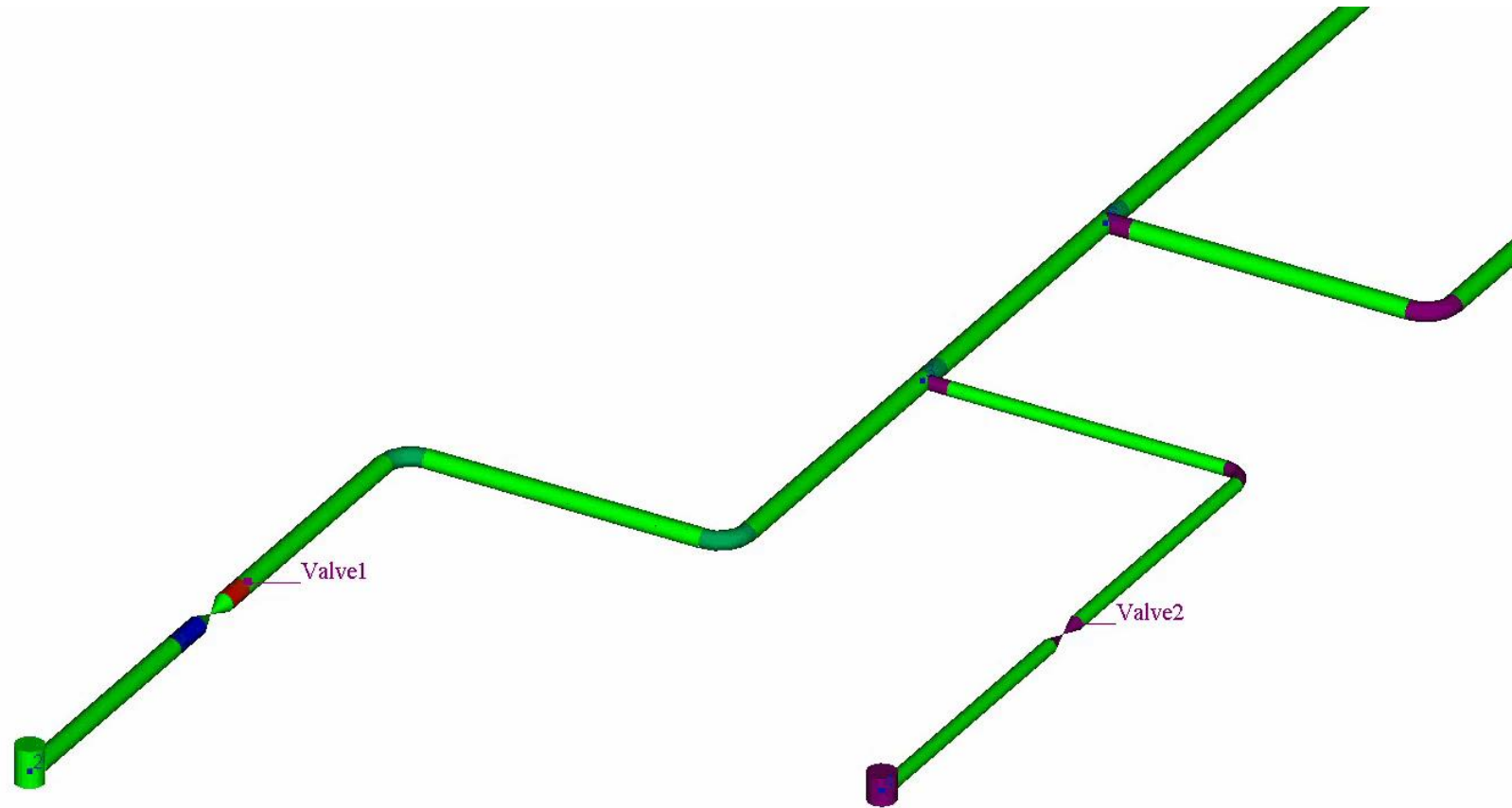
Input data list | Isothermal flow

Back | Cancel | Finish



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PASS/Hydrosystem | Surge calculation & view



P

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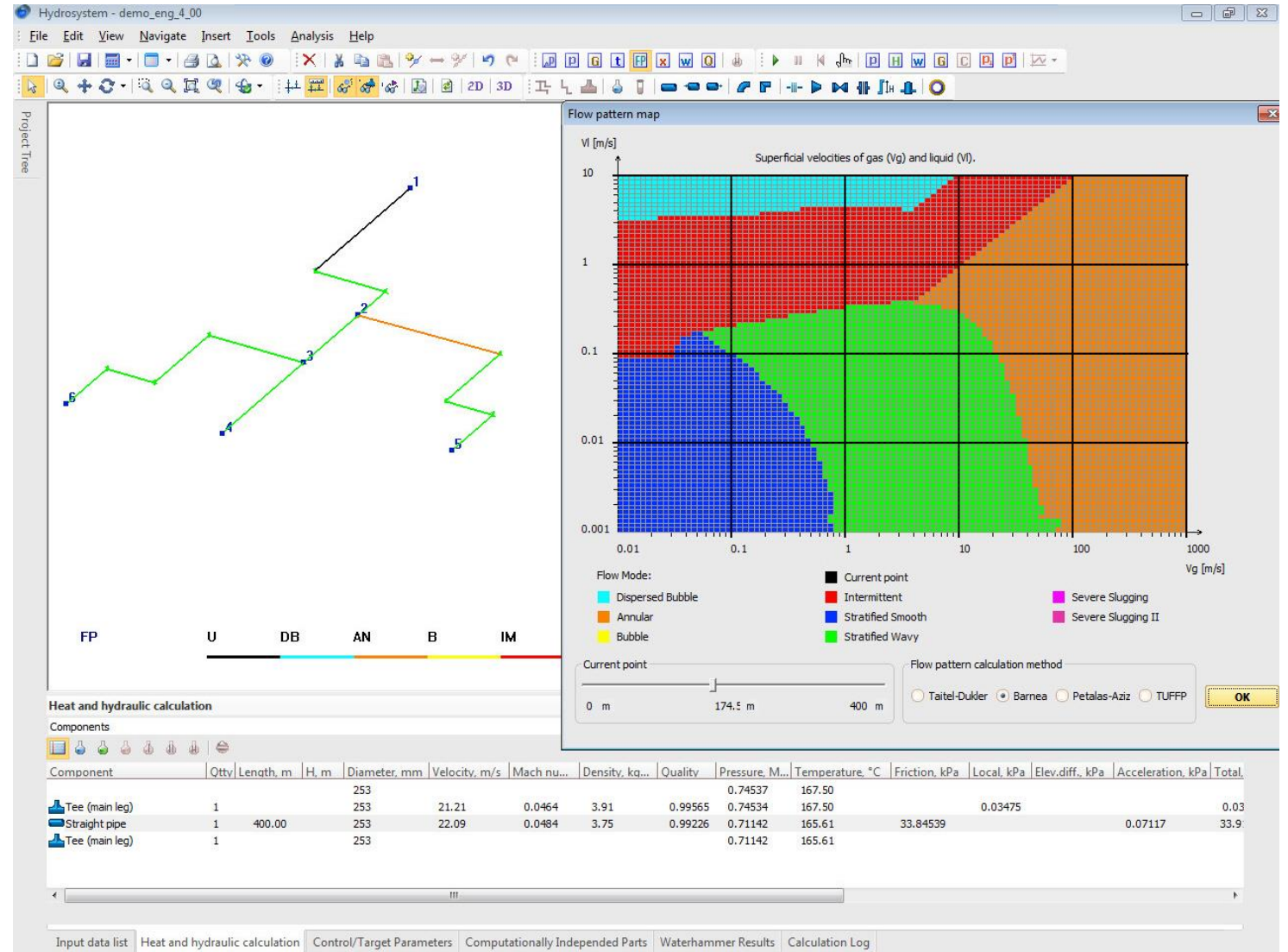
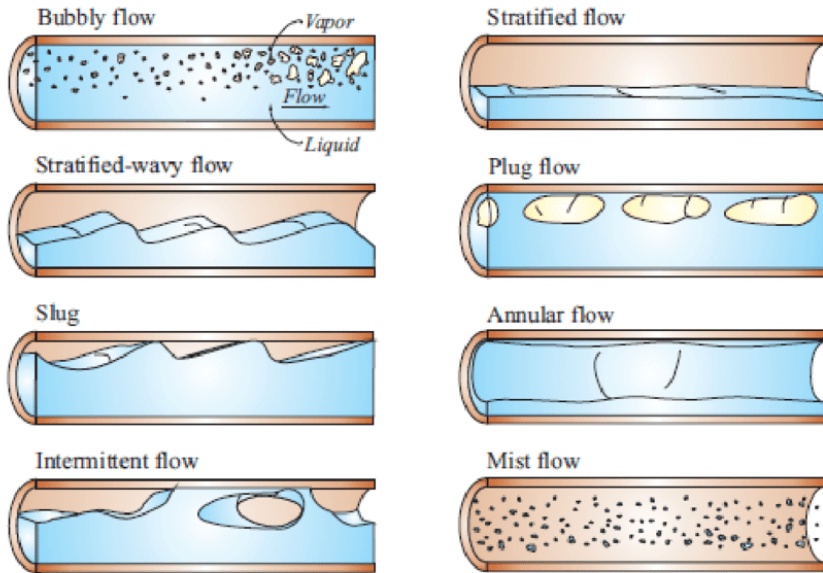
3.33 MPa



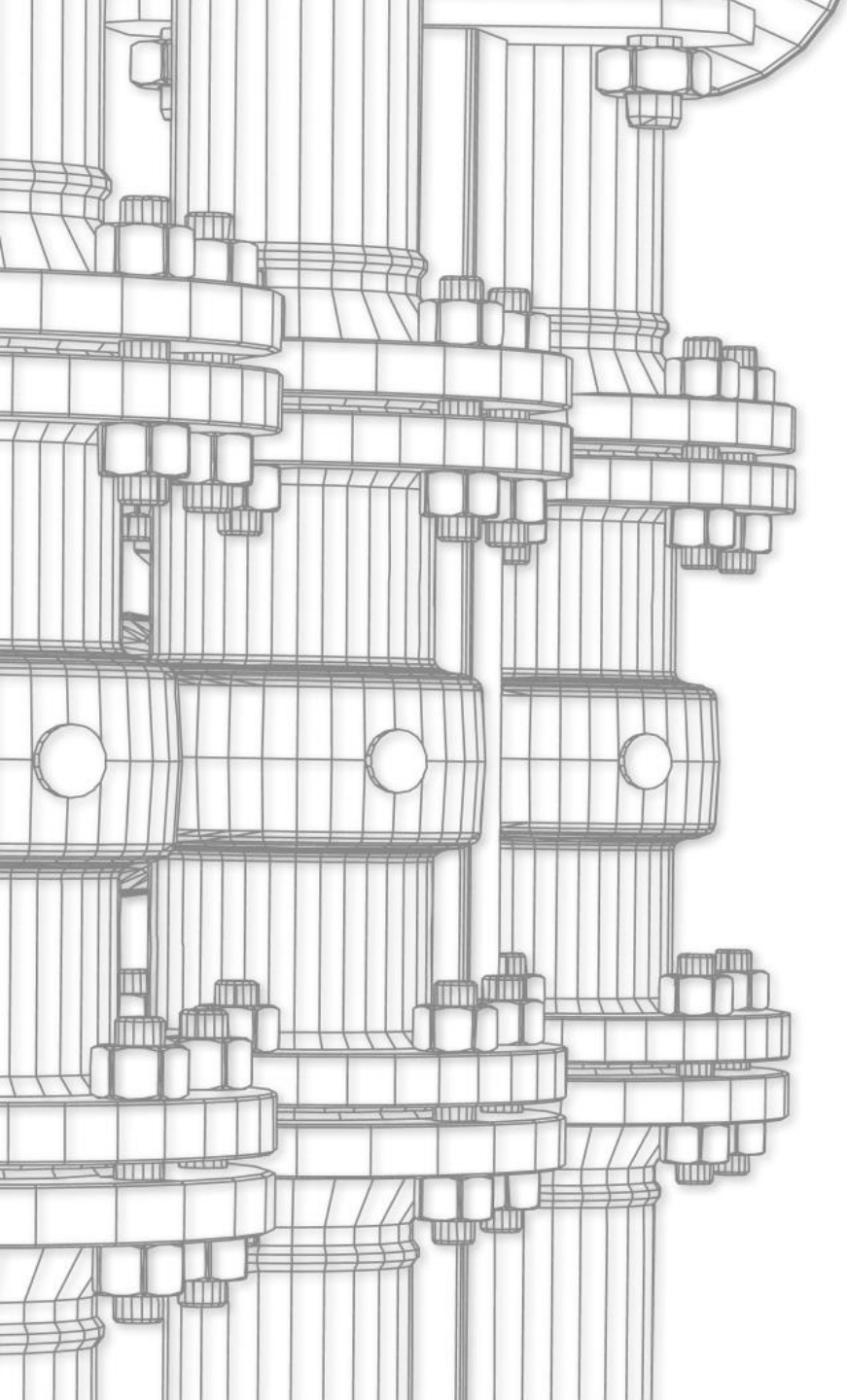
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PASS/Hydrosystem | Two-phase flow pattern map



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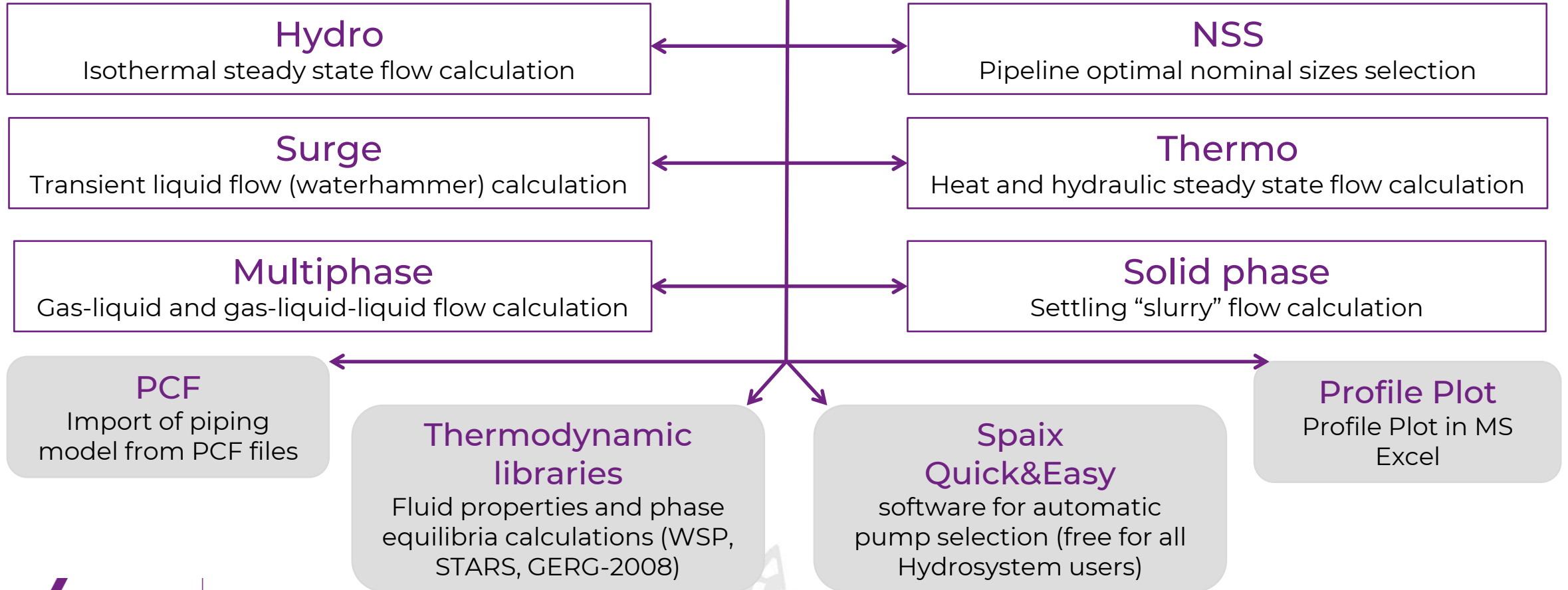
PASS/Hydrosystem Configurations & Licensing



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PASS/Hydrosystem | Flexible licensing

PASS/HYDROSYSTEM



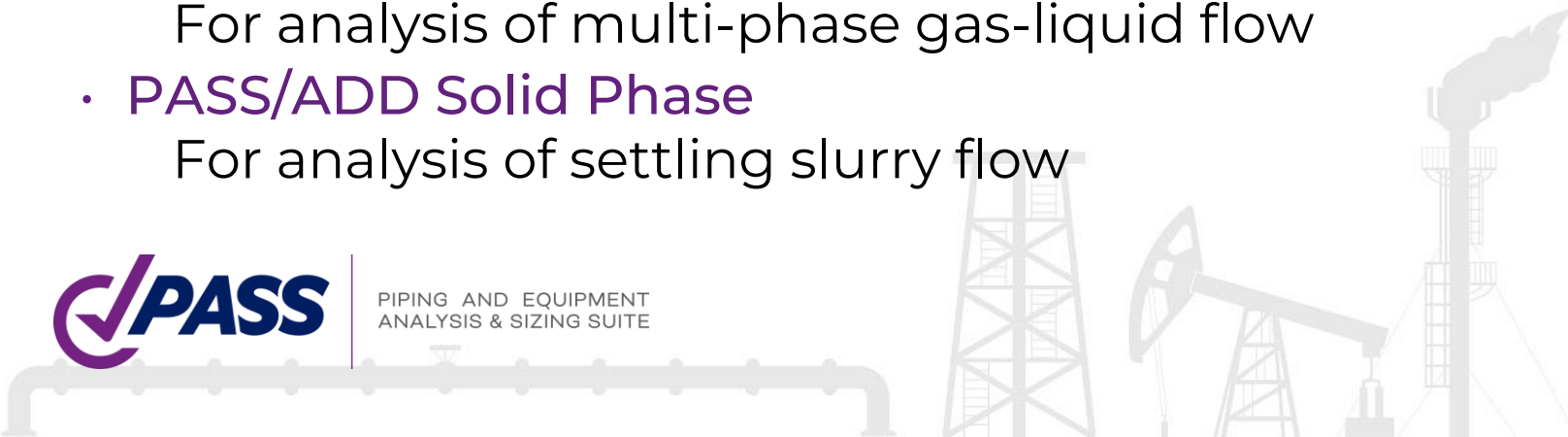
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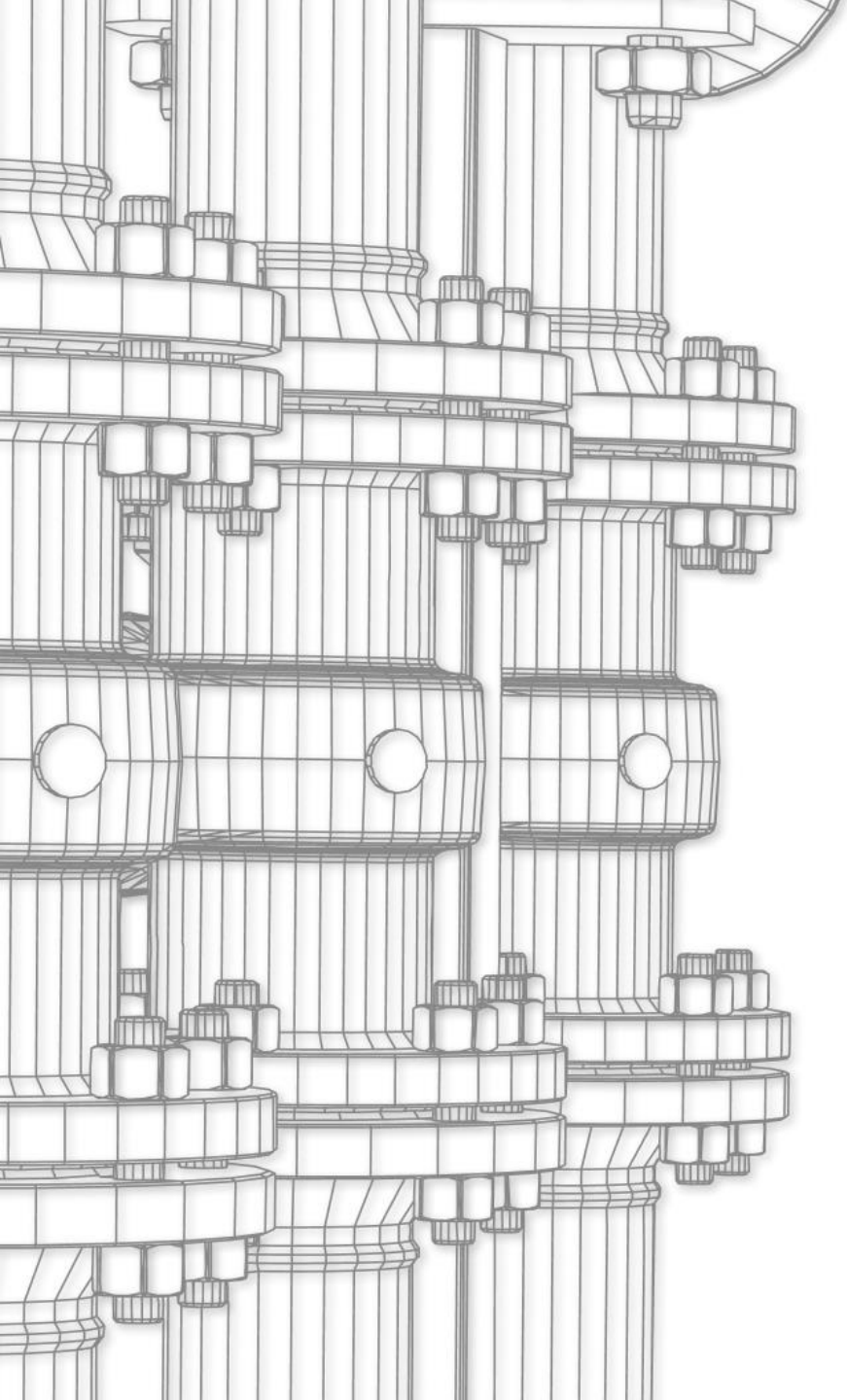
PASS/Hydrosystem | Flexible licensing

- **PASS/Hydrosystem Complete**
For comprehensive hydraulic and thermal analysis and sizing (includes PASS/ADD Surge, PASS/ADD Multiphase & PASS/ADD Solid)
- **PASS/Hydrosystem Pressure & Heat**
For single phase steady state flow hydraulic and thermal analysis
- **PASS/Hydrosystem Pressure**
For single phase steady state flow hydraulic analysis
- **PASS/ADD Surge**
For analysis of liquid transient flow
- **PASS/ADD Multiphase**
For analysis of multi-phase gas-liquid flow
- **PASS/ADD Solid Phase**
For analysis of settling slurry flow



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What's new in PASS/Hydrosystem 4.4

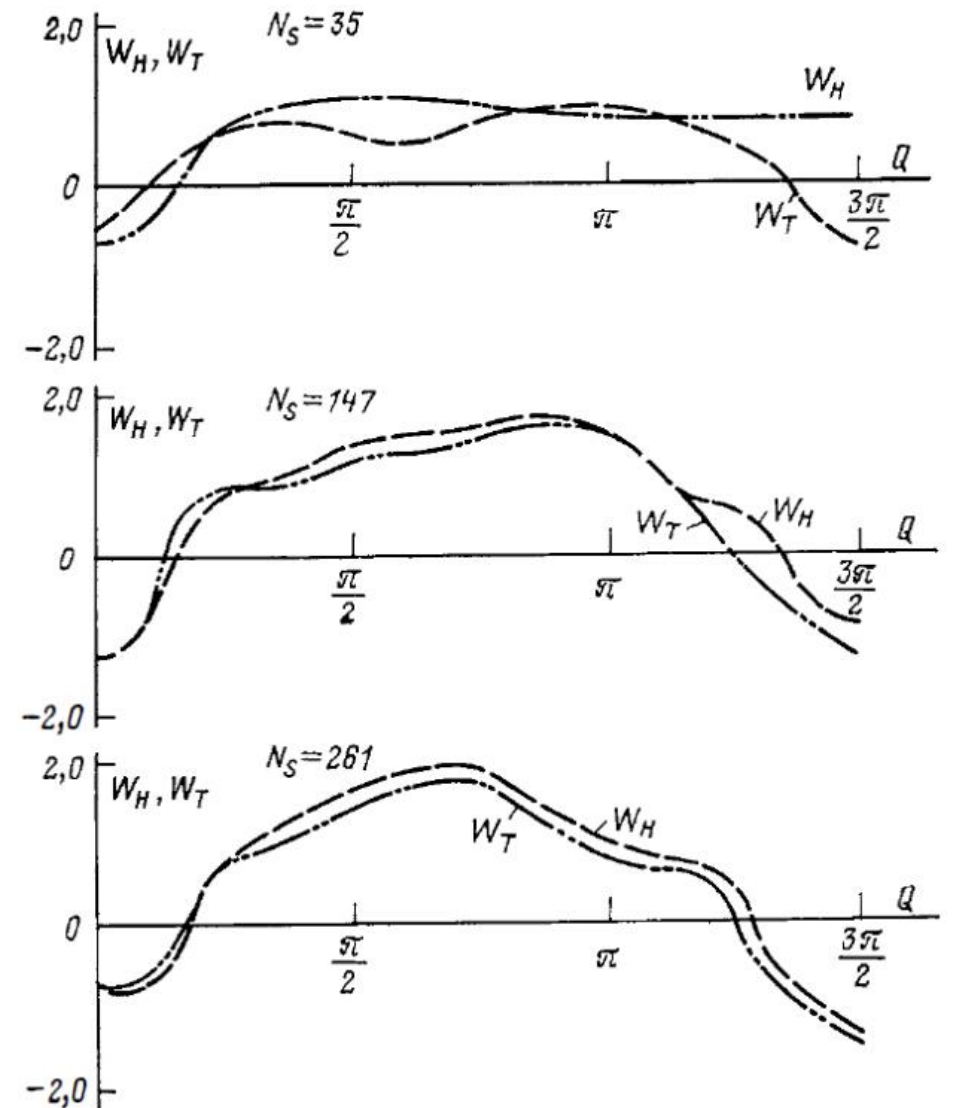


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PASS/Hydrosystem | What's new version 4.4

New improved model of centrifugal pumps trip and startup at surge analysis

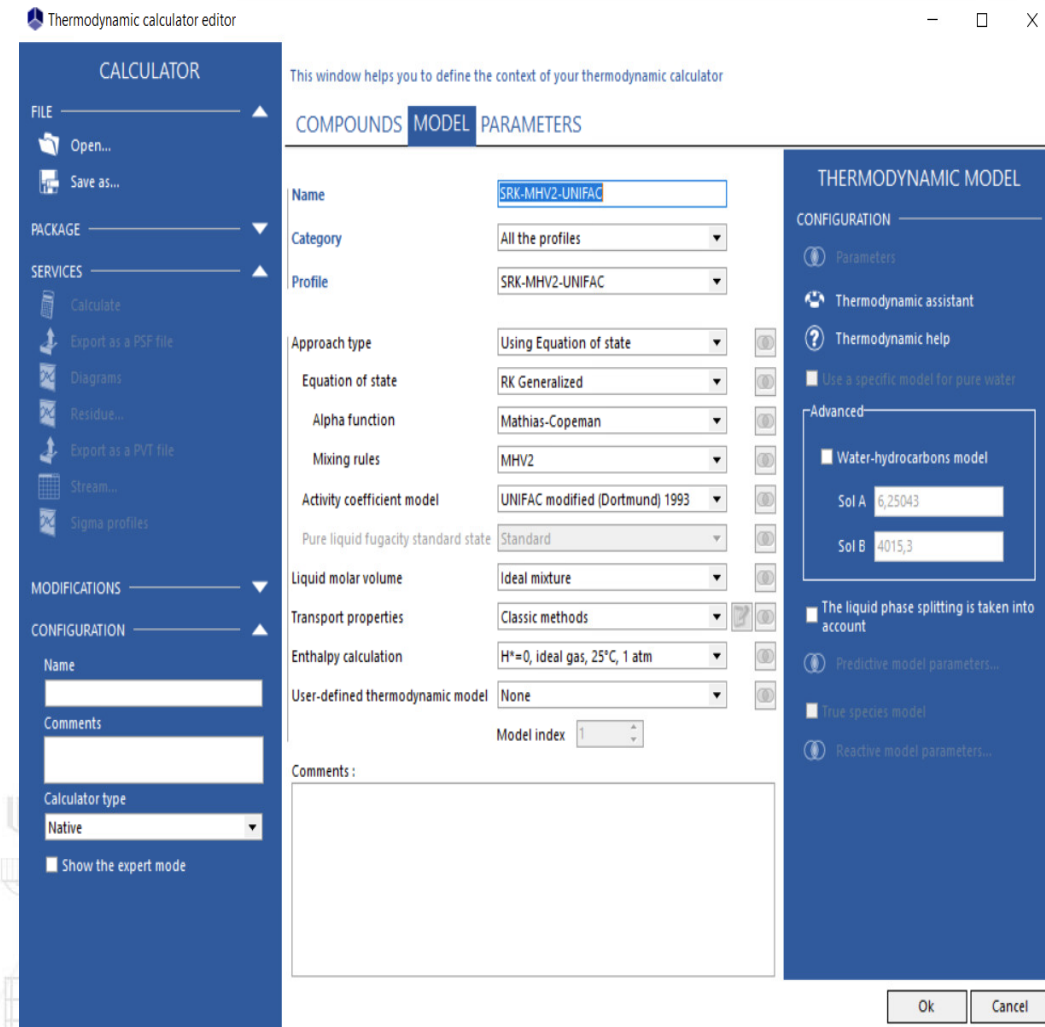
- Based on famous 'Suter curves'
- Considers all possible pump operation zones (pump mode, turbine mode, pump dissipation, turbine dissipation mode)
- Requires minimum data for simulation



PASS/Hydrosystem | What's new version 4.4

New improved 'Simulis Thermodynamics' integration

- Simulis Thermodynamics calculator launching right from Hydrosystem
- More detailed thermodynamic model adjustment
- Automatic recalculation of pseudo-components from 'STARS' library to 'Simulis Thermodynamics'
- Performance and stability improvements

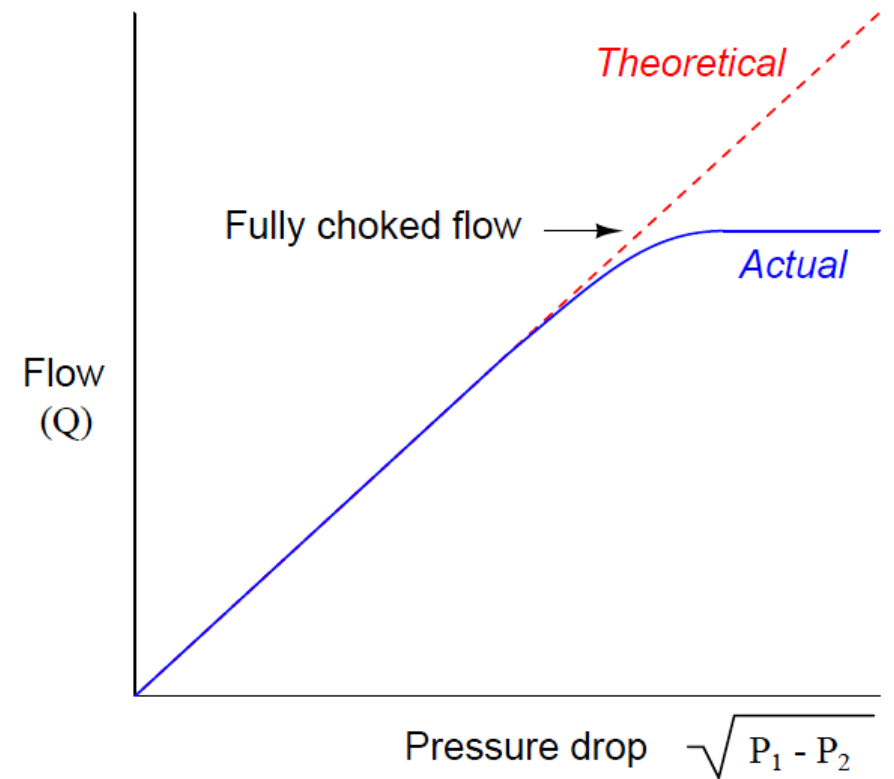


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PASS/Hydrosystem | What's new version 4.4

Calculation of choked (and near choked) flow with phase transitions

- For pipes, pipe exits, reducers, sudden contractions/expansions etc.
- Allows more precise calculation of fluid inlet properties (P, T, x) at sonic velocities in pipeline
- Currently in 'beta-testing' mode but all types of phase transitions of 'practical' interest in pipelines are already implemented



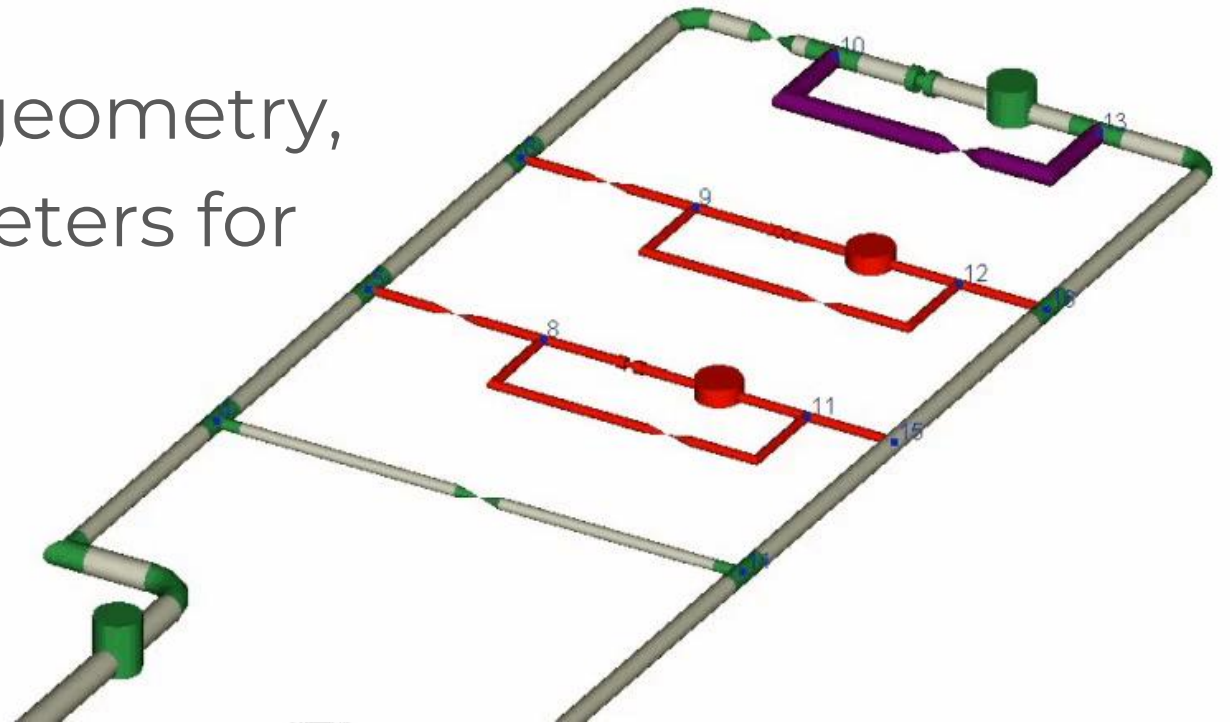
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PASS/Hydrosystem | What's new version 4.4

Group operations with pipeline elements (branches, components)

- Allows to change piping geometry, location and other parameters for multiple components
- Works quickly even in large projects



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PASS/Hydrosystem | What's new version 4.4

New service for seeking and fixing user-made errors in piping geometry vertical projections

- Piping components vertical projections are very important at liquid, gas-liquid and slurry flow analysis (because of static pressure drop)
- Vertical mismatches in looped pipelines may cause significant inaccuracy of calculation or even convergence problems
- A new service tool is intended to solve this problem



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PASS/Hydrosystem | What's new version 4.4

A lot more improvements:

- The algorithm of elevation mismatches diagnostics in piping components elevation differences for looped pipelines has been changed – now the program shows a branch with mismatch instead of a circuit.
- Valves import from PCF files has been improved.
- Improvements have been made to the calculation of density for fluids containing oil fractions with high boiling point using 'STARS' library;
- The severe slugging two-phase flow prediction has been improved.
- Two-phase flow pattern diagram output has been improved.
- Flashing/condensing gas-liquid flow calculation (including 'reverse' analysis for unbranched pipelines) accuracy has been improved.
- Improvements have been made to the parameters selection service:
 - Added a dynamic view of the parameters selection progress (indicating the number of the current iteration and the current values of control parameters) which allows to evaluate the progress and convergence of the calculation more accurately;
 - Added the ability to interrupt the calculation with parameters selection.
- The diagnostic system of waterhammer analysis has been improved.
- Heat and hydraulic calculation algorithm for the rare case of laminar gas flow has been improved.
- Some minor errors and inaccuracies in the program have been fixed.



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PASS/Hydrosystem | What's new version 4.4

A new version is out in near days

- Don't forget to download new version from our website www.passuite.com/hydrosystem →



- Turn on the automatic updates in Hydrosystem settings to get software updates

- If you're not a PASS/Hydrosystem user, demand free trial on www.passuite.com/trial →



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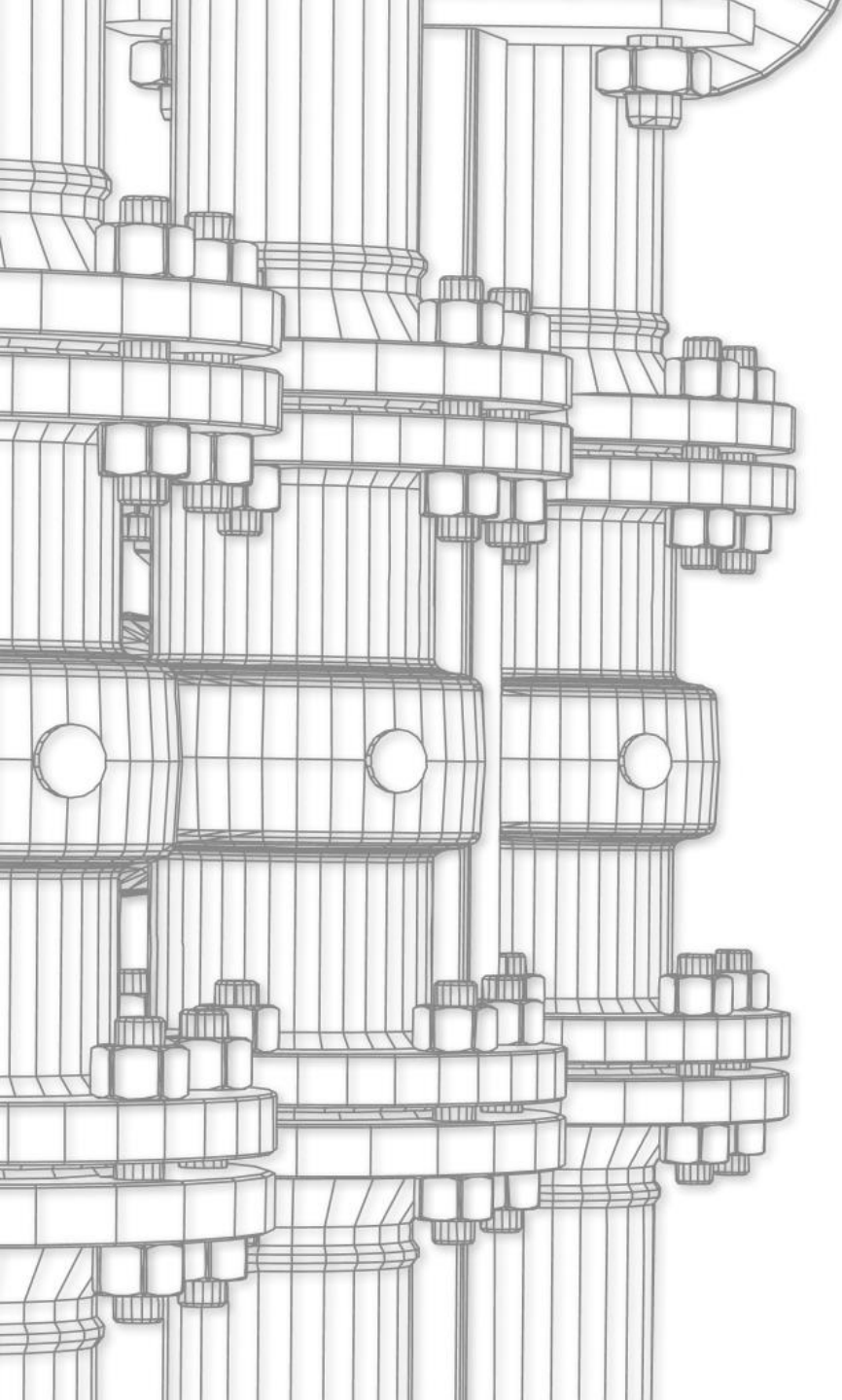


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Thank YOU!



Q&A

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