HydrauCalc

2021a Release

www.hydraucalc.com

APPLICATION DESCRIPTION

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HydrauCalc is a software application that allows accurate modeling and calculating of stabilized flows in piping elements as straight pipes, bends, changes of cross-section, tees, valves, orifices and more.

HydrauCalc is particularly suitable for pre-projects because it allows to estimate quickly the pressure losses of the components of a hydraulic installation, and thus to specify the characteristics of the pumps.

Friction Loss is calculated using the Darcy-Weisbach method, which provides accurate results for non-compressible fluids (liquids). This method also provides satisfactory results of reasonable accuracy for compressible fluids (gases) when the flow velocity is not very high.

HydrauCalc is mainly based on well-known and respected references in the field of fluid flow and pressure drop calculation.

THE REFERENCES

MAINLY REFERENCES

[1] Handbook of Hydraulic Resistance, I.E. Idelchik

[2] Internal Flow System, D.S. Miller

[3] CRANE - Flow of Fluids Through Valves, Fitting and Pipe - Technical Paper No. 410

[4] Pipe Flow - A Practical and Comprehensive Guide, D. C. Rennels, H. M. Hudson

THE GRAPHICAL USER INTERFACE

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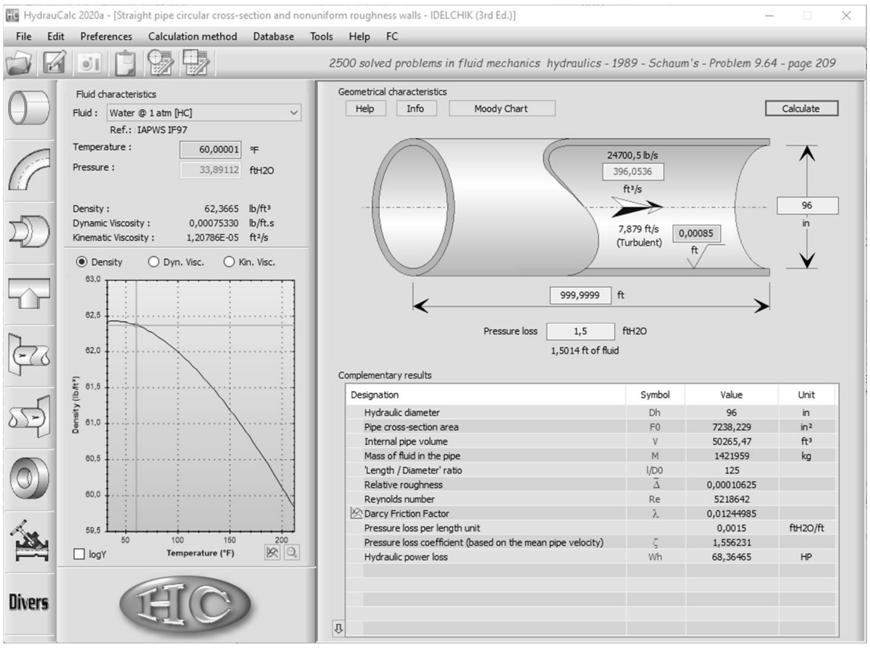
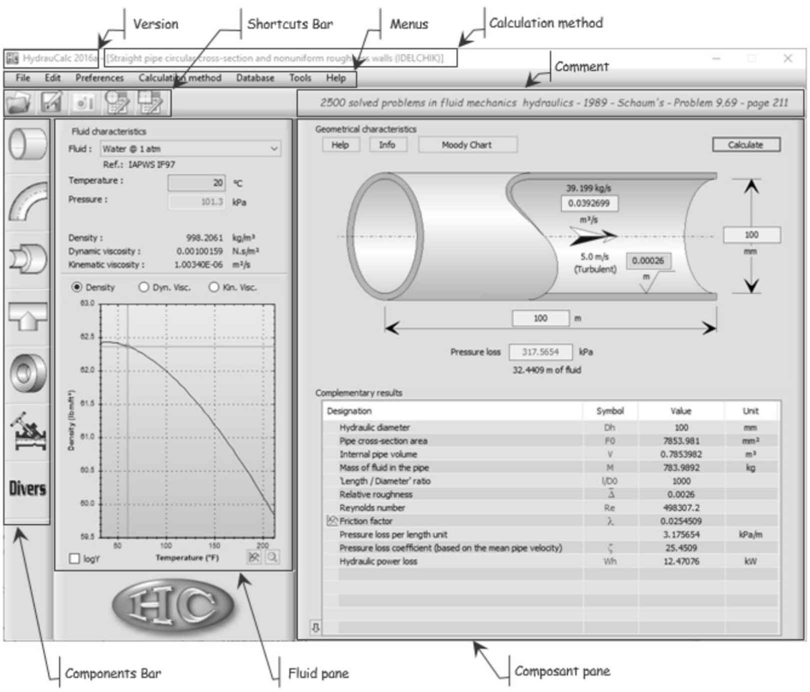


The graphical user interface is available in English, French or Spanish.

From this interface, the user selects the type of component he wants to calculate and the fluid carried in this component. It also provides the necessary input data (fluid and flow characteristics and component geometry).

This interface is intuitive and very easy-to-use.

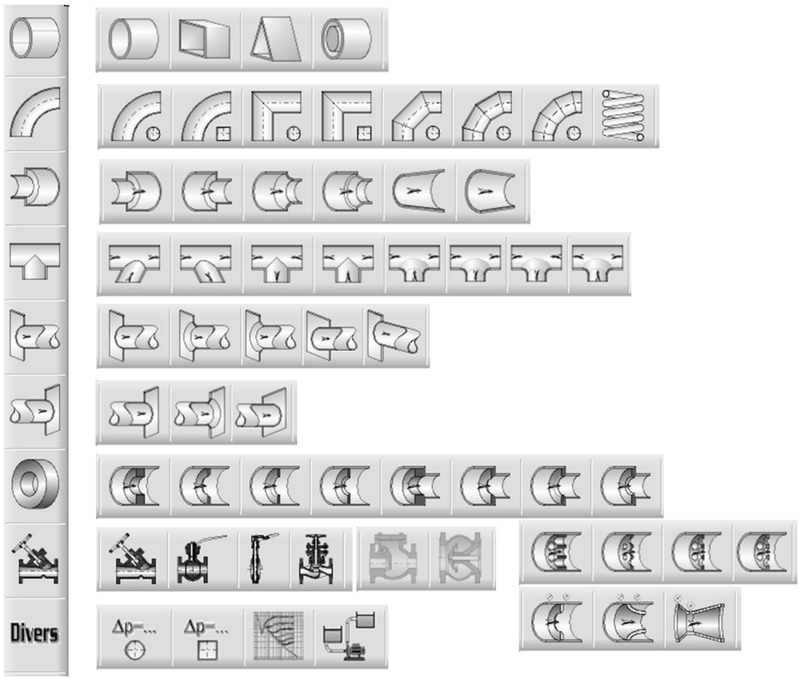
GRAPHICAL INTERFACE STRUCTURE



The graphical interface is structured in four main parts:

- The components bar
- The fluid pane
- The component pane
- The upper part which includes:
  - The information about release and calculation method chosen
  - Menus and shortcuts bar
  - The display area for a possible comment

COMPONENTS BAR

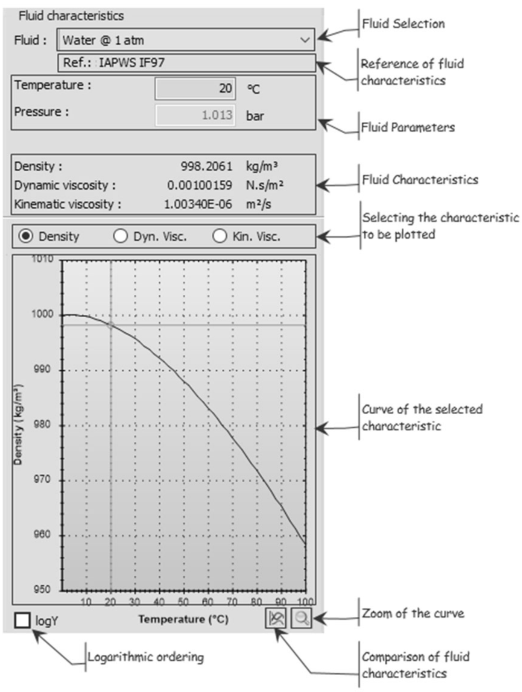


The vertical components bar makes it possible to select a family of components (straight pipes, bends, changes of cross-section, tees, pipeline entrances and discharges, restriction and measurement orifices, valves, ...)

Selecting a family displays the available components for that family in one or more horizontal bars.

The shaded components are under development and will be available in a future release.

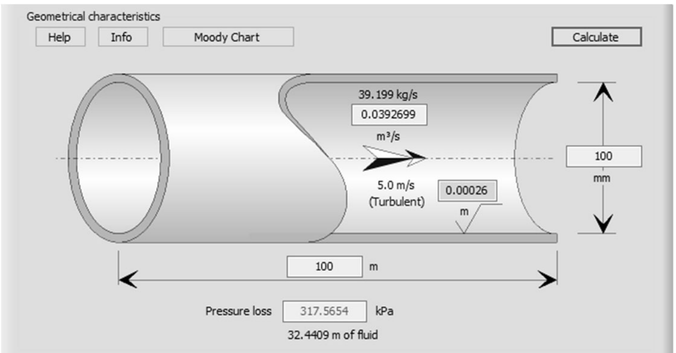
FLUID PANE



The fluid pane mainly allows:

- Select the fluid
- Set the fluid according to the selected fluid type (temperature, pressure, salinity, quality, humidity, ...)
- Visualize the characteristics of the fluid (density, dynamic and kinematic viscosity)
- Visualize the evolution of the characteristics according to the temperature or the pressure (according to the type of selected fluid)

COMPONENT PANE



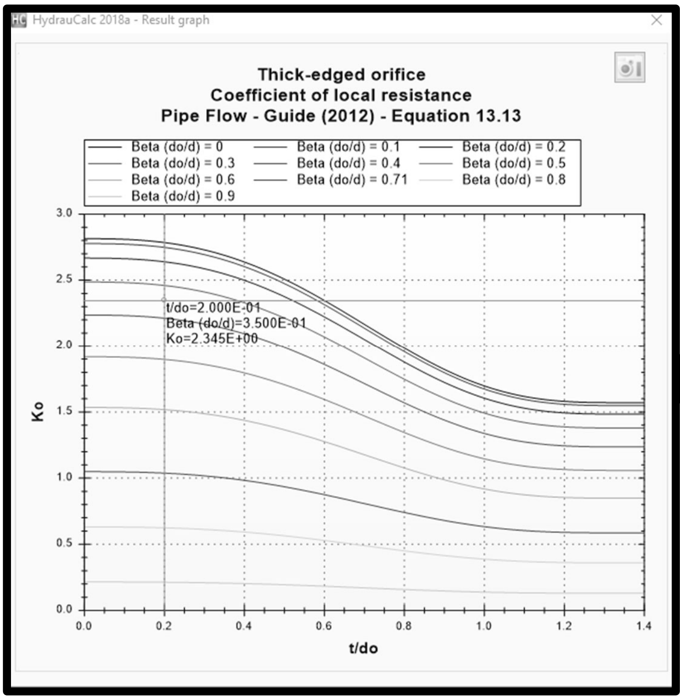
Complementary results

Designation	Symbol	Value	Unit
Hydraulic diameter	Dh	100	mm
Pipe cross-section area	F0	7853.981	mm²
Internal pipe volume	V	0.7853982	m³
Mass of fluid in the pipe	M	783.9892	kg
'Length / Diameter' ratio	l/D0	1000	
Relative roughness	Δ	0.0026	
Reynolds number	Re	498307.2	
Friction factor	λ	0.0254509	
Pressure loss per length unit		3.175654	kPa/m
Pressure loss coefficient (based on the mean pipe velocity)	ζ	25.4509	
Hydraulic power loss	Wh	12.47076	kW

The component pane allows you to:

- Define the geometry of the component according to the selected component type (inside diameter, length, roughness, ...)
- Define flow (volume flow rate)
- Execute the calculation of the component
- Visualize the results
- Display the Moody diagram corresponding to the calculation with the calculated point (case of friction loss)
- Access information about the component:
  - Help (technical documentation of the component)
  - Info (information on the use of the component)
  - Other eventually

COMPLEMENTARY RESULTS

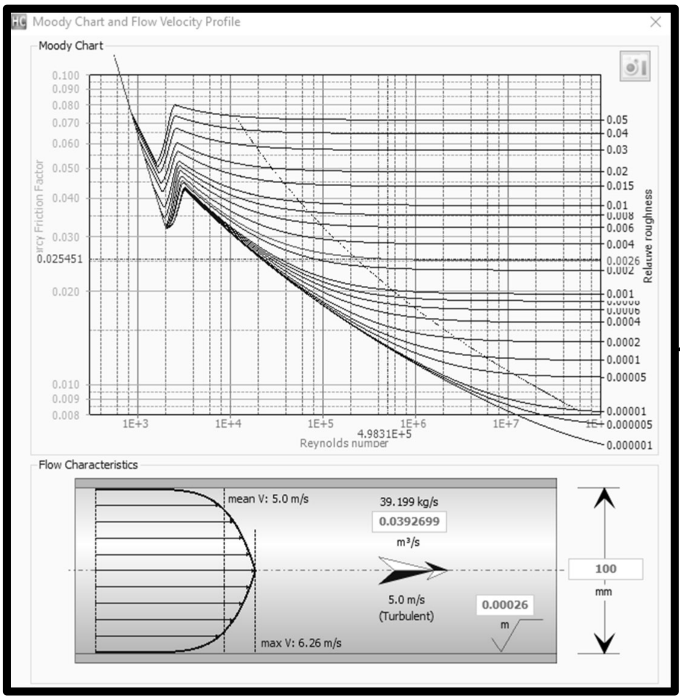


When, in the complementary results, the variable is preceded by the symbol , a simple click on this variable shows the evolution graph of the variable with the calculated point.

Example :

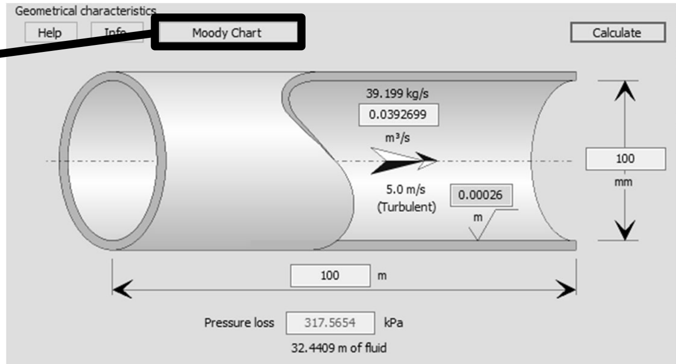
Designation	Symbol	Value	Unit
Pipe cross-section area	A	7853.981	mm²
Orifice cross-section area	Ao	962.1127	mm²
Diameters ratio (Do/d)	β	0.35	
Cross-sections area ratio	Ao/A	0.1225	
Thickness to orifice diameter ratio	t/Do	0.2	
Pipe Reynolds number	NRe	498307.2	
Orifice Reynolds number	NReo	1423735	
Velocity in vena contracta	Vc	65.43075	m/s
Jet velocity ratio (Equation 13.4)	λ	1.603054	
Coefficient Cth (Equation 13.14)	Cth	0.9763061	
Coefficient of local resistance (Equation 13.13)	Ko	2.34488	
Pressure loss coefficient (based on the mean pipe velocity)	K	156.2602	
Hydraulic power loss	Wh	76.56641	kW

MOODY DIAGRAM

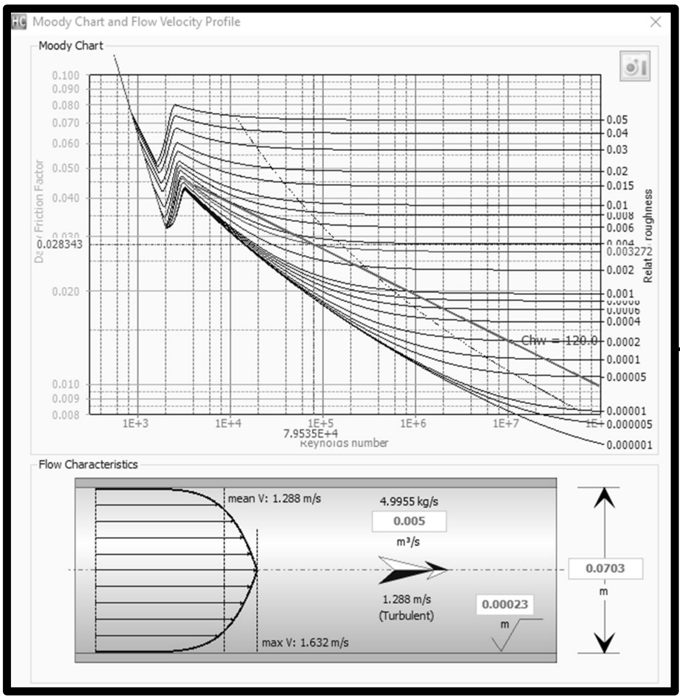


When the component is subjected to friction, the Moody diagram can be consulted to observe the operating point (as well as the flow velocity profile).

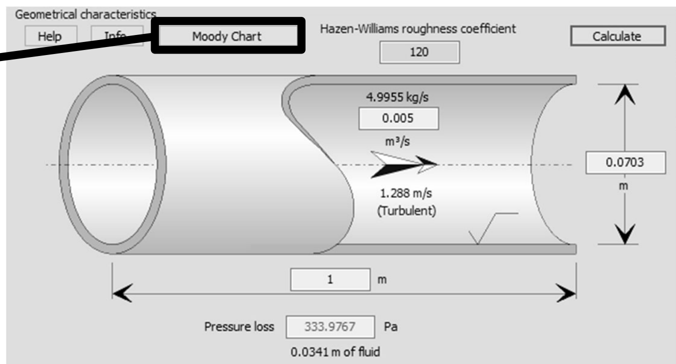
Example of a straight pipe:



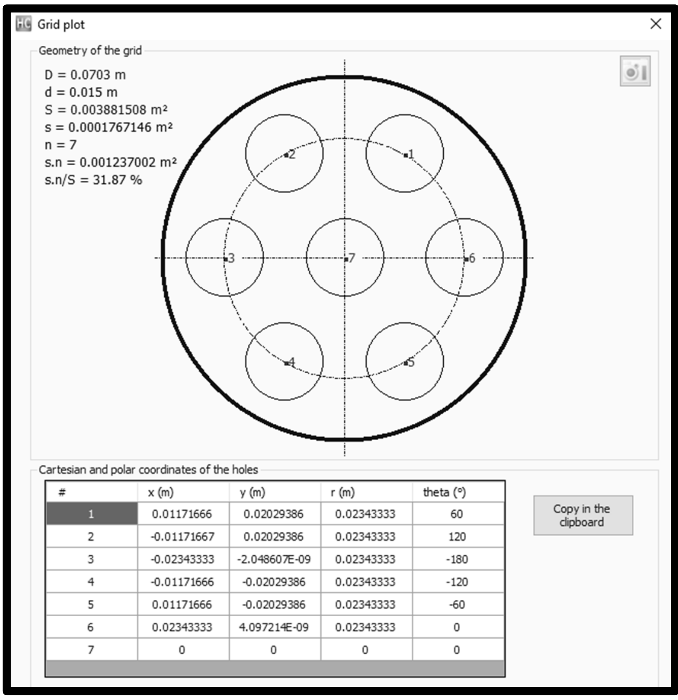
MOODY DIAGRAM AND HAZEN-WILLIAMS FORMULA



For the "Hazen-Williams" calculation method for circular cross-section straight pipes, the Moody diagram shows the relationship between the roughness coefficient of the Hazen-Williams formula and the friction coefficient of Darcy. The diagram also shows the limits of applicability of the Hazen-Williams formula.

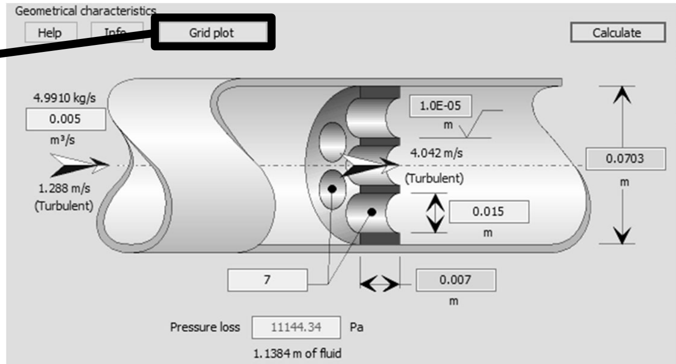


GRID PLOT



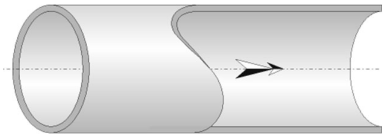
For "Grid" components (perforated plate), the application provides a grid plot with the coordinates of each hole.

Example of a perforated plate plot:

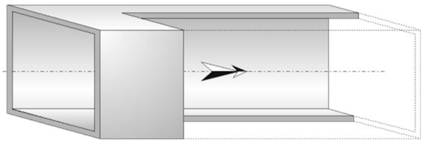


THE COMPONENTS

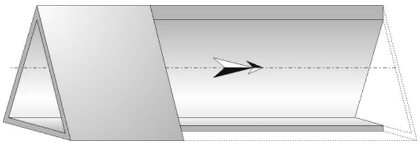
STRAIGHT PIPES



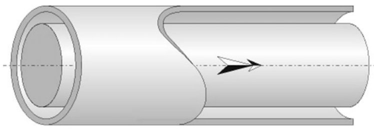
Circular cross-section



Rectangular cross-section



Triangular cross-section



Annular cross-section

The proposed calculation methods:

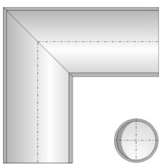
- IDELCHIK
  - Uniform roughness walls (Nikuradze equation)
  - Nonuniform roughness walls (Colebrook-White equation)
  - Smooth roughness walls (Filonenko and Althsul equation)
  - Explicit Darcy friction factor
- MILLER
  - Roughness walls (Swamee-Jain equation)
  - Explicit Darcy friction factor
- HAZEN-WILLIAMS (only circular cross-section)
  - Roughness walls (Hazen-Williams equation)

The proposed calculations:

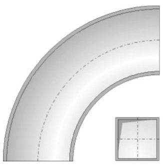
- Pressure loss
- Volume flow rate
- Length of pipe
- Inside diameter (circular cross-section)
- Height or width (rectangular cross-section)
- Height or base (triangular cross-section)

BENDS

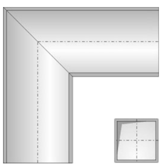
Smooth bend with circular cross-section



Miter bend with circular cross-section



Smooth bend with rectangular cross-section



Miter bend with rectangular cross-section

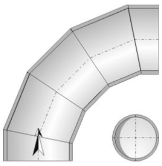
The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

The proposed calculations:

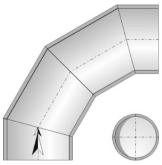
- Pressure loss
- Volume flow rate

BENDS



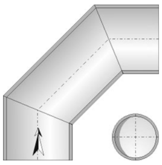
New R2021a

Composite bend 90° with circular cross-section (4 x 22.5°)



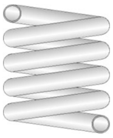
New R2021a

Composite bend 90° with circular cross-section (3 x 30°)



New R2021a

Composite bend 90° with circular cross-section (2 x 45°)



New R2021a

Helical tube

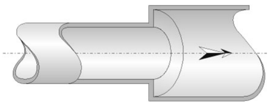
The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

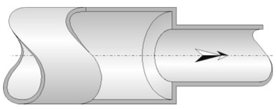
The proposed calculations:

- Pressure loss
- Volume flow rate

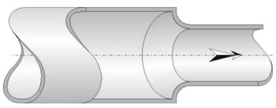
CHANGES OF CROSS-SECTION



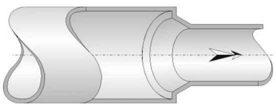
Sudden expansion



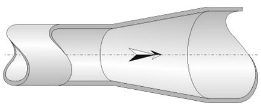
Sudden contraction sharp



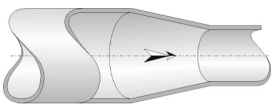
Sudden contraction rounded



Sudden contraction bevelled



Gradual expansion



Gradual contraction

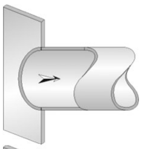
The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

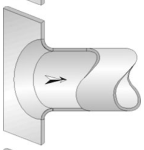
The proposed calculations:

- Pressure loss
- Volume flow rate

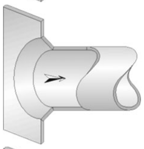
ENTRANCE OF PIPELINE



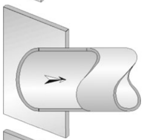
Flush-mounted sharp-edged entrance



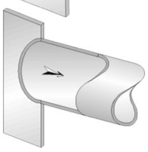
Flush-mounted rounded entrance



Flush-mounted bevelled entrance



Sharp-edged entrance mounted at a distance



Sharp-edged entrance mounted at an angle

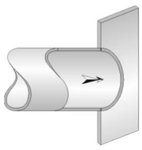
The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

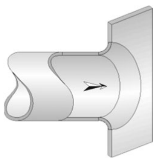
The proposed calculations:

- Pressure loss
- Volume flow rate

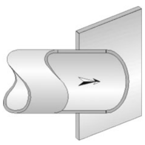
DISCHARGE OF PIPELINE



Flush-mounted sharp-edged discharge



Flush-mounted rounded discharge



Sharp-edged discharge mounted at a distance

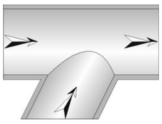
The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

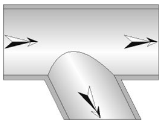
The proposed calculations:

- Pressure loss
- Volume flow rate

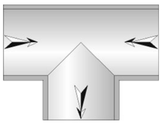
JUNCTIONS



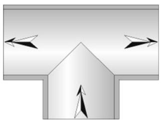
Combining sharp-edged junction



Dividing sharp-edged junction



Symmetric combining sharp-edged T-junction



Symmetric dividing sharp-edged T-junction

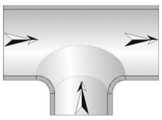
The proposed calculation methods:

- IDELCHIK
- MILLER
- CRANE

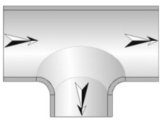
The proposed calculations:

- Pressure loss in each branch

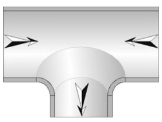
JUNCTIONS (FOLLOWING)



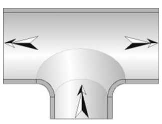
Combining radiused-edged T-junction



Dividing radiused-edged T-junction



Symmetric combining radiused-edged T-junction



Symmetric dividing radiused-edged T-junction

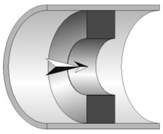
The proposed calculation methods:

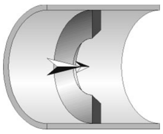
- MILLER
- Pipe Flow Guide

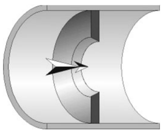
The proposed calculations:

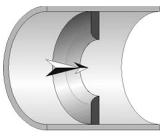
- Pressure loss in each branch

RESTRICTION ORIFICES


Thick-edged orifice


Sharp-edged orifice


Bevelled-edged orifice


Radiused-edged orifice

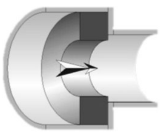
The proposed calculation methods:

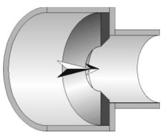
- IDELCHIK
- MILLER
- CRANE
- Pipe Flow Guide

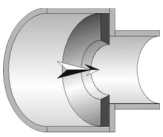
The proposed calculations:

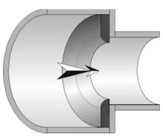
- Pressure loss
- Volume flow rate
- Orifice diameter

RESTRICTION ORIFICES (FOLLOWING)


Thick-edged orifice
(in transition section)


Sharp-edged orifice
(in transition section)


Bevel-edged orifice
(in transition section)


Round-edged orifice
(in transition section)

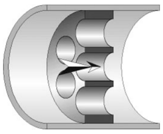
The proposed calculation methods:

- IDELCHIK
- Pipe Flow Guide

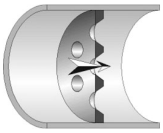
The proposed calculations:

- Pressure loss
- Volume flow rate
- Orifice diameter

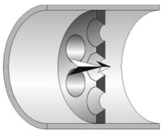
GRIDS



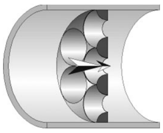
Thick-edged grid



Sharp-edged grid



Bevelled-edged grid



Radiused-edged grid

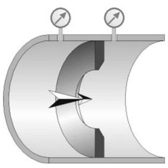
The proposed calculation methods:

- IDELCHIK
- MILLER
- Pipe Flow Guide

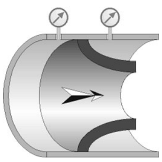
The proposed calculations:

- Pressure loss
- Volume flow rate
- Holes diameter
- Holes number

MEASUREMENT ORIFICES

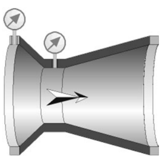


Orifice plate flowmeter



New R2021a

Nozzle and Venturi nozzle flowmeter



New R2021a

Venturi tube flowmeter

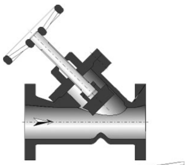
The proposed calculation methods:

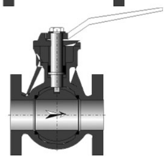
- ISO 5167:2003
- ISO 5167:1991
- CRANE 1999

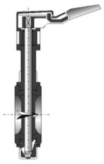
The proposed calculations:

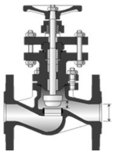
- Measured differential pressure
- Net pressure loss
- Volume flow rate
- Orifice diameter

VALVES


Y globe valve


Ball valve


Butterfly valve


Globe valve

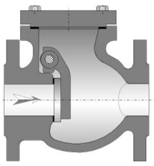
The proposed calculation methods:

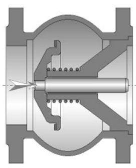
- ❑ IDELCHIK
- ❑ MILLER
- ❑ Manufacturers

The proposed calculations:

- ❑ Pressure loss
- ❑ Volume flow rate

CHECK VALVES


Swing check valve


Lift check valve

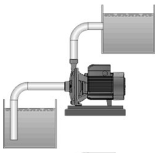
The proposed calculation methods:

- ❑ IDELCHIK
- ❑ Manufacturers

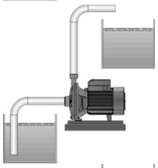
The proposed calculations:

- ❑ Pressure loss

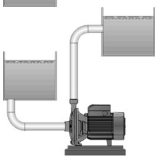
PUMP QUICK DESIGN



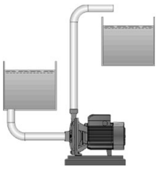
Suction lift operation
Tank with pipe ending below the fluid level



Suction lift operation
Free flow from the pipe ending above the water level



Suction head operation
Tank with pipe ending below the fluid level



Suction head operation
Free flow from the pipe ending above the water level

The proposed calculation method:

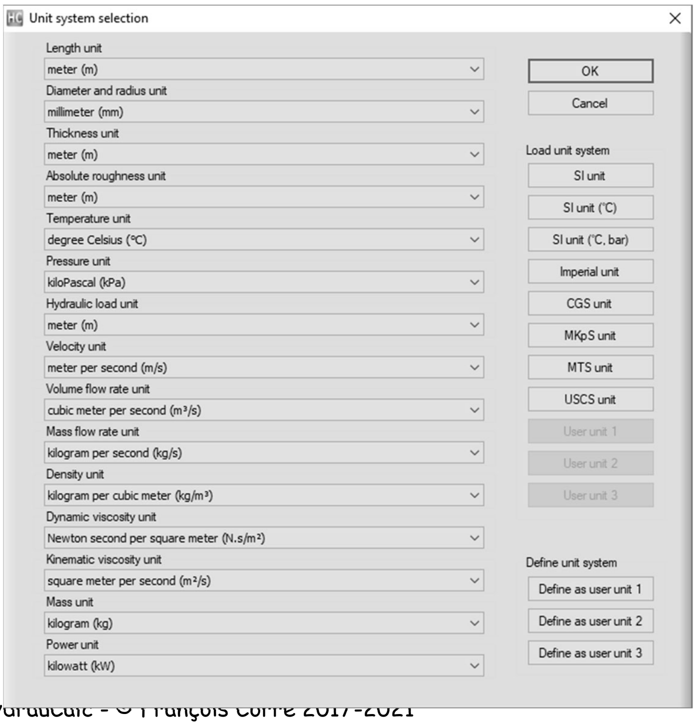
- KSB Manufacturer

The proposed calculations:

- Total Dynamic Head (TDH)
- Net Positive Suction Head available ($NPSH_a$)
- Pressure loss in suction and discharge lines
- Pressures at the pump flanges

THE MEASURE UNITS

UNIT SYSTEM SELECTION

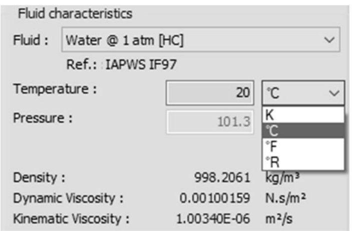


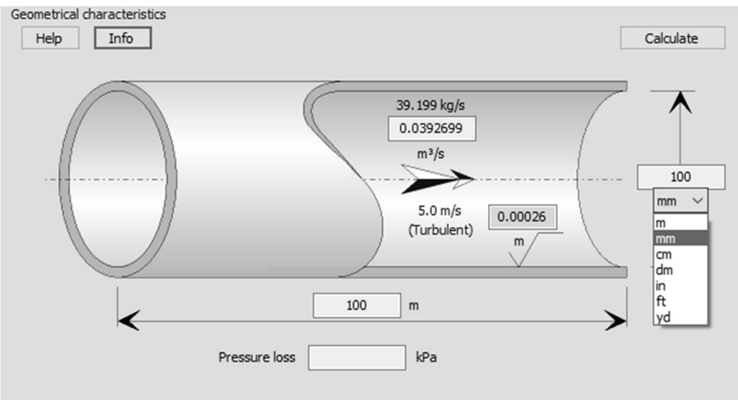
Units can be selected:

- individually
- by unit systems

The user can define his own systems of units (within the limit of three systems)

UNITS MODIFICATION





The application has a dynamic unit conversion engine.

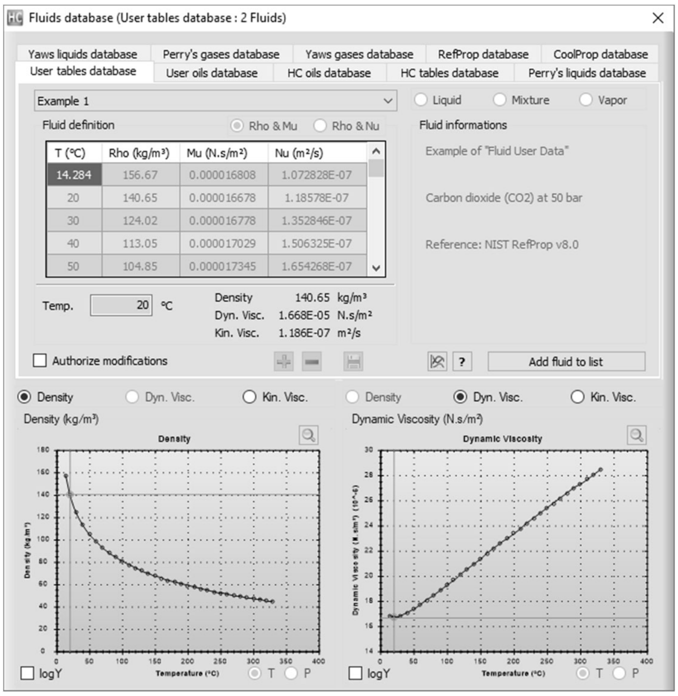
The units displayed in the Fluid Pane and Component Data Panes can be changed by simply clicking on the unit displayed.

After selecting a new unit, the value entered in the input box is automatically converted to the new unit.

The results will be displayed in the current units.

THE DATABASES

DATABASE - FLUIDS

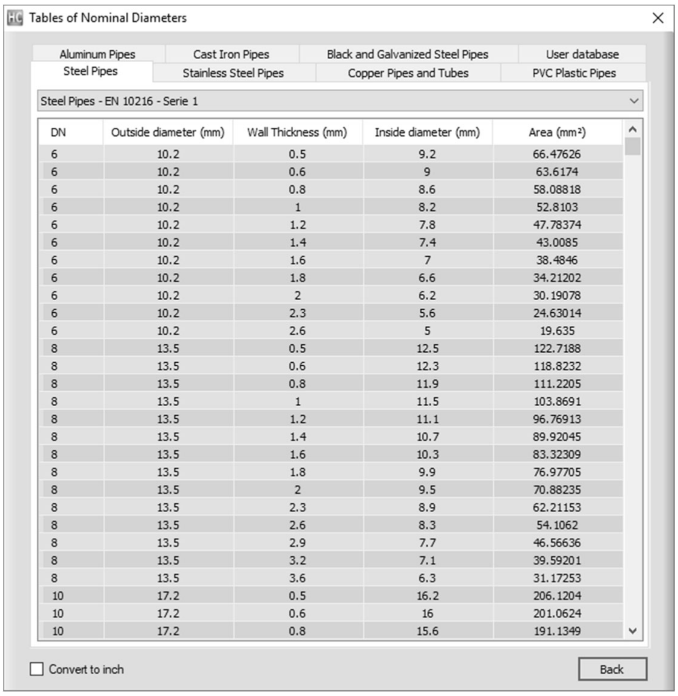


HydrauCalc has a fluid characteristics database consisting of several hundred fluids based on recognized references:

- Perry's Handbook
- Oil products
- Yaws Handbook
- Coolprop
- Refprop (coming soon ...)

The user can also define his own fluids in the form of point tables as a function of temperature.

DATABASE – PIPINGS



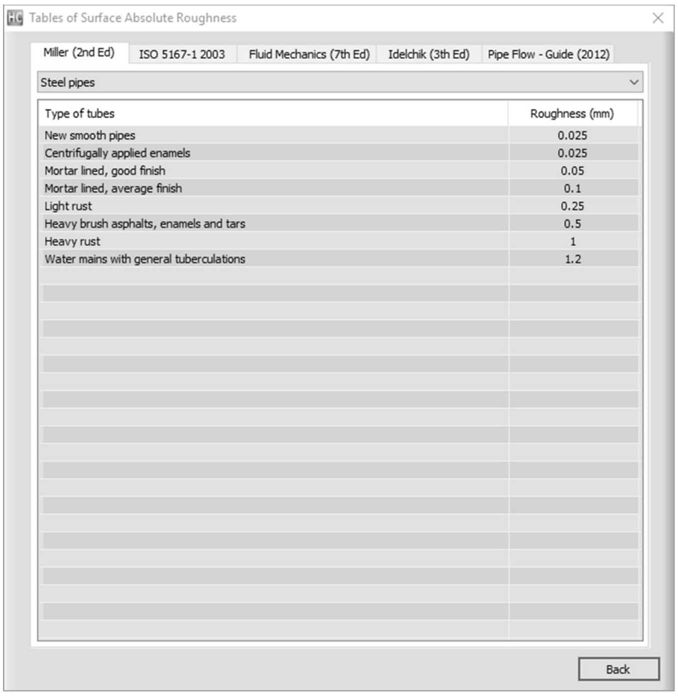
DN	Outside diameter (mm)	Wall Thickness (mm)	Inside diameter (mm)	Area (mm²)
6	10.2	0.5	9.2	66.47626
6	10.2	0.6	9	63.6174
6	10.2	0.8	8.6	58.08818
6	10.2	1	8.2	52.8103
6	10.2	1.2	7.8	47.78374
6	10.2	1.4	7.4	43.0085
6	10.2	1.6	7	38.4846
6	10.2	1.8	6.6	34.21202
6	10.2	2	6.2	30.19078
6	10.2	2.3	5.6	24.63014
6	10.2	2.6	5	19.635
8	13.5	0.5	12.5	122.7188
8	13.5	0.6	12.3	118.8232
8	13.5	0.8	11.9	111.2205
8	13.5	1	11.5	103.8691
8	13.5	1.2	11.1	96.76913
8	13.5	1.4	10.7	89.92045
8	13.5	1.6	10.3	83.32309
8	13.5	1.8	9.9	76.97705
8	13.5	2	9.5	70.88235
8	13.5	2.3	8.9	62.21153
8	13.5	2.6	8.3	54.1062
8	13.5	2.9	7.7	46.56636
8	13.5	3.2	7.1	39.59201
8	13.5	3.6	6.3	31.17253
10	17.2	0.5	16.2	206.1204
10	17.2	0.6	16	201.0624
10	17.2	0.8	15.6	191.1349

HydrauCalc has a database defining the diameters of the main pipe standards.

- Steel piping
- Stainless steel piping
- Copper piping
- PVC piping
- Aluminium piping
- Cast iron piping
- Black and galvanized steel piping

The user can also add his own diameter tables.

DATABASE – WALL ROUGHNESS'S



Type of tubes	Roughness (mm)
New smooth pipes	0.025
Centrifugally applied enamels	0.025
Mortar lined, good finish	0.05
Mortar lined, average finish	0.1
Light rust	0.25
Heavy brush asphalts, enamels and tars	0.5
Heavy rust	1
Water mains with general tuberculations	1.2

HydrauCalc has a database of values of absolute roughness of pipe wall from recognized references:

- MILLER
- ISO 5167-1 2003
- Fluid Mechanics – F. White
- IDELCHIK
- Pipe Flow Guide

DATABASE – ROUGHNESS COEFFICIENT

Tables of Hazen-Williams Roughness Coefficient

Tables Hazen-Williams

Cast-Iron pipes

Type of tubes	Coefficient
cast, plain	100
cast iron, old, unlined	40-120
cast iron (10 years old)	107-113
cast iron (20 years old)	89-100
cast iron (30 years old)	75-90
cast iron (40 years old)	64-83
cast iron, tar (asphalt) coated	100
cast iron, cement lined	140
cast iron, bituminous lined	140
cast iron, mitumastic	140-150
cast iron, sea-coated	100
Ductile Iron Pipe (DIP)	140
Ductile Iron, cement lined	120
galvanized, plain	120
wrought, plain	100

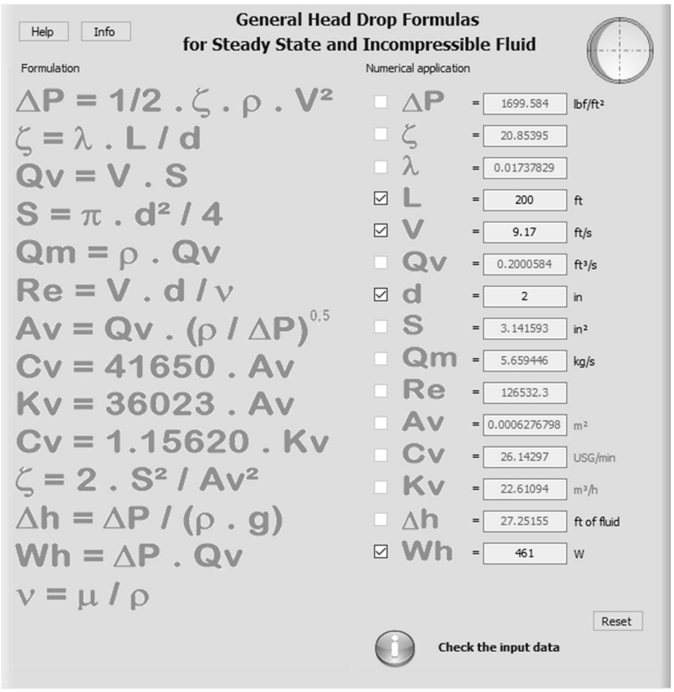
Back

HydrauCalc has a database of values of Hazen-Williams roughness coefficient from:

- Hydraulic Tables by GARDNER S. WILLIAMS and ALLEN HAZEN - 2nd Ed. (1914)

THE TOOLS

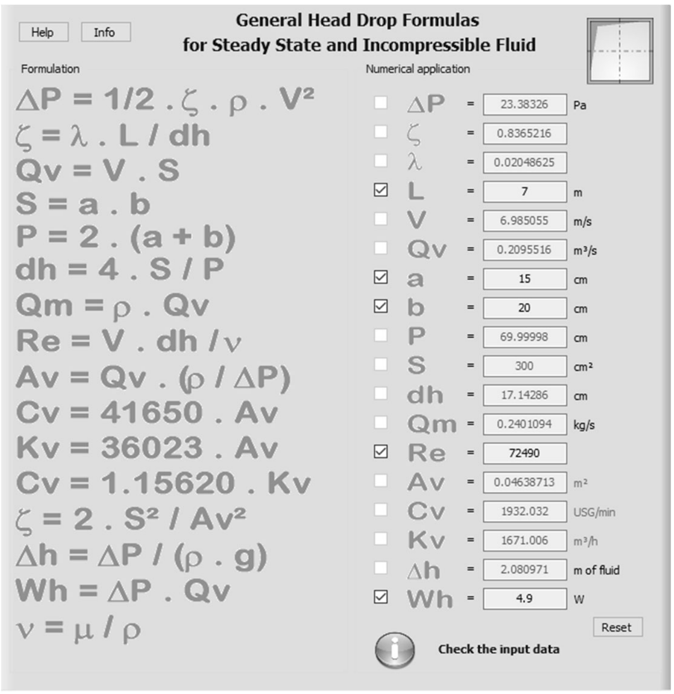
TOOL – CALCULATOR FOR CIRCULAR CROSS-SECTIONS



The application allows, from known input data and for circular cross-sections, to automatically calculate those that can be deduced.

It is thus possible to determine the volume flow rate corresponding, for example, to an imposed mean velocity, so as to inform the input data of the components.

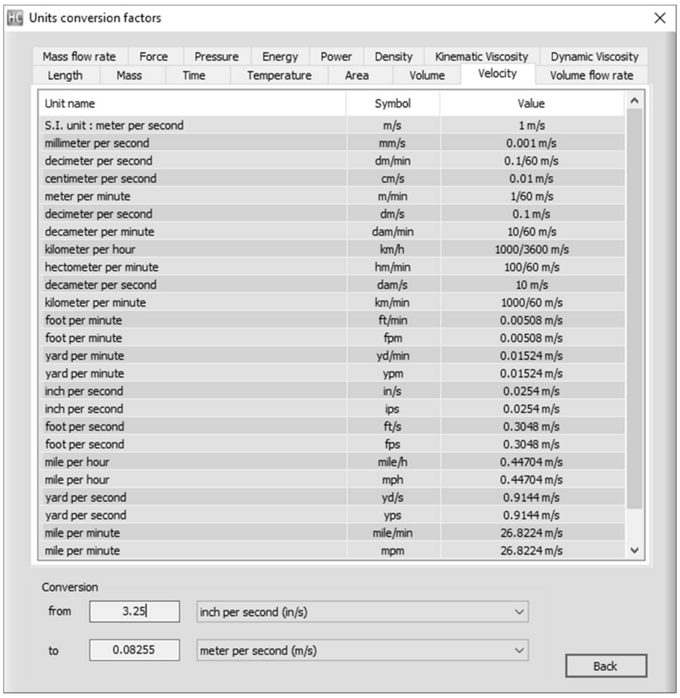
TOOL – CALCULATOR FOR RECTANGULAR CROSS-SECTIONS



The application also makes it possible, from known input data and for rectangular cross-sections, to calculate those that can be deduced from it.

It is thus possible to determine the volume flow rate corresponding, for example, to an imposed Reynolds number, so as to inform the input data of the components.

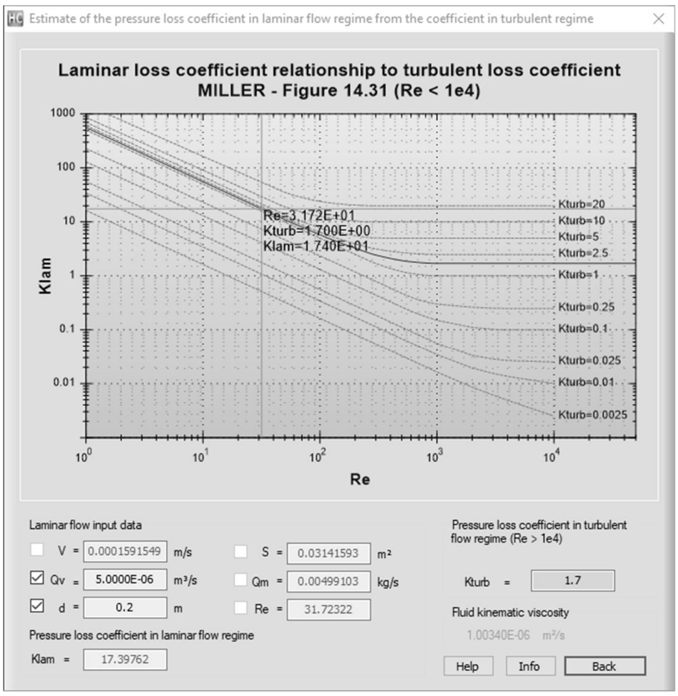
TOOL – UNITS CONVERSION



The application has a tool allowing:

- to view the conversion factors of the measurement units integrated in the application,
- to convert together units of measurement of the same physical size.

TOOL - ESTIMATE PRESSURE LOSS COEFFICIENT IN LAMINAR FLOW

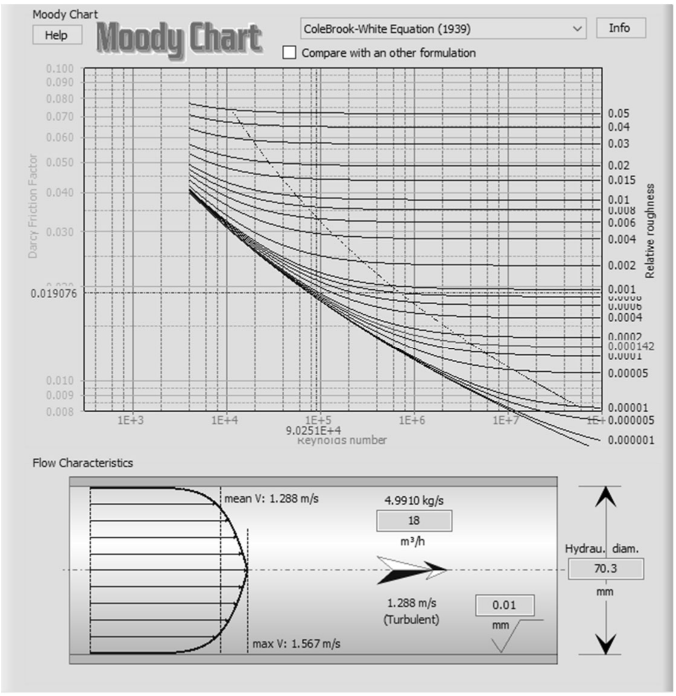


The application has a tool making it possible to obtain an estimate of the coefficient of pressure loss in the laminar flow regime, if the coefficient of pressure loss in the turbulent flow regime is known.

This method only applies to minor pressure losses (pipe fittings, valves, etc.) and is based on the following reference book:

- Internal Flow System, D.S. Miller

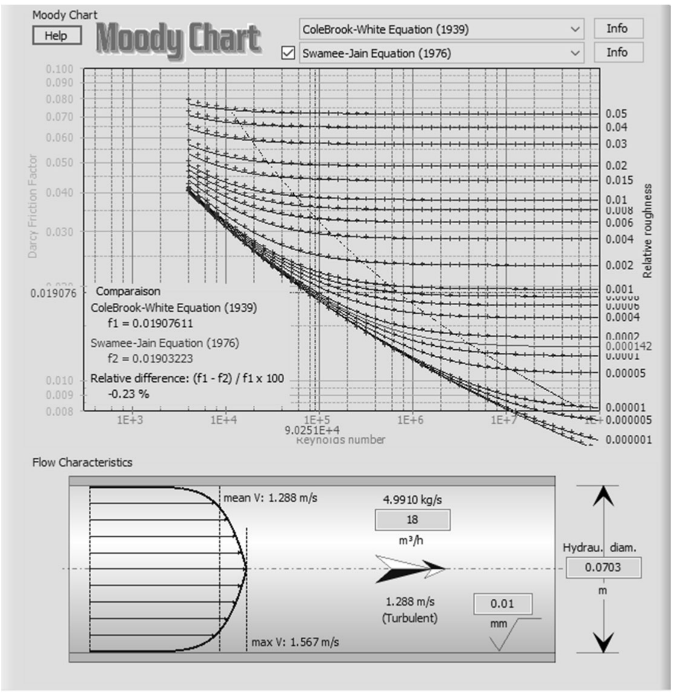
TOOL – MOODY DIAGRAM



The application has a tool to calculate the coefficient of friction from more than 40 other formulations published by recognized scientists. The curves of iso-values of relative roughness are plotted in a Moody diagram and the calculated point is presented.

The velocity profile of the flow corresponding to the calculation point is also plotted in a pipe of same hydraulic diameter as that of the component.

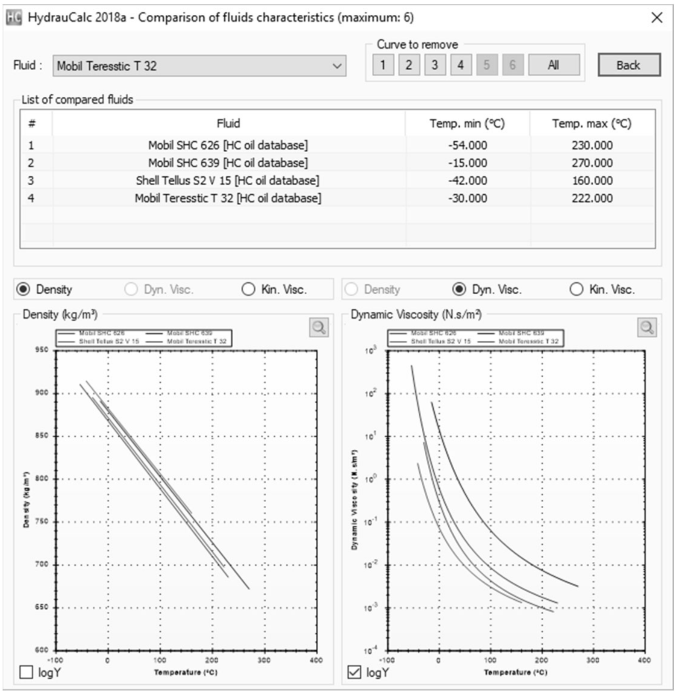
TOOL – MOODY DIAGRAM (FOLLOWING)



This tool also makes it possible to compare two different formulations for determining the Darcy friction coefficient.

The relative difference found at the calculation point is calculated and displayed on the diagram.

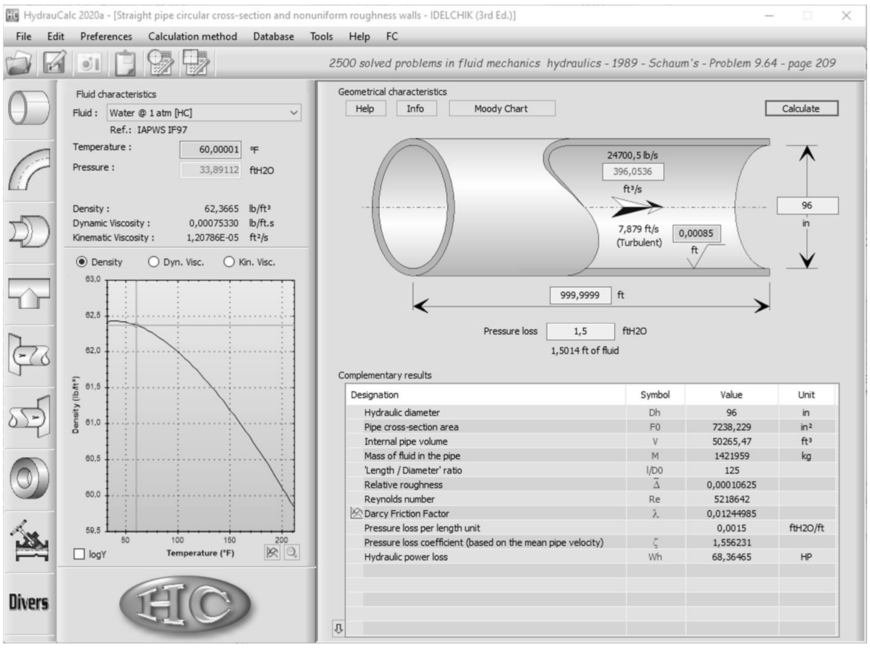
TOOL – FLUID COMPARATOR



The application has a tool to compare the characteristics of the fluids integrated in the application or defined by the user (density, dynamic viscosity and kinematic viscosity).

THE CALCULATION REPORT

CALCULATION REPORT



To include a calculation result in a document, it is possible to copy the window using the button and paste it into the document.

The screenshot contains all the data used for the calculation and the results:

- in the title bar:
  - the release of the application,
  - the type of component calculated and the calculation method used,
- in the fluid pane:
  - the characteristics of the fluid used,
- in the component pane:
  - the input data of the component,
  - the desired main result (value in green colour),
  - the additional results from the calculation.

THE DATA EXPORT

DATA EXPORT

	B	C	D
4	Straight pipe circular cross-section and nonuniform roughness walls - IDELCHIK (3rd Ed.)		
5	Diameter	0,3333598	m
6	Pipe cross-section area	0,08728033	m²
7	Length	609,6	m
8	Absolute Roughness	4,60E-005	m
9	Volume flow rate	25,57719	m³/s
10	Pressure loss	1,00E+009	Pa
11	Fluid head	102191,5	m of fluid
12	Pressure loss coefficient	23,33955	
13	Darcy Friction Factor	0,01276324	
14	Flow velocity	293,0464	m/s
15	Reynolds number	1,00E+008	
16	Hydraulic power loss	2,56E+010	W
17	Density	997,9705	kg/m³
18	Dynamic Viscosity	9,75E-004	N.s/m²
19	Kinematic Viscosity	9,77E-007	m²/s

Feuille1 / Feuille2 / Feuille3

For each component, the input data and the main results can be copied to the clipboard, using the button, for reuse in another application, for example a spreadsheet.

DATA EXPORT

Référence : Pipe Flow - A Practical and Comprehensive Guide (2012) - Example 7.4 - page 71

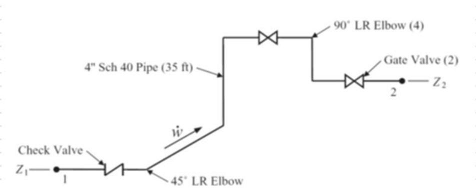


FIGURE 7.1. Four-inch pipe section.

	Ktotal = N1.K1 + N2.K2 + N3.K3 + N4.K4 + N5.K5	
K	4,394	
	dPtotal = N1.dP1 + N2.dP2 + N3.dP3 + N4.dP4 + N5.dP5	
dP	15,216	psi
	HydrauCalc result:	
	P1 - P2 = dP + dH	
P1 - P2	17,380	psi
	Reference result:	
P1 - P2	17,41	psi
	Relative difference:	
	0,174%	

N1	Number	1	
	4" Schedule 40 Pipe (New, Clean Steel)		
	Straight pipe circular cross-section and nonuniform roughness walls -		
	Diameter	0,3355	ft
	Pipe cross-section area	0,0884	ft²
	Length	35	ft
	Absolute Roughness	1,50E-04	ft
	Volume flow rate	0,05681	m³/s
dP1	Pressure loss	6,15249	psi
	Fluid head	14,2205	ft of fluid
K1	Pressure loss coefficient	1,77655	
	Darcy Friction Factor	0,01703	
	Flow velocity	22,6954	ft/s
	Reynolds number	724116	
	Hydraulic power loss	3,27677	HP
rho	Density	62,3013	lb/ft³
	Dynamic Viscosity	2,04E-05	lbf.s/ft²
	Kinematic Viscosity	1,05E-05	ft²/s

N2	Number	1	
	45 ° LR Elbow		
	Smooth bend with circular cross-section - Pipe Flow - Guide (2012)		
	Diameter	0,3355	ft
	Passage cross-section area	0,0884	ft²
	Bend angle	45	°
	Radius of curvature	0,50325	ft
	Absolute Roughness	0,00015	ft
	Volume flow rate	0,05681	m³/s
dP1	Pressure loss	0,51601	psi
	Fluid head	1,19267	ft of fluid
K2	Pressure loss coefficient	0,149	
	Flow velocity	22,6954	ft/s
	Reynolds number	724116	
	Hydraulic power loss	0,27482	HP
	Density	62,3013	lb/ft³
	Dynamic Viscosity	2,04E-05	lbf.s/ft²
	Kinematic Viscosity	1,05E-05	ft²/s

N3	Number	4	
	90 ° LR Elbow		
	Smooth bend with circular cross-section - Pipe Flow - Guide (2012)		
	Diameter	0,3355	ft
	Passage cross-section area	0,0884	ft²
	Bend angle	90	°
	Radius of curvature	0,50325	ft
	Absolute Roughness	0,00015	ft
	Volume flow rate	0,05681	m³/s
dP1	Pressure loss	0,75173	psi
	Fluid head	1,7375	ft of fluid
K3	Pressure loss coefficient	0,21706	
	Flow velocity	22,6954	ft/s
	Reynolds number	724116	
	Hydraulic power loss	0,40036	HP
	Density	62,3013	lb/ft³
	Dynamic Viscosity	2,04E-05	lbf.s/ft²
	Kinematic Viscosity	1,05E-05	ft²/s

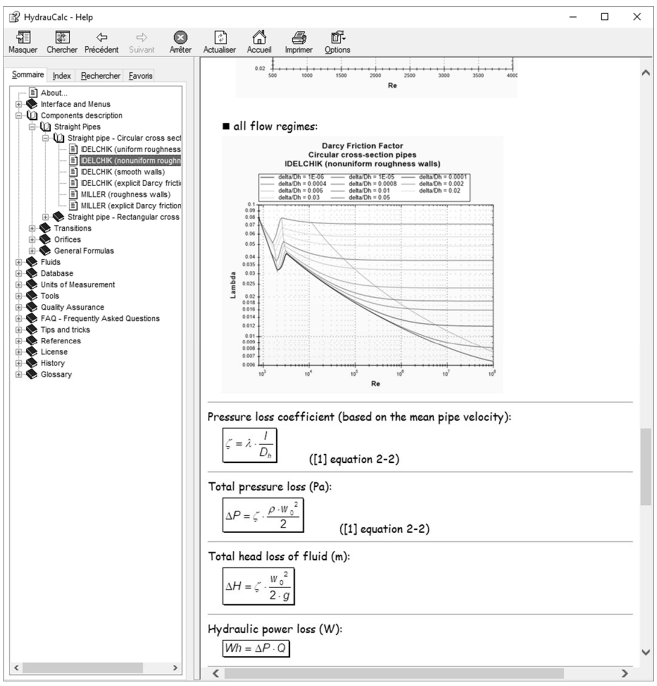
Feuil1

Exporting the main data and results to a spreadsheet allows you to perform additional calculations such as:

- Calculation of the total pressure loss of the circuit by summing the pressure losses of each component.
- Search for the flow circulating in the circuit from the sum of the pressure loss coefficients and using the solver integrated into the spreadsheet.

THE ASSURANCE QUALITY

TECHNICAL DOCUMENTATION



In general, each component has several calculation methods that come from different reference works. For all components, each calculation method is detailed in a technical document including:

- A description of the method used
- The mathematical formulation of the model
- The nomenclature used for the equations
- The range of the formulation
- An example of an application
- The bibliographic reference (s) used for modelling

COMPONENTS MODEL VALIDATION

HydrauCalc comes with a document that provides a comparison of software results with a series of examples published in well-known and respected references. Examples of hydraulic analysis include calculations of flow, pressure drop and pipe sizing for compressible and incompressible fluids.

The results obtained by the HydrauCalc application are very close to the published results.

At each new software release, a series of tests is performed to check the non-regression of the software features.

THE ROAD MAP

ROAD MAP

Next release (2021b release):

- Add new components.
- Add Excel functions library for performing pressures loss calculations in an Excel spreadsheet (see brief description on following pages).

Following releases:

- Gradual addition of new components.

What is HydrauCalcXL Add-in?

HydrauCalcXL Add-in is a library of functions that has been developed to calculate the pressure losses of hydraulic components in Microsoft Excel®. This library allows the direct call of functions relating to the calculation of pressure losses. It comes from the HydrauCalc application which is based mainly on recognized and respected references in the field of flow and pressure losses calculation.

The HydrauCalcXL functions can be used via the user interface of Excel, like the own integrated functions of Excel.

The joint use of this library and the solver integrated in Excel® (solver of nonlinear systems of equations) makes it possible to solve iterative flow problems and to perform multi-variables optimization analyzes of fluid systems.

The functions of the HydrauCalcXL library

The HydrauCalcXL library includes three types of functions:

- Functions for calculating pressure losses of piping components such as straight pipes, bends, transitions, bifurcations, orifices, grids, Pipeline entrances, Pipeline discharges (54 functions).
- Functions for calculation between the different variables entering into the general pressure loss formulas (pressure loss, pressure loss coefficient, flow coefficient, volume flow, mass flow, Reynolds number, flow velocity , ...) (81 functions).
- Functions to convert units of measure to each other (17 functions).

The available piping components

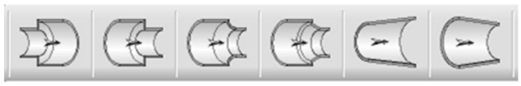
Straight pipes:

Bends:

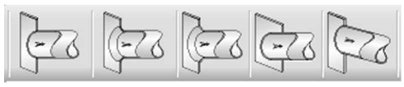
Junctions:

Orifices:

Transitions:



Pipeline entrances:

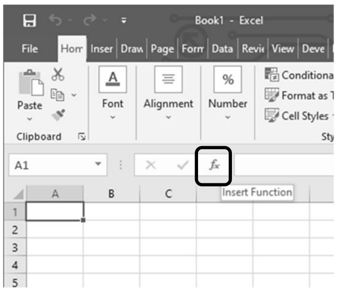


Pipeline discharges:

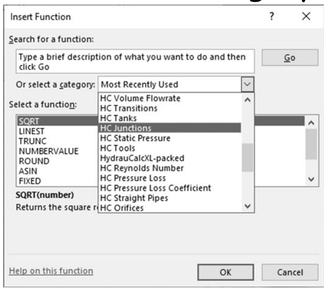
Grids:

Example of a function call of a category

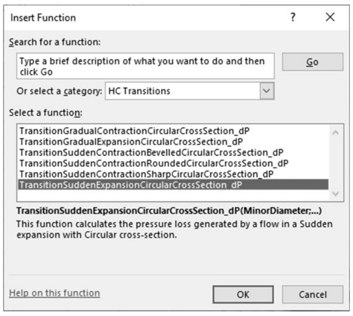
1. Insert Function



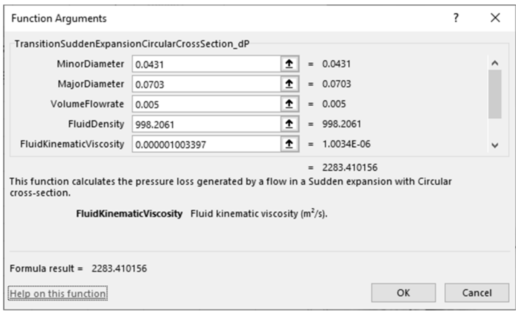
2. Select a category



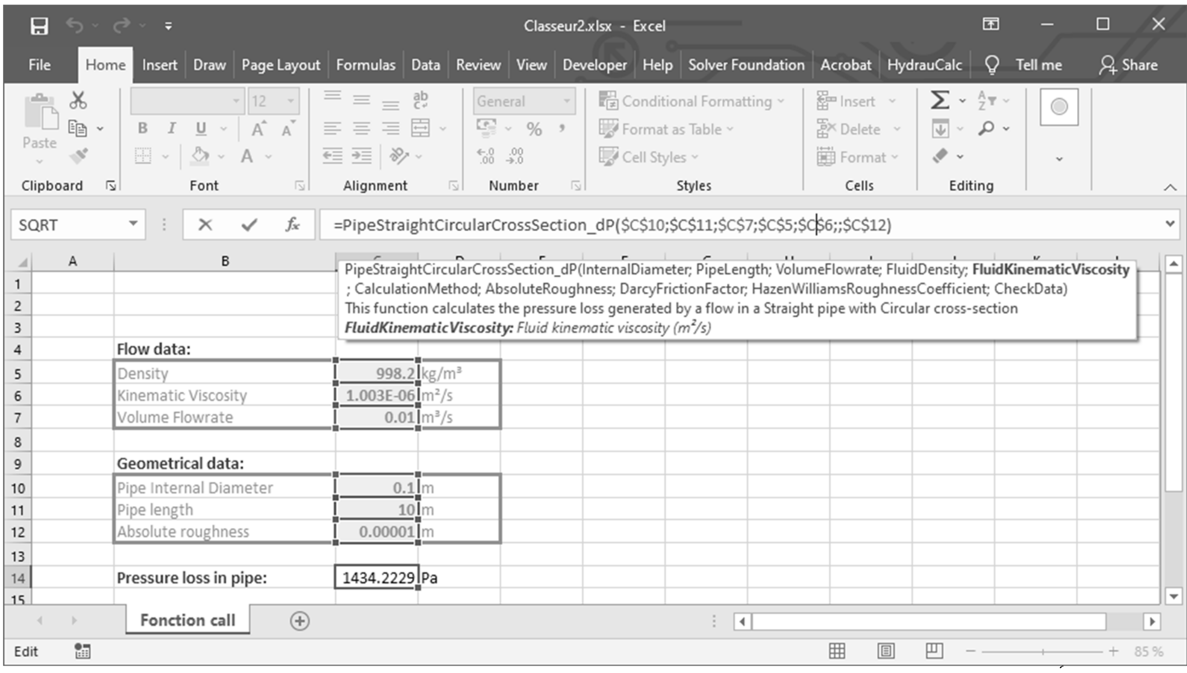
3. Select a function



4. Enter function arguments

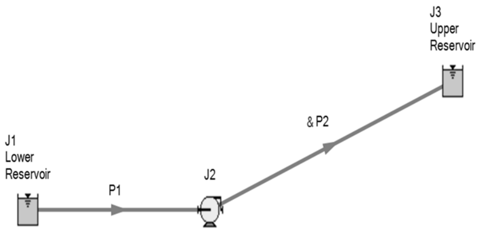


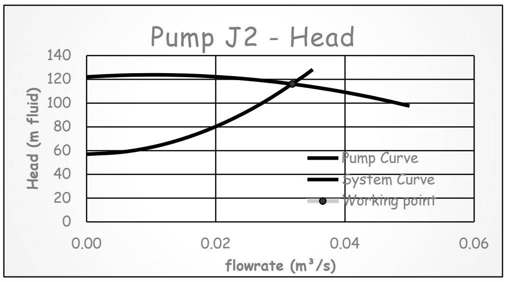
Example of a function a component



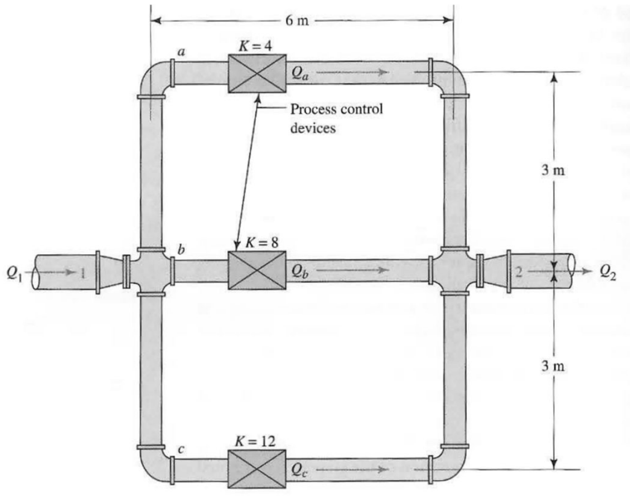
Examples of systems solved using HydrauCalcXL and Excel solver

Reference: AFT Fathom 10
Title: Examples – Sizing a pump
Find: Pump working point





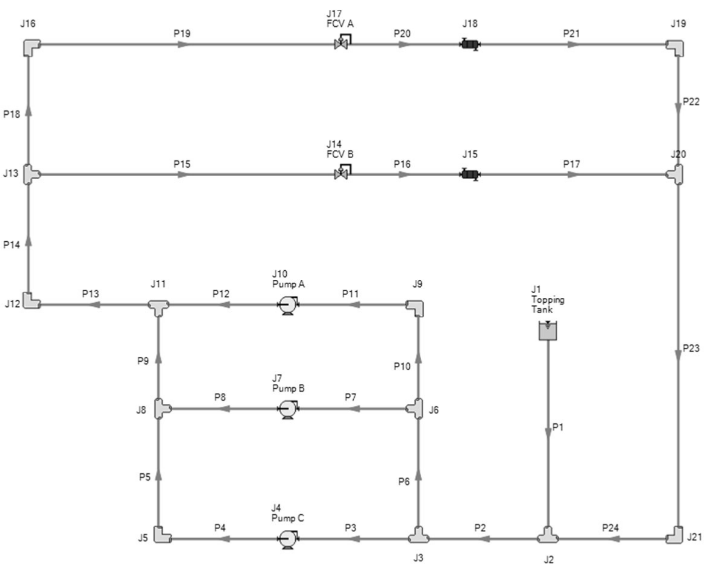
Reference: Applied Fluid Mechanics
Title: Example 12.4 page 309
Find: Flowrate in each branch



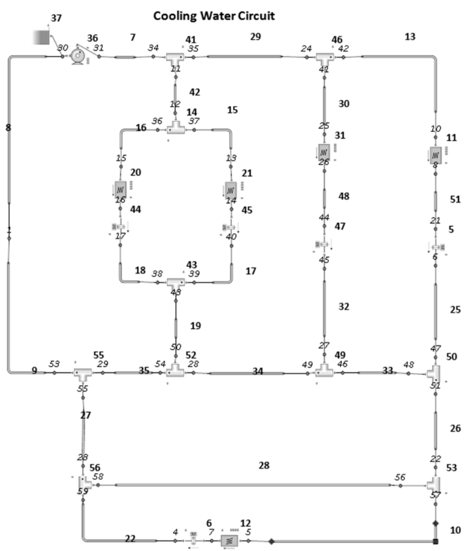
Note: Inlet and outlet pipes: DN 50 Sch. 40
Branch pipes a, b, and c: DN 25 Sch. 40
Elbows are standard

Examples of systems solved using HydrauCalcXL and Excel solver

Reference: AFT Fathom 10
Title: Examples – Hot Water System
Find: Pumps working point



Reference: Flomaster v2020
Title: Marine Cooling System
Find: Diameters of restriction orifices



HydrauCalc

2021a Release

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