

APPLICATION DESCRIPTION

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APPLICATION DESCRIPTION

- 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.

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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

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THE GRAPHICAL USER INTERFACE

5

GRAPHICAL USER INTERFACE

ile Edi	t Preferences Calculation r	-	atabase Tool	Is Help FC 2500 solved problems in fluid mechanics hyd	draulics - 1989 - Schaun	n's - Problem 9.6	4 - page 209
	Fluid characteristics		- E	Geometrical characteristics			
	Fluid : Water @ 1 atm [HC]		~	Help Info Moody Chart		Г	Calculate
	Ref.: IAPWS IF97						
					-		
1		i0,00001 ⁰F			24700,5 lb/s		
1	Pressure : 3	3,89112 ftH	120		396,0536	/	
1					ft³/s	1	
-	Density :	62,3665 lb/f	A2		1 5		96
5		0075330 lb/f					in
\mathcal{I}		786E-05 ft2/			7,879 ft/s 0, (Turbulent)	,00085	Ĩ
					(Turbulent)	ft	
	Density O Dyn. Visc.	Kin. Vi	/isc.			V	_ Y _
	63,0	· · · · · ·					
					999,9999 ft	×	
	62.5			<	999,9999 ft	\rightarrow	
	62.5			Pressure loss	1,5 ftH20	>	
	62.5			Pressure loss			
-76				Pressure loss	1,5 ftH20		
-78	62.0			Pressure loss	1,5 ftH2O 5014 ft of fluid	>	164
-7	62.0			Pressure loss	1,5 ftH2O 5014 ft of fluid Symbol	Value	Unit
2 2 2	62,0			Pressure loss	1,5 ftH2O 5014 ft of fluid Symbol Dh	96	in
2) 	62.0 (++++++++++++++++++++++++++++++++++++			Pressure loss	1,5 ftH2O 5014 ft of fluid Symbol Dh F0	96 7238,229	in in²
5	62.0 (4(1)), (1), (1), (1), (1), (1), (1), (1),			Pressure loss	1,5 ft+20 5014 ft of fluid Dh F0 V	96 7238,229 50265,47	in in² ft³
	62.0 (++++++++++++++++++++++++++++++++++++			Pressure loss	1,5 ftH2O 5014 ft of fluid Symbol Dh F0	96 7238,229	in in²
	0.0 0.0 0.0 0.0			Pressure loss	1,5 ft+20 3014 ft of fluid Symbol Dh F0 V M	96 7238,229 50265,47 1421959	in in² ft³
) 2 2 3	62.0 (4(1)), (1), (1), (1), (1), (1), (1), (1),			Pressure loss	1,5 ft+120 5014 ft of fluid Dh F0 V M I/D0	96 7238,229 50265,47 1421959 125	in in² ft³
2 2 2 2 2 3	0.0 0.0 0.0 0.0			Pressure loss	1.5 ft+120 5014 ft of fluid Symbol Dh F0 V M I/D0 <u>A</u>	96 7238,229 50265,47 1421959 125 0,00010625	in in² ft³
	0.29 0.19 0.19 0.19 0.09 0.09 0.09			Pressure loss	1,5 ftH20 05014 ft of flud Din Din F0 V W UD0 Δ Re λ	96 7238,229 50265,47 1421959 125 0,00010625 5218642 0,01244985 0,0015	in in² ft³
	62.0 4 (1) 01.0 61.0 60.0	150		Pressure loss	1,5 ftrt20 5014 ft of fluid Symbol Dh Dh F0 V UD0 Δ Re ν λ e velocity) ζ	96 7238,229 50265,47 1421959 125 0,00010625 5218642 0,01244985 0,0015 1,556231	in in² ft³ kg ftH2O/ft
	0.29 0.19 0.19 0.19 0.09 0.09 0.09		200	Pressure loss	1,5 ftH20 05014 ft of flud Din Din F0 V W UD0 Δ Re λ	96 7238,229 50265,47 1421959 125 0,00010625 5218642 0,01244985 0,0015	in in² ft³ kg
	62.0 4 (1) 01.0 61.0 60.0			Pressure loss	1,5 ftrt20 5014 ft of fluid Symbol Dh Dh F0 V UD0 Δ Re ν λ e velocity) ζ	96 7238,229 50265,47 1421959 125 0,00010625 5218642 0,01244985 0,0015 1,556231	in in² ft³ kg ftH2O/ft
	62.0 4 (1) 01.0 61.0 60.0		200	Pressure loss	1,5 ftrt20 5014 ft of fluid Symbol Dh Dh F0 V UD0 Δ Re ν λ e velocity) ζ	96 7238,229 50265,47 1421959 125 0,00010625 5218642 0,01244985 0,0015 1,556231	in in² ft³ kg ftH2O/ft

- 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.

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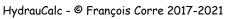
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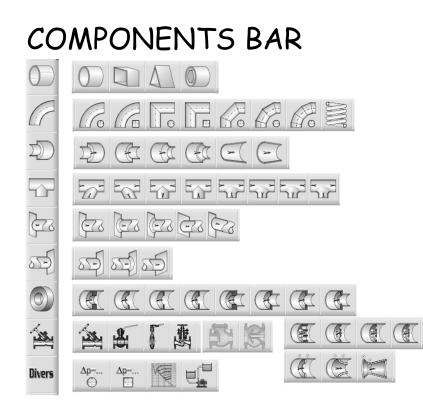
GRAPHICAL INTERFACE STRUCTURE

	fools Help			
	2500 solved problems in fluid mechanics hydraulics -	1989 - Scha	um's - Problem !	9.69 - po
Fluid characteristics	Geometrical characteristics			
Fluid : Water @ 1 atm 🗸	Help Info Moody Chart		L	Calculat
Ref.: LAPWS IF97				
Temperature : 20 °C		199 kg/s		
Pressure : 101.3 kPa		199 kg/s 1392699	/	\uparrow
			1	
		m³/s		
Density : 998.2061 kg/m ³				100
Dynamic viscosity : 0.00100159 N.s/m ²		5.0 m/s	00026	mm
Kinematic viscosity : 1.00340E-06 m ³ /s	0	Turbulent)		
Density O Dyn. Visc. O Kin. Visc.				V
63.0				
	100 m			
63.0	× 100 m	C	>	
	<		>	
62.5	Pressure loss 317.5654	kPa	>	
63.0	<	kPa	>	
613 625	Pressure loss 317.5654	kPa	>	
62.5	Pressure loss 317.5654 32.4409 m of fluid	kPa	Value	Unit
6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5	Pressure loss 317.5554 32.4409 m of fluid Complementary results	iPa I	Value 100	Unit
613 625	Pressure loss 317.5554 3 32.4409 m of fluc Designation	iPa I Symbol		
6.5 65 65 65	Pressure loss 317.5554 3 32.4409 m of flue Designation Hydrauk danter Pipe cross section area Internal per volume	kPa Symbol Dh F0 V	100 7853.981 0.7853982	mm
6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5 6.5	Pressure loss 317.5554 3 32.4409 m of fluc Complementary results Designation Hydraulc dameter Pipe cross section area Internal spic volume Mass of fluid in the pipe	kPa Symbol Dh P0 V M	100 7853.981 0.7853982 783.9892	mm mm ³
6.0 623 60.0 60.0 60.0 60.0 60.0 60.0 60.0 60.	Pressure loss 317.5554 3 32.4409 m of flue Complementary results Designation Hydrauk dameter Pipe cross-section area Internal pipe volume Mass of fluel in the pipe Length / Dameter ratio	KPa Symbol Dh P0 V M I(D0	100 7853.981 0.7853982 783.9892 1000	mm mm ² m ³
Demoks [][Bruh]	Pressure loss 317.5554 3 32.4409 m of fluc Complementary results Designation Hydraulic dameter Pipe cross section area Internal pipe volume Mass of fluid in the pipe Length / Diameter ratio Relative roughness	kPa Symbol Dh F0 V M I(D0 Ā	100 7853.981 0.7853982 783.9892 1000 0.0026	mm mm ² m ³
6.0 62.5 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0 6.0	Pressure loss 317.5554 3 32.4409 m of flue Designation Hydrauk daneter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Linght / Daneter ratio Relative roughness Reginatio number	KPa Symbol Dh P0 V M I(D0	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2	mm mm ² m ³
60.0 62.3 60.0 60.0 60.0 60.0	Pressure loss 317.5554 3 32.4409 m of Ruiz Designation Hydraulic dameter Pipe cross-section area Internal pipe valume Mass of Ruis Inter pipe Length / Dameter ratio Relative roughness Regrative roughness Regrative roughness Regrative roughness	kPa Symbol Dh F0 V M I(D0 Ā	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509	mm mm³ kg
61.5 61.5 61.5 61.5 61.5 61.5 61.5 61.5	Pressure loss 317.5554 32.4409 m of flue S2.4409 m of flue Designation Hydrauk daneter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length / Daneter / ratio Relative roughness Registad number Pressure los per length unit	kPa Symbol Dh F0 V M I(D0 Ā	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509 3.175654	mm mm ² m ³
	Pressure loss 317.5554 32.4409 m of Ruc Complementary results Designation Hydraulic dameter Pipe cross-section area Internal pipe valume Mass of Rulis in the pipe Length / Dameter Mass of Rulis number Resource loss per length unit Pressure loss centiform (based on the mean pipe velocity)	kPa Dh P0 V M I(D0 Δ Re λ	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509 3.175654 25.4509	mm mm ² m ³ kg
61.5 61.5 61.5 61.5 61.5 61.5 61.5 61.5	Pressure loss 317.5554 32.4409 m of flue S2.4409 m of flue Designation Hydrauk daneter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length / Daneter / ratio Relative roughness Registad number Pressure los per length unit	kPa Symbol Dh F0 V M I(D0 Ā	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509 3.175654	mm mm³ kg
	Pressure loss 317.5554 32.4409 m of Ruc Complementary results Designation Hydraulic dameter Pipe cross-section area Internal pipe valume Mass of Rulis in the pipe Length / Dameter Mass of Rulis number Resource loss per length unit Pressure loss centiform (based on the mean pipe velocity)	kPa Dh P0 V M I(D0 Δ Re λ	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509 3.175654 25.4509	mm mm ² m ³ kg
	Pressure loss 317.5554 32.4409 m of Ruc Complementary results Designation Hydraulic dameter Pipe cross-section area Internal pipe valume Mass of Rulis in the pipe Length / Dameter Mass of Rulis number Resource loss per length unit Pressure loss centiform (based on the mean pipe velocity)	kPa Dh P0 V M I(D0 Δ Re λ	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509 3.175654 25.4509	mm mm ² m ³ kg
	Pressure loss 317.5554 32.4409 m of Ruc Complementary results Designation Hydraulic dameter Pipe cross-section area Internal pipe valume Mass of Rulis Inter pipe Length / Dameter ratio Relative roughness Reynolds number Pressure loss per freight unt Pressure loss coefficient based on the mean pipe velocity)	kPa Dh P0 V M I(D0 Δ Re λ	100 7853.981 0.7853982 783.9892 1000 0.0026 498307.2 0.0254509 3.175654 25.4509	mm mm ² m ³ kg

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 released and calculation method chosen
 - Menus and shortcuts bar
 - The display area for a possible comment



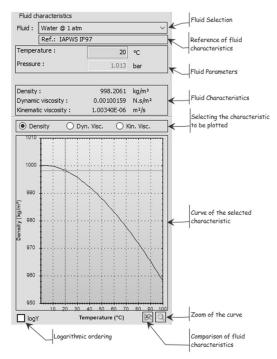


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- The vertical components bar makes it possible to select a family of components (straight pipes, bends, changes of crosssection, tees, pipeline entrances and discharges, restriction and measurement orifices, valves, ...)
- Selecting a family displays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

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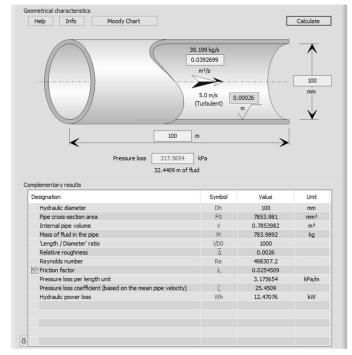
FLUID PANE



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 evolution the of the characteristics according to, ′tb∕e pressure temperature or the (according to the type of selected fluid)

COMPONENT PANE



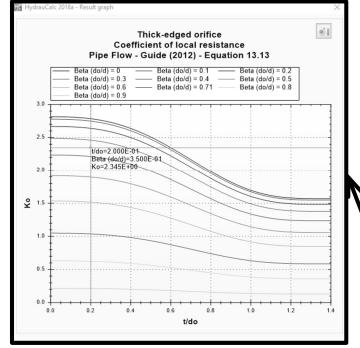
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The component pane allows you to:

- 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

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COMPLEMENTARY RESULTS

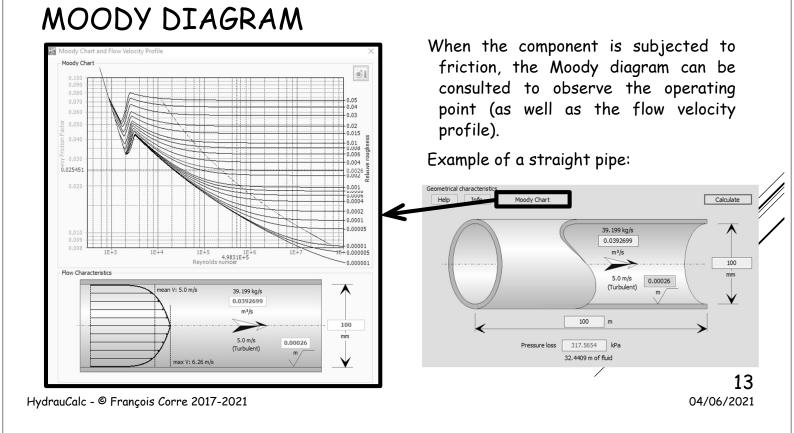


When, in the complementary results, the variable is preceded by the symbol 🖄, a simple click on this variable shows the evolution graph of the variable with the calculated point.

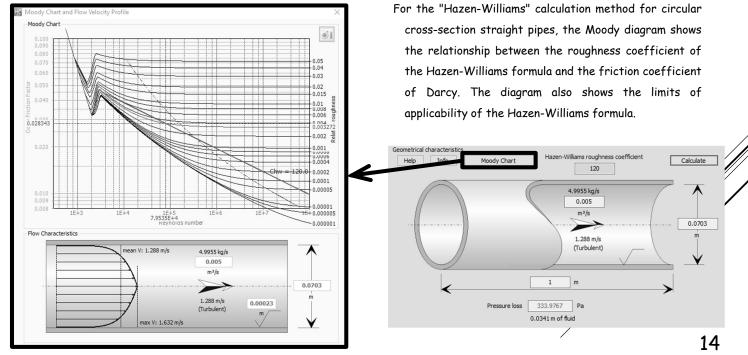
Example :

/			4.0
Hydraulic power loss	Wh	76.56641	kW
Pressure loss coefficient (based on the mean pipe velocity)	K	156.2602	
loefficient of local resistance (Equation 13.13)	Ko	2.34488	
Coefficient Cth (Equation 13.14)	Cth	0.9763061	
🖄 Jet velocity ratio (Equation 13.4)	λ	1.603054	
Velocity in vena contracta	Vc	65.43075	m/s
Orifice Reynolds number	NReo	1423735	
Pipe Reynolds number	NRe	498307.2	
Thickness to orifice diameter ratio	t/Do	0.2	
Cross-sections area ratio	Ao/A	0.1225	
Diameters ratio (Do/d)	β	0.35	
Orifice cross-section area	Ao	962.1127	mm ²
Pipe cross-section area	A	7853.981	mm ²
Designation	Symbol	Value	Unit

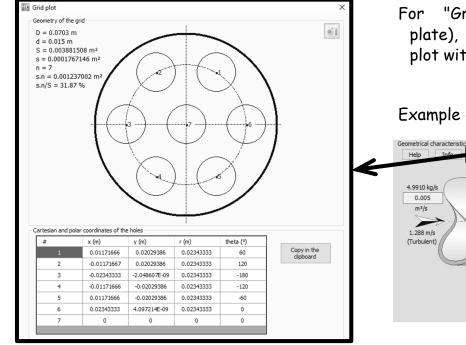
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MOODY DIAGRAM AND HAZEN-WILLIAMS FORMULA



GRID PLOT



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

1.0E-05

4.042 m/s

(Turbulent)

≎

0.015

0.007

m

m

Example of a perforated plate plot:

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Pressure loss 11144.34 Pa

1.1384 m of fluid

Grid plot

THE COMPONENTS

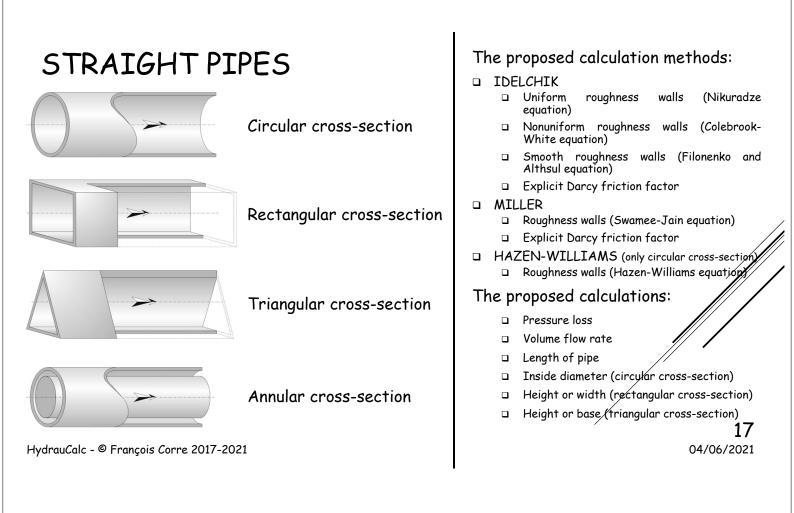
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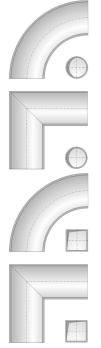
Calculate

0.0703

15



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

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BENDS

New R2021a Composite bend 90° with circular cross-section (4 × 22.5°)

New R2021a Composite bend 90° with circular cross-section (3 × 30°)

New R2021a Composite bend 90° with circular cross-section (2 × 45°)

New R2021a Helical tube

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The proposed calculation methods:

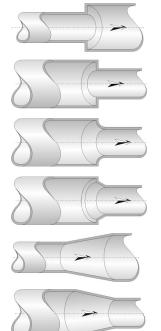
- □ IDELCHIK
- □ MILLER
- □ CRANE
- □ Pipe Flow Guide

The proposed calculations:

- Pressure loss
- Volume flow rate

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CHANGES OF CROSS-SECTION



Sudden expansion

Sudden contraction sharp

Sudden contraction rounded

Sudden contraction bevelled

Gradual expansion

Gradual contraction

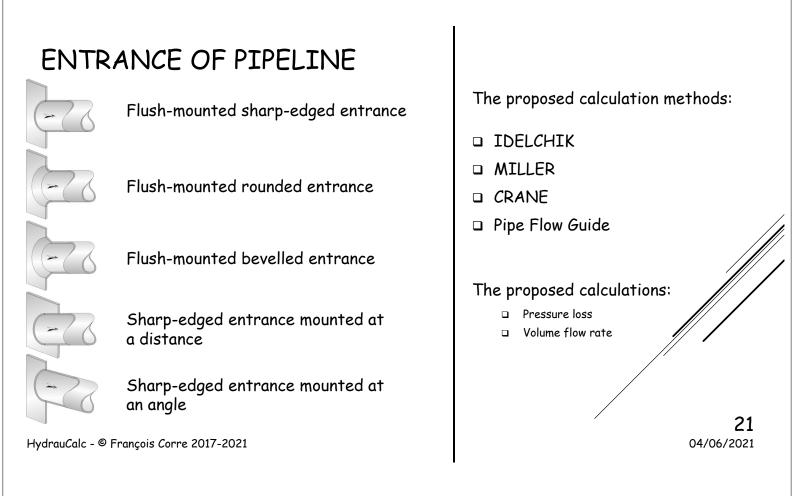
The proposed calculation methods:

- □ IDELCHIK
- □ MILLER
- □ CRANE
- Pipe Flow Guide

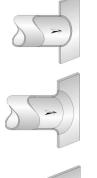
The proposed calculations:

- Pressure loss
- Volume flow rate

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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 Image: Symmetric combining sharp-edged function Image: Symmetric combining sharp-edged function Image: Symmetric combining sharp-edged function Image: Symmetric dividing sharp-edged function <

JUNCTIONS (FOLLOWING)



Combining radiused-edged T-junction



Dividing radiused-edged T-junction



Symmetric combining radiusededged T-junction

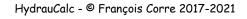


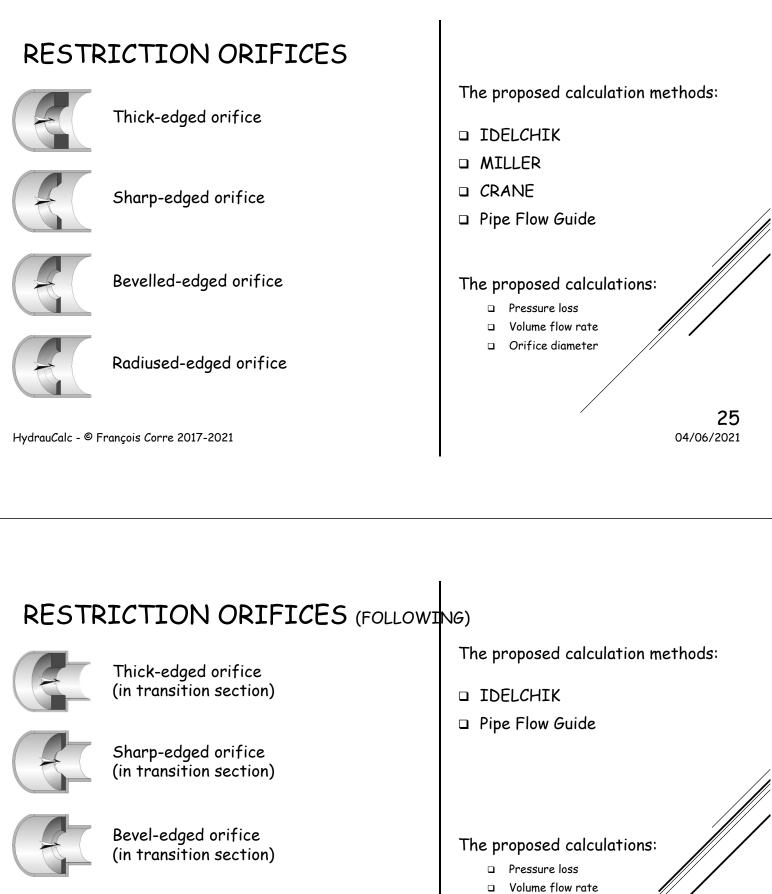
Symmetric dividing radiused-edged T-junction The proposed calculation methods:

- MILLER
- Pipe Flow Guide

The proposed calculations:

Pressure loss in each branch





Orifice diameter

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Round-edged orifice (in transition section)

GRIDS



Thick-edged grid



Sharp-edged grid



Bevelled-edged grid



Radiused-edged grid

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The proposed calculation methods:

- □ IDELCHIK
- MILLER
- □ Pipe Flow Guide

The proposed calculations:

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

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MEASUREMENT ORIFICES



Orifice plate flowmeter



New R2021a Nozzle and Venturi nozzle flowmeter



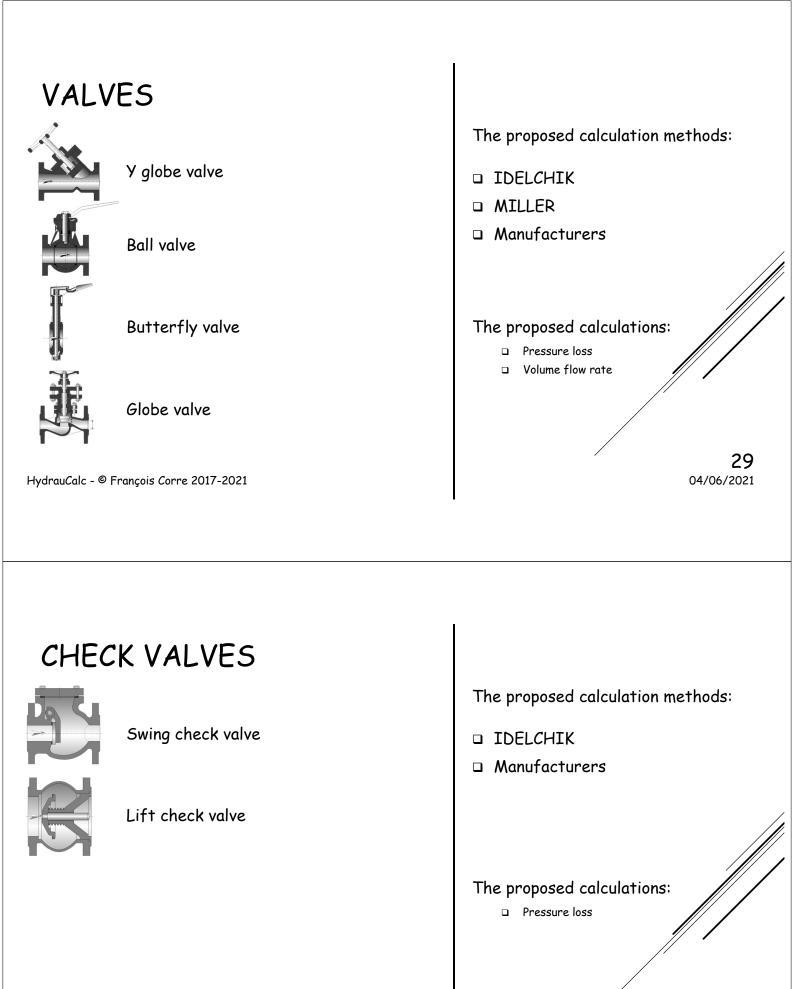
New R2021a Venturi tube flowmeter The proposed calculation methods:

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

The proposed calculations:

- Measured differential pressure
- Net pressure lossVolume flow rate
- U volume flow rate
- Orifice diameter

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PUMP	QUICK DESIGN	
	Suction lift operation Tank with pipe ending below the fluid level	The proposed calculation method:
	Suction lift operation Free flow from the pipe ending above the water level	
	Suction head operation Tank with pipe ending below the fluid level	The proposed calculations: Total Dynamic Head (TDH) Net Positive Suction Head available (NPSH_a)
	Suction head operation Free flow from the pipe ending above the water level	 Pressure loss in suction and discharge lines Pressures at the pump flanges
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THE MEASURE UNITS

UNIT SYSTEM SELECTION

Length unit		
meter (m)	~	ОК
Diameter and radius unit		
millimeter (mm)	~	Cancel
Thickness unit		
meter (m)	~	Load unit system
Absolute roughness unit		SI unit
meter (m)	~	Cl
Temperature unit		SI unit (°C)
degree Celsius (°C)	~	SI unit ('C, bar)
Pressure unit		lana and all sure its
kiloPascal (kPa)	~	Imperial unit
Hydraulic load unit		CGS unit
meter (m)	~	MKpS unit
Velocity unit		Mittipo unit
meter per second (m/s)	~	MTS unit
Volume flow rate unit		USCS unit
cubic meter per second (m³/s)	~	03C3 unit
Mass flow rate unit		User unit 1
kilogram per second (kg/s)	~	
Density unit		
kilogram per cubic meter (kg/m³)	~	User unit 3
Dynamic viscosity unit		
Newton second per square meter (N.s/m ²)	~	
Kinematic viscosity unit		Define unit system
square meter per second (m²/s)	~	Define as user unit 1
Mass unit		
kilogram (kg)	~	Define as user unit 2
Power unit		Define as user unit 3
kilowatt (kW)	~	Donne da úser únit 5

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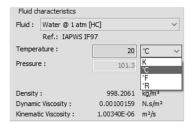
Units can be selected:

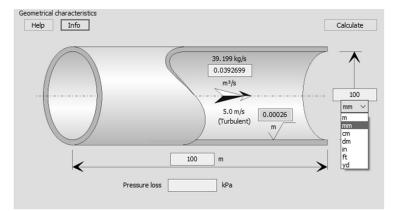
- individually
- by unit systems

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

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UNITS MODIFICATION





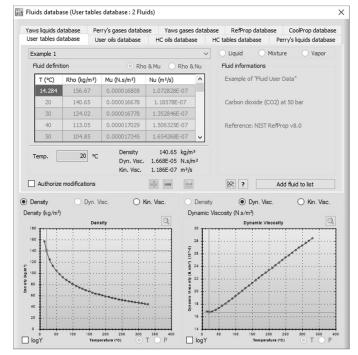
The application has a dynamic unit conversion engine.

- 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

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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.

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DATABASE - PIPINGS

Tables of Nominal Diameters

Steel	Pipes Stainless S	teel Pipes Co	opper Pipes and Tubes	PVC Plastic Pip	es
Steel Pipes	s - EN 10216 - Serie 1				
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	•

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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.

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DATABASE - WALL ROUGHNESS'S

Miller (2nd Ed)	ISO 5167-1 2003	Fluid Mechanics (7th Ed)	Idelchik (3th Ed)	Pipe Flow - Guide (2012)
Steel pipes				
Type of tubes				Roughness (mm)
New smooth pipe	es			0.025
Centrifugally app	plied enamels			0.025
Mortar lined, goo	od finish			0.05
Mortar lined, ave	erage finish			0.1
Light rust				0.25
Heavy brush asp	phalts, enamels and ta	rs		0.5
Heavy rust				1
Water mains with	h general tuberculation	ns		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

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

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

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

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THE TOOLS

TOOL - CALCULATOR FOR CIRCULAR CROSS-SECTIONS

Help Info General Head for Steady State and	d Incompress	ible Fluid	
Formulation $\Delta P = 1/2 \cdot \zeta \cdot \rho \cdot V^2$ $\zeta = \lambda \cdot L / d$ $Qv = V \cdot S$ $S = \pi \cdot d^2 / 4$ $Qm = \rho \cdot Qv$ $Re = V \cdot d / v$ $Av = Qv \cdot (\rho / \Delta P)^{0.5}$ $Cv = 41650 \cdot Av$ $Kv = 36023 \cdot Av$ $Cv = 1.15620 \cdot Kv$ $\zeta = 2 \cdot S^2 / Av^2$ $\Delta h = \Delta P / (\rho \cdot g)$ $Wh = \Delta P \cdot Qv$ $v = \mu / \rho$	Numerical applicable ΔP ζ λ \vee L \vee V Qv \vee d S Qm Re Av Cv Kv Δh \vee Wh	xn = [1699.584 = [20.85395 = [200 = 9.17 = 0.2000584 = 2 = 3.141593 = 5.659446 = [126532.3] = 0.0006276798 = 22.61094 = 27.25155 = 461 ck the input data	bf/ft ² ft ft/s ft/s ft/s

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The application allows, from known input data and for circular crosssections, 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.

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TOOL - CALCULATOR FOR RECTANGULAR CROSS-SECTIONS

Help Info	l Drop Formulas d Incompressible Fluid
Formulation	Numerical application
$\Delta P = 1/2 . \zeta . \rho . V^2$	△P = 23.38326 Pa
$\zeta = \lambda \cdot \mathbf{L} / \mathbf{dh}$	ζ = 0.8365216
$Qv = V \cdot S$	λ = 0.02048625
$S = a \cdot b$	☑ L = 7 m
P = 2.(a + b)	= 6.985055 m/s
$dh = 4 \cdot S / P$	$QV = 0.2095516 \text{ m}^3/\text{s}$
	☑ a = 15 cm
$Qm = \rho \cdot Qv$	☑ b = 20 cm
$Re = V \cdot dh / v$	P = 69.99998 cm
$Av = Qv \cdot (\rho / \Delta P)$	S = 300 cm ²
Cv = 41650 Av	ch = 17.14286 cm
	Qm = 0.2401094 kg/s
Kv = 36023 . Av	✓ Re = 72490
Cv = 1.15620 . Kv	Av = 0.04638713 m ²
$\zeta = 2 \cdot S^2 / Av^2$	CV = 1932.032 USG/min
$\Delta \mathbf{h} = \Delta \mathbf{P} / (\rho \cdot \mathbf{g})$	Kv = 1671.006 m³/h
	△ h = 2.080971 m of fluid
$Wh = \Delta P \cdot Qv$	☑ Wh = 4.9 W
$v = \mu / \rho$	Reset Check the input data

The application also makes it possible, from known input data and for rectangular crosssections, 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

	Force	Pressure	Energy	Power	Density	Kinematic Viscosity	
Length N	lass	Time	Temperature	Area	Va	lume Velocity	Volume flow ra
Unit name					Symbol	V	alue
S.I. unit : mete	r per secor	nd			m/s	1	m/s
millimeter per se	econd				mm/s	0.0	D1m/s
decimeter per s	econd				dm/min	0.1/	60 m/s
centimeter per	second				cm/s	0.0	1 m/s
meter per minut	te				m/min	1/6	i0 m/s
decimeter per s	econd				dm/s	0.	1 m/s
decameter per	minute				dam/min	10/	50 m/s
kilometer per ha	our				km/h	1000/	3600 m/s
hectometer per	minute				hm/min	100/	/60 m/s
decameter per	second				dam/s	10) m/s
kilometer per mi	inute				km/min	1000	/60 m/s
foot per minute					ft/min	0.00	508 m/s
foot per minute					fpm	0.00	508 m/s
yard per minute	:				yd/min	0.01	524 m/s
yard per minute					ypm	0.01	524 m/s
inch per second					in/s	0.02	!54 m/s
inch per second	1				ips	0.02	.54 m/s
foot per second	i i				ft/s	0.30	148 m/s
foot per second	ł				fps	0.30	148 m/s
mile per hour					mile/h	0.44	704 m/s
mile per hour					mph	0.44	704 m/s
yard per secon	đ				yd/s	0.91	.44 m/s
yard per secon	đ				yps	0.91	.44 m/s
mile per minute					mile/min	26.8	224 m/s
mile per minute					mpm	26.8	224 m/s

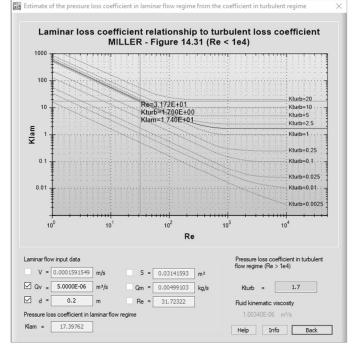
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The application has a tool allowing:

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

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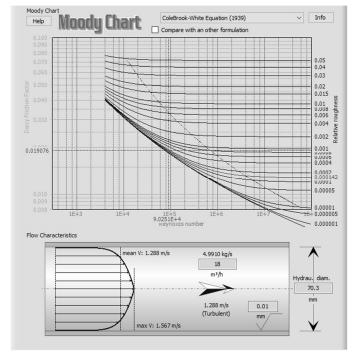
TOOL - ESTIMATE PRESSURE LOSS COEFFICIENT IN LAMINAR FLOW



- 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

HydrauCalc - © François Corre 2017-2021

TOOL - MOODY DIAGRAM

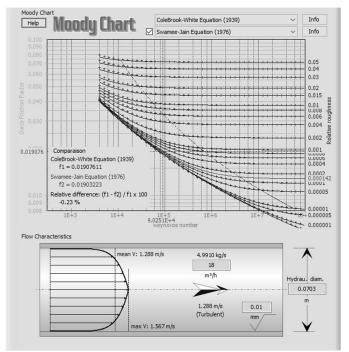


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- The application has a tool to calculate the coefficient of friction from more than 40 other formulations published by recognized scientists. The curves of isovalues of relative roughness are plotted in a Moody diagram and the calculated point is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

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TOOL - MOODY DIAGRAM (FOLLOWING)



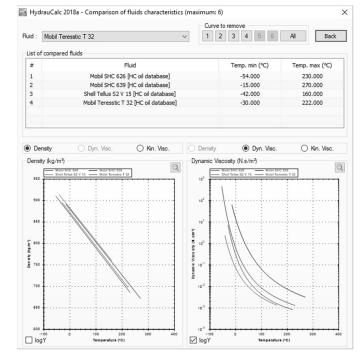
This tool also makes it possible to compare two different formulations for determining the Darcy friction coefficient.

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

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TOOL - FLUID COMPARATOR



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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).

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THE CALCULATION REPORT

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CALCULATION REPORT

	Fluid characteristics		_	Geometrical characteristics		_	
	Fluid : Water @ 1 atm	n [HC]	~	Help Info Moody Chart		L	Calculate
_	Ref.: IAPWS I	IF97					
-	Temperature :	60,00001	op:				_
1	Pressure :	33,89112			24700,5 lb/s	(\wedge
1	ricadare i	33,89112	ftH2O		396,0536		
1					ft³/s	1	
	Density :	62,3665					96
0	Dynamic Viscosity :	0,00075330			7,879 ft/s	,00085	in
2	Kinematic Viscosity :	1,20786E-05	ft²/s		(Turbulent)		
						ft /	
	(•) Density () D	vn. Visc. O ł	Kin, Visc.				×
		iyn. Visc. 🔾 H	Kin. Visc.			\checkmark	_ V
	O Density O D	iyn. Visc. Oł	Kin. Visc.		D e		_ Y
7	63.0	lyn. Visc. O ł	Kin. Visc.	999,9999	ft		_¥
7		lyn. Visc. O H	Kin. Visc.	K		<u> </u>	
7	63,0	iyn. Visc. O H	Kin. Visc.	Pressure loss 1,5	ftH2O	<u> </u>	
77	63.0	lyn. Visc. O H	Kin, Visc.	K	ftH2O	<u> </u>	
28	63.0	lyn. Visc. O F	Kin. Visc.	Pressure loss 1,5 1,5014 ft of	ftH2O		
7	63.0	iym. Visc. O F	Kin. Visc.	Pressure loss 1,5	ftH2O	Value	Unit
2 2 2	03.0 02.5 02.0 (4)(01.5 02.0	lym. Visc. O F	Kin. Visc.	Pressure loss 1,5 1,5014 ft of Complementary results	ftH2O fluid		
<u>6</u> 2	63.0	iym, Visc. O	Kin, Visc.	Pressure loss 1,5 1,5014 ft of Complementary results Designation	ftH2O fluid Symbol	Value	
<u>5</u>	03.0 02.5 02.0 (4)(01.5 02.0	lym. Visc. O	Kin. Visc.	Pressure loss 1,5 1,5014 ft of Complementary results Designation Hydraulic dameter	ftH20 fluid Symbol Dh	Value 96	in
<u></u>	03.0 02.5 02.0 (4g(0),5	lym. Visc. O I	Kin, Visc.	Pressure loss 1.5 1,5014 ft of Complementary results Designation Hydraulic dameter Pipe cross section area Internal pipe volume Mass of Hula In the pipe	ftuid ftuid Symbol Dh F0 V M	Value 96 7238,229 50265,47 1421959	in in²
2 Fr 2 - 7	63.0 62.5 62.0 62.0 62.0 61.0 61.0	lym. Visc. O I	Kin, Visc.	Pressure loss 1,5 1,5014 ft of Complementary results Designation Hydrauk: dameter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length / Diameter / rato	ftH2O fluid Dh F0 V M I/D0	Value 96 7238,229 50265,47 1421959 125	in in² ft³
	02.0 02.5 02.0 01.0 0.0 00.5	ym Visc. O I	Kin, Visc.	Pressure loss 1.5 1,5014 ft of Complementary results Designation Hydraulic dameter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length / Dameter / rabio Relative roughness	ftH2O ftuid Dh F0 V M (/Do Ā	Value 96 7238,229 50265,47 1421959 125 0,00010625	in in² ft³
	63.0 62.5 62.0 62.0 62.0 61.0 61.0	ym Visc. O I	Kin, Visc.	Pressure loss 1,5 1,5014 ft of Complementary results Designation Hydrauk dameter Pipe cross-section area Internal pipe volume Mass of flaid in the pipe Length (Joaneter / rabo Relative roughness Reymolds number	ftH2O ftuid Symbol Dh F0 V M I/D0 Δ Re	Value 96 7238,229 50255,47 1421959 125 0,00010625 5216642	in in² ft³
	010 02.5 02.0 01.0 0.5 00.5	ym Visc. O I	Kin, Visc.	Pressure loss <u>1,5</u> 1,5014 ft of Complementary results Designation Hydraulic dameter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length / Dameter / rabio Relative roughness Reynolds number È⊘ Dersy Pristion Factor	ftH2O ftuid Dh F0 V M (/Do Ā	Value 96 7238,229 50255,47 1421959 1215 0,00010625 5218642 0,01244985	in in² ft³ kg
	610 62.5 62.0 61.0 61.0 61.0 61.0 61.0 61.0 61.0 61			Pressure loss 1.5 1,5014 ft of Complementary results Designation Hydrauk dameter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length Joaneter ratio Relative roughness Reynolds number Pressure loss per length unit	ftH20 ftuid Symbol Dh F0 V M I/D0 Δ Re λ	Value 96 7238,229 50255,47 1421959 125 0,00010625 5216642 0,0115	in in² ft³
	910 425 420 420 420 420 420 420 420 420	100 190	200	Pressure loss 1.5 I,5014 ft of 1,5014 ft of Complementary results 1,5014 ft of Designation Hydraulic dameter Pipe cross-section area 1,111 ft of Internal pipe volume Mass of fluid in the pipe Length / Dameter / rabo Relative roughness Reynolds runtber Image: Pressure loss per length unit Pressure loss cefficient (lossed on the mean pipe velocity) Pressure loss cefficient (lossed on the mean pipe velocity)	ft+20 fuld Symbol Dh F0 V M I/D0 A Re λ 5	Value 96 7238,229 50255,47 1421959 1215 0,00010625 5218642 0,01244985 0,01244985 0,01244985	in in² ft³ kg ftH2O/ft
	910 425 420 420 420 420 420 420 420 420			Pressure loss 1.5 1,5014 ft of Complementary results Designation Hydrauk dameter Pipe cross-section area Internal pipe volume Mass of fluid in the pipe Length Joaneter ratio Relative roughness Reynolds number Pressure loss per length unit	ftH20 ftuid Symbol Dh F0 V M I/D0 Δ Re λ	Value 96 7238,229 50255,47 1421959 125 0,00010625 5216642 0,0115	in in² ft³ kg

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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:

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

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THE DATA EXPORT

DATA EXPORT

	A	В	С	D	E	F	G	^
1								
2								
3								
4		Straight pipe circular cross	-section and n	onuniform ro	ughness walls	- IDELCHIK (3)	d 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				
20		-						
21								~
H 4	Feuille	e1 / Feuille2 / Feuille3 /	<			i	1	>

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.

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DATA EXPORT

	B	C D	E F	G	н	1	J	К	L	м	N	0	1
_	Référence :	Pipe Flow - A Practica	l and Comprehensiv	e Guide (2012) - Example 7.4 -	page 71								
-									1.K1 + N2.K2 + N3.K3 + N4.K4	+ N5.K5			
-							K	4,394					
-				> 90° LR Elbow	(0)				N1.dP1+N2.dP2+N3.dP3+N		10.0		
-				90 LK Elbow	(4)		-10			4.0P4 + N5	5.dP5		
-							dP	15,216	psi				
-	4" Col	h 40 Pipe (35 ft)		Gate	Valve (2)								
-	4 Sci	n 40 Pipe (35 ft) -	*	Nr.				HydrauCa	le energier				
					$- Z_{2}$			P1-P2=d					
				-			D1 . D2	17.380					
							P1-P2	17,500	psi				
		ŵ, w						Reference	result:				
	Check Valve	//					P1 - P2						
	- Check Valve	/						11,11	p.21				
		\rightarrow						Relative d	ifference:				
	- 1	45" LR	Elbow					0.174%					
			-					-,					
	F	IGURE 7.1.	Four-inch p	pipe section.									
				-									
N	1 Number	1	Na	Number	1			N3	Number	4			
N	1 Number 4"Schedule 40 Pipe (New,		N	Number 45 ° LR Elbow	1			N3	Number 90 ° LR Elbow	4			
N	4" Schedule 40 Pipe (New,	Clean Steel)				Pipe Flor	w - Guide				on - Pipe Flo	w - Guide	(20
N	4" Schedule 40 Pipe (New,	Clean Steel)		45 ° LR Elbow		Pipe Flor	w - Guide		90 ° LR Elbow			w - Guide	(20
N	4" Schedule 40 Pipe (New, Straight pipe circular cross	Clean Steel) s-section and nonunifor		45 ° LR Elbow Smooth bend with circular o	ross-section - 0,3355 ft	Pipe Flor	w - Guide		90 ° LR Elbow Smooth bend with circular c	ross-secti 0,3355	ft	w - Guide	(20
N	4" Schedule 40 Pipe (New, Straight pipe circular cross Diameter	Clean Steel) s-section and nonunifor 0,3355 ft		45 ° LR Elbow Smooth bend with circular o Diameter	ross-section - 0,3355 ft	Pipe Flor	w - Guide		90 ° LR Elbow Smooth bend with circular o Diameter	ross-secti 0,3355	ft ft ²	w - Guide	(20
N	4"Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area	Clean Steel) s-section and nonunifor 0,3355 ft 0,0884 ft ²		45 ° LR Elbow Smooth bend with circular o Diameter Passage cross-section area	0,3355 ft 0,0884 ft ²	Pipe Flo	w - Guide		90° LR Elbow Smooth bend with circular o Diameter Passage cross-section area	ross-secti 0,3355 0,0884	ft ft ² •	w - Guide	: (20
N	4"Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area Length	Clean Steel) s-section and nonunifor 0,3355 ft 0,0884 ft ² 35 ft		45 ° LR Elbow Smooth bend with circular o Diameter Passage cross-section area Bend angle	0,3355 ft 0,0884 ft ² 45 *	Pipe Flor	w - Guide		90 ° LR Elbow Smooth bend with circular o Diameter Passage cross-section area Bend angle	ross-secti 0,3355 0,0884 90	ft ft ² • ft	w - Guide	: (20
	4"Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area Length Absolute Roughness	Clean Steel) -section and nonunifor 0,3355 ft 0,0884 ft ² 35 ft 1,50E-04 ft		45 ° LR Elbow Smooth bend with circular of Diameter Passage cross-section area Bend angle Radius of curvature	ross-section - 0,3355 ft 0,0884 ft ² 45 * 0,50325 ft		w - Guide		90 ° LR Elbow Smooth bend with circular of Diameter Passage cross-section area Bend angle Radius of curvature	ross-secti 0,3355 0,0884 90 0,50325	ft ft ² ft ft	w - Guide	: (20
	4" Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area Length Absolute Roughness Volume flow rate	Clean Steel) I-section and nonunifor 0,3355 ft 0,0884 ft ² 35 ft 1,50E-04 ft 0,05681 m ³ /s	m roughness walls	45 ° LR Elbow Smooth bend with circular of Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness	0,3355 ft 0,0884 ft ² 45 * 0,50325 ft 0,00015 ft	/s	w - Guide	(2012)	90 ° LR Elbow Smooth bend with circular o Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness	ross-secti 0,3355 0,0884 90 0,50325 0,00015	ft ft ² e ft ft m ³ /s	w - Guide	+ (2C
dP	4" Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area Length Absolute Roughness Volume flow rate Pressure loss	Clean Steel) s-section and nonunifor 0,3355 ft 0,0884 ft ² 35 ft 1,50E-04 ft 0,05681 m ⁵ /s 6,15249 psi	m roughness walls	45 ° LR Elbow Smooth bend with circular of Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness Volume flow rate	0,3355 ft 0,0884 ft ² 45 * 0,50325 ft 0,00015 ft 0,05681 m ⁵ /	/s	w - Guide	(2012)	90 ° LR Elbow Smooth bend with circular o Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness Volume flow rate	ross-secti 0,3355 0,0884 90 0,50325 0,00015 0,05681 0,75173	ft ft ² e ft ft m ³ /s	w - Guide	: (20
dP	4" Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area Length Absolute Roughness Volume flow rate 1 Pressure loss Fluid head	Clean Steel) -section and nonunifor 0,3355 ft 0,0884 ft ² 35 ft 1,506-04 ft 0,05681 m ⁵ /s 6,15249 psi 14,2205 ft of fluid	m roughness walls	45 * LR Elbow Smooth bend with circular o Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness Volume flow rate Pressure loss	0,3355 ft 0,0884 ft ² 45 * 0,50325 ft 0,00015 ft 0,05681 m ⁵ / 0,51601 psi	/s	w - Guide	(2012) dP1	90 ° LR Elbow Smooth bend with circular of Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness Volume flow rate Pressure loss	ross-secti 0,3355 0,0884 90 0,50325 0,00015 0,05681 0,75173	ft ft ² • ft ft ft m ⁵ /s psi ft of fluid	w - Guide	: (20
dP	4" Schedule 40 Pipe (New, Straight pipe circular cross Diameter Pipe cross-section area Length Absolute Roughness Volume flow rate 1 Pressure loss Fluid head Pressure loss coefficient	Clean Steel) -section and nonunifor 0,3355 ft 0,084 ft ² 35 ft 1,50E-04 ft 0,05651 m ³ /s 6,15249 psi 14,2205 ft offluid 1,77655	m roughness walls	45 * LR Elbow Smooth bend with circular o Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness Volume flow rate Pressure loss Fluid head	ross-section - 0,3355 ft 0,0884 ft ² 45 * 0,50325 ft 0,00015 ft 0,05681 m ³ / 0,51601 psi 1,19267 ft o	/s	w - Guide	(2012) dP1	90 ° LR Elbow Smooth bend with circular c Diameter Passage cross-section area Bend angle Radius of curvature Absolute Roughness Volume flow rate Pressure loss Fluid head	ross-secti 0,3355 0,0884 90 0,50325 0,00015 0,05681 0,75173 1,7375	ft ft ² • ft ft m ⁵ /s psi ft of fluid	w - Guide	: (20
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- 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 fløw circulating in the circuit from the sum of the pressure loss coefficients and using the solver integrated into the spreadsheet.

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THE ASSURANCE QUALITY

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TECHNICAL DOCUMENTATION

By HydrauCalc - Help Image: Image	Actualizer Accuel Imprimer Options	- ×
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	Pressure loss coefficient (based on the mean pipe velocity): $\begin{aligned} & \hline & & \\ \hline \\ \hline$	
	Total pressure loss (Pa): $\Delta P = \zeta^{-} \frac{\beta^{-} W_{\chi}^{-2}}{2}$ ([1] equation 2-2)	
	Total head loss of fluid (m): $\Delta H = \varphi' \cdot \frac{W_0^2}{2 \cdot g}$	
٢	Hydraulic power loss (W): $[Wh = \Delta P \cdot O]$	

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:

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

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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 ponregression of the software features.

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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.

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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.

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The functions of the HydrauCalcXL library

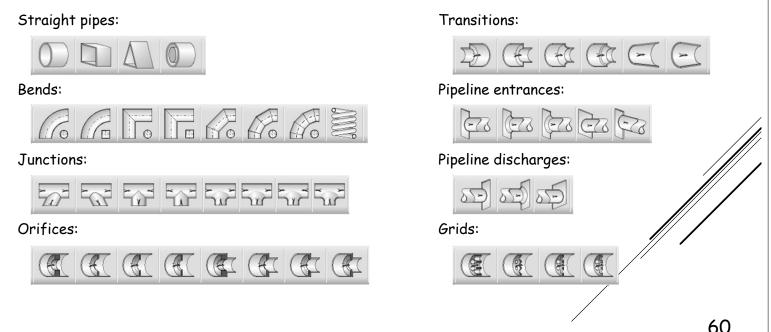
The HydrauCalcXL library includes three types of functions:

- 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).

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The available piping components



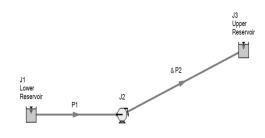
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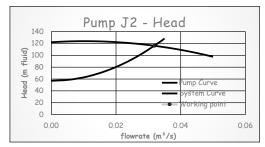
Example of a function a component

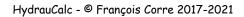
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0 1 2 3 3 5	Density Kinematic Viscosity Volume Flowrate Geometrical data: Pipe Internal Diameter Pipe length Absolute roughness	998.2 1.003E-06 0.01 0.01 0.1 10 0.00001	kg/m³ m²/s m³/s m m m m								

Examples of systems solved using HydrauCalcXL and Excel solver

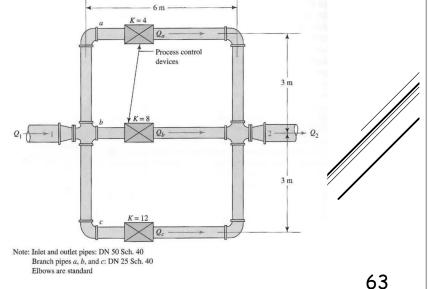
Reference: AFT Fathom 10 **Title**: Examples - Sizing a pump **Find**: Pump working point





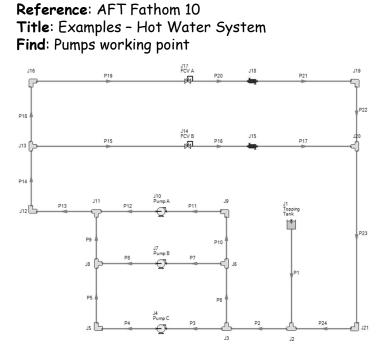


Reference: Applied Fluid Mechanics **Title**: Example 12.4 page 309 **Find**: Flowrate in each branch



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Examples of systems solved using HydrauCalcXL and Excel solver



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

