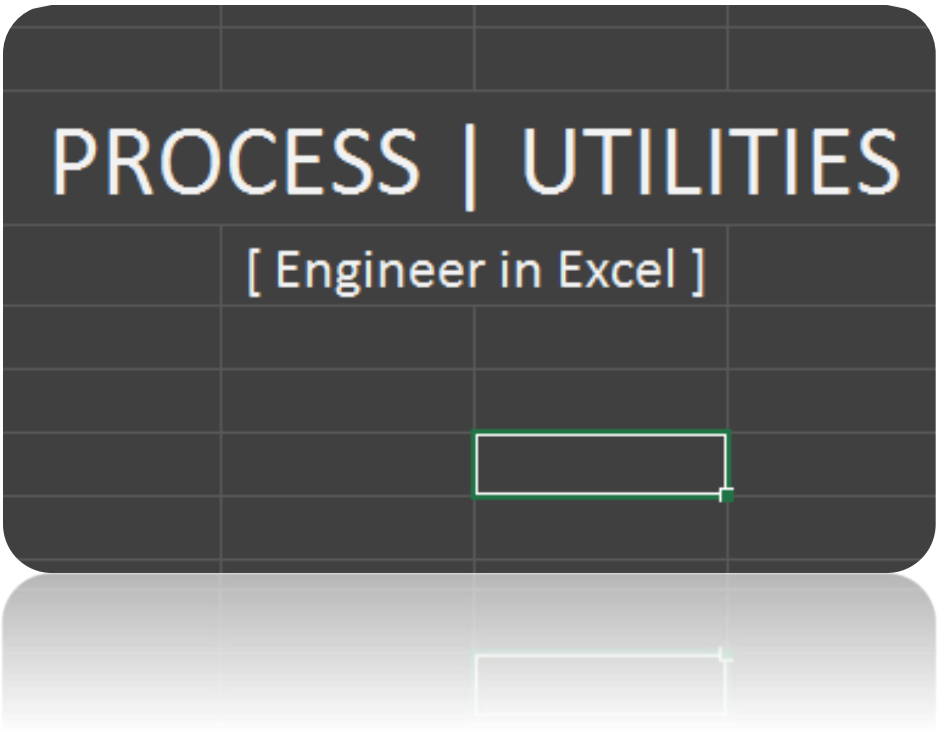


Getting started…

www.processutilities.com

A note from the developer:

ProcessUtilities is a collection of custom functions that make engineering in Excel better. On the front end, spreadsheet development is faster and more efficient. On the back end, your spreadsheet solutions will be simpler, more useful, and more intuitive.

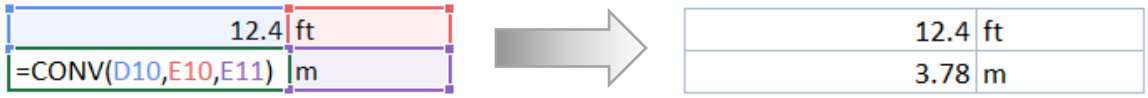
I am a process engineer, so many of the functions are oriented towards chemical process engineering applications. That said, there are also many that will find uses throughout engineering and science.

In the following pages you'll find a selection of some of my favorite functions and those that I find most useful. I've used some version of Process Utilities nearly every working day for the past ten years. I hope that you find it equally useful.

Cheers,
Chris

Conv

Intelligent unit conversion – this is what makes it all possible. **Conv** will perform all kinds of unit conversions, for example:



Okay, you don't need an add-in to do that. But how about this:

Or this:

The **Conv** function will convert between any two dimensionally consistent sets of units. You can even define your own standard conditions in the user interface, and then convert freely between standard volumes and moles.

Send that old supplementary worksheet of conversion factors to the recycle bin and use your named ranges for something better.

MW

Give this function a molecular formula and it will give you a molecular weight:

Na2SO4	=MW(C40)

Na2SO4	142.0

Default units are ‘g/mol’, but if you’re looking for something else, just reference it after the formula:

Na2SO4	
=MW(D44,E45)	lb/mol

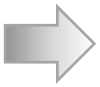
Na2SO4	
0.3131	lb/mol

Material balances will never be the same.

UnitMath

Design responsive units into your spreadsheets.

Diameter	**0.5**	**ft**
Area	0.20	ft2
Velocity	**100**	**ft/min**
Flow rate	19.6	=UNITMATH(E6,1,E7,1)



Diameter	**0.5**	**ft**
Area	0.20	ft2
Velocity	**100**	**ft/min**
Flow rate	19.6	ft3/min

SaturatedSteam

Here is one function that gives you access to the entire NIST saturated steam database, in any unit system.

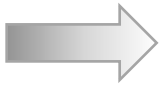
What's the boiling point of water at 13.4 bar?

P	13.4	bar
T	=SaturatedSteam(H69,I69,J69,H70,J70)	degF

P	13.4	bar
T	379.1	degF

Or maybe you're doing some thermo calcs:

T	525.0	degR
Sg	=SaturatedSteam(H73,I73,J73,H74,J74)	Btu/(kg-K)

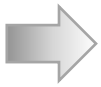


T	525.0	degR
Sg	8.25	Btu/(kg-K)

PipeSize

Access to inner diameter, outer diameter, and inner area for any standard NPS pipe size, 1/8" to 18".

Pipe size	4" Sch80	
OD	4.5	in
ID	=PIPESIZE(I81,H83,J83)	cm
A	11.5	in2



Pipe size	4" Sch80	
OD	4.5	in
ID	9.7	cm
A	11.5	in2

Pretty simple, pretty useful.

Flow rate	10	gpm
	2.23E-02	ft3/s
Pipe size	2" Sch40	
Inner area	=PIPESIZE(E83,D84,F84)	ft2
Velocity	0.96	ft/s

Dimensionless

This function is the pinnacle of the ProcessUtilities dimensional analysis engine.

You enter value/unit pairs in any order, the only rule is that numerator arguments have to be entered before denominator arguments. If a dimensionless number can be calculated from the values you entered, the **Dimensionless** function will do it. Some examples:

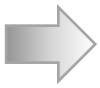
Reynolds number:

Density	8.4	lb/gal
Velocity	115	cm/s
Diameter	2.05	in
Dynamic viscosity	0.8	cP
Re	=DIMENSIONLESS(C2,D2,C3,D3,C4,D4,C5,D5)	

Density	8.4	lb/gal
Velocity	115	cm/s
Diameter	2.05	in
Dynamic viscosity	0.8	cP
Re	7.53E+04	

Prandtl number:

Heat capacity	4.2	J/(g-degC)
Dynamic viscosity	1.1	cP
Thermal conductivity	0.61	W/(m-K)
Pr	=DIMENSIONLESS(C15,D15,C16,D16,C17,D17)	



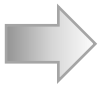
Heat capacity	4.2	J/(g-degC)
Dynamic viscosity	1.1	cP
Thermal conductivity	0.61	W/(m-K)
Pr	7.57E+00	

CvLiquid

Intelligent liquid flow coefficient (Cv) calculator. You give it pressure drop and flow rate, it will tell you the Cv. You give it Cv and pressure drop, and it will tell you the flow rate. You get the idea.

So, to calculate flow coefficient:

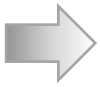
Flow rate	1250	gal/d
Pressure drop	0.4	atm
Density	0.95	g/cm3
Flow coefficient	=CvLiquid(D4,E4,D5,E5,D6,E6)	



Flow rate	1250	gal/d
Pressure drop	0.4	atm
Density	0.95	g/cm3
Flow coefficient	0.349	

Or, to calculate pressure drop:

Flow rate	950	L/h
Flow coefficient	0.95	
Density	55	lb/ft3
Pressure drop	17.1	psi

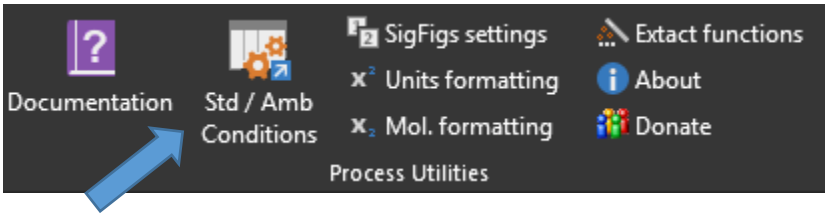


Flow rate	950	L/h
Flow coefficient	0.95	
Density	55	lb/ft3
Pressure drop	=CvLiquid(I7,H4,I4,H5,H6,I6)	psi

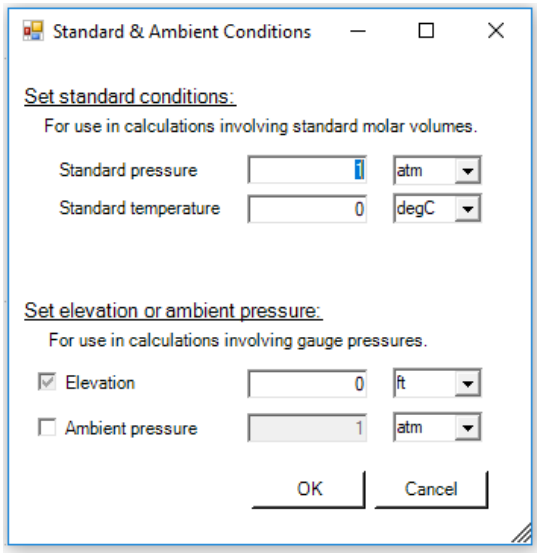
Use the **CvGas_Subcritical** and **CvGas_Critical** functions to do the same calculations for gases.

Conditions Settings

There's a bit more to process utilities than the functions. Depending on where you are, and what you do, there are numerous definitions for standard temperature and pressure. The settings menu allows you to specify those for your application, and they get saved with your workbook as named ranges.



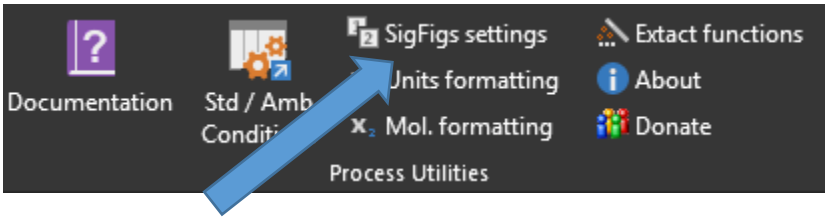
These values will be used to define the number of mole of gas in a standard cubic foot, liter, etc.

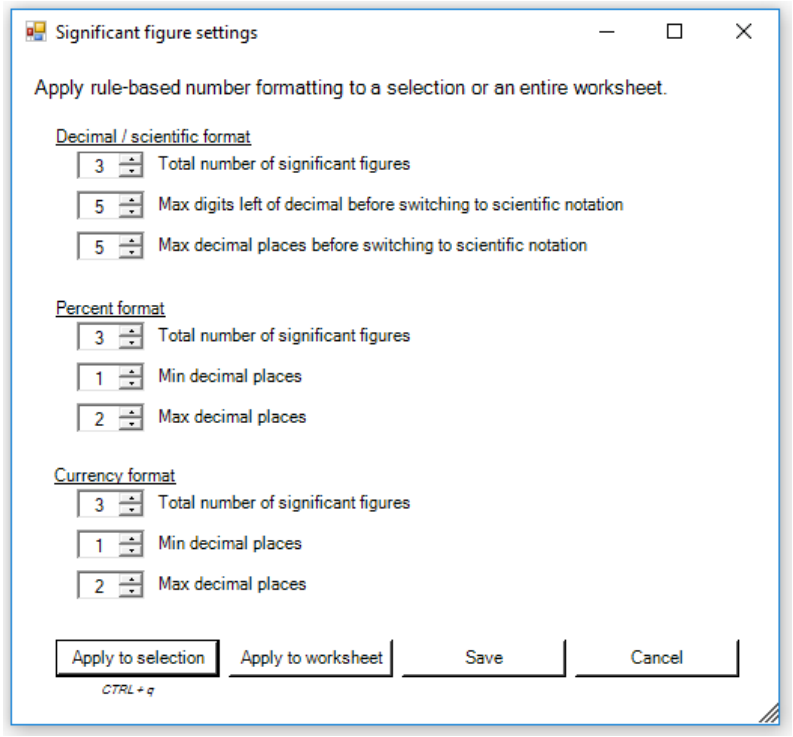


You can also enter elevation or ambient pressure. This information is used to convert between gauge and absolute pressures in the **PConv** function and elsewhere.

SigFigs Settings

Setting consistent SigFigs in Excel can be tedious. Adjust your settings, then press the short cut CTRL+Q, and let Process Utilities do the work for you.





Flow rate	12.22554332	gpm
Pressure drop	0.002344421	bar
Power	23423444	W

Flow rate	12.2	gpm
Pressure drop	0.00234	bar
Power	2.34E+07	W