

## Usage of Interpolation Macros

Since Excel doesn't allow simple help fields when coding a macro in VBA it is sometimes confusing as to how to use someone else's macro. Let's try this as an explanation...

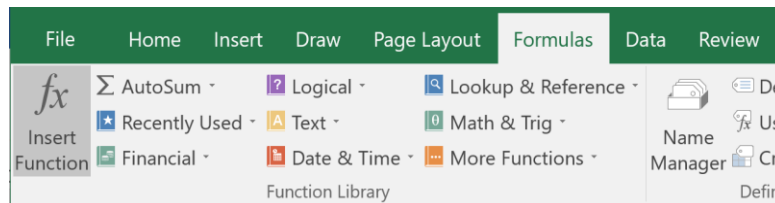
### ***Linear Interpolation***

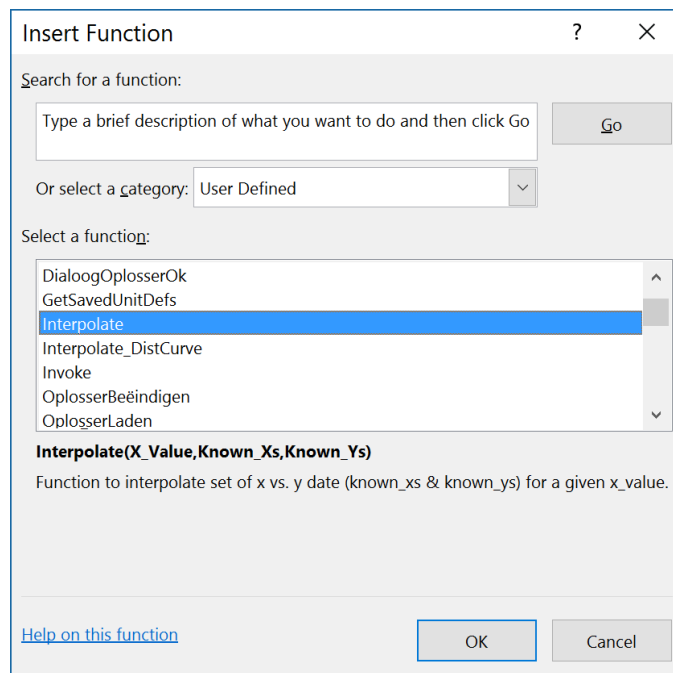
Given a set of  $x$  vs  $y$  data, the linear interpolation routine, Interpolate, will find an appropriate value of  $y_i$  given a value of  $x_i$ . The routine will determine if  $x_i$  is in between any of the  $x$  data values. If it is, then linear interpolation is performed to find the value of  $y_i$ . If it is before the first  $x$  value, then the  $y_i$  value is determined by extrapolation of the first two points; if it is after the last  $x$  value, then the  $y_i$  value is determined by extrapolation of the last two points.

The following shows part of a spreadsheet. We're interested in determining the sulfur content of a narrow fraction whose cumulative yield at the middle of the increment is 70 vol%. We will associate the yield data in cells G5:G12 with the sulfur data in cells L5:L12.

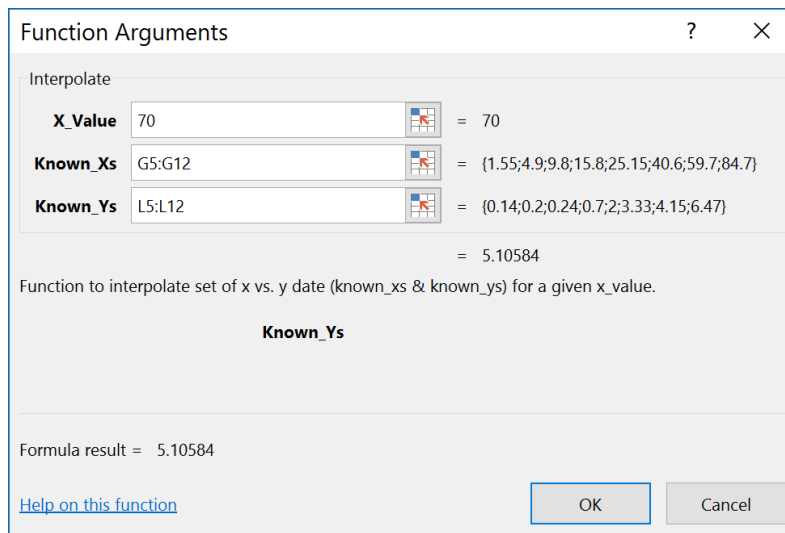
	A	B	C	D	E	F	G	J	K	L
1	<b>Eocene Crude Oil</b>									
2		TBP (°F)			Yield (vol%)			Gravity		
3		Initial	Final	@ Mid Cumulative Yield	Cumulative @ Initial	Cumulative @ Final	Cumulative @ Mid	°API	Specific Gravity	Sulfur [wt%]
4	Whole Crude							18.7	0.9421	3.97
5	Light Naphtha	55	175		0.4	2.7	1.55	82.7	0.6606	0.14
6	Medium Naphtha	175	300		2.7	7.1	4.90	56.9	0.7511	0.20
7	Heavy Naphtha	300	400		7.1	12.5	9.80	45.5	0.7994	0.24
8	Kero	400	500		12.5	19.1	15.80	39.0	0.8299	0.70
9	Atm Gas Oil	500	650		19.1	31.2	25.15	29.5	0.8789	2.00
10	Light VGO	650	850		31.2	50	40.60	21.5	0.9248	3.33
11	Heavy VGO	850	1050		50	69.4	59.70	15.5	0.9626	4.15
12	Vacuum Resid	1050	End		69.4	100	84.70	1.0	1.0679	6.47

You can use the Insert Function menu command to bring up the function's dialogue box. This is under the Formulas tab & then the item on the far left (as shown below). When properly installed the Interpolate function can be found in the User Defined list.





For this example, entering the value “70” will give an answer of 5.1 (which can actually be seen in the dialogue box). A cell reference could also be specified for X\_Value.



### ***Distillation Interpolation***

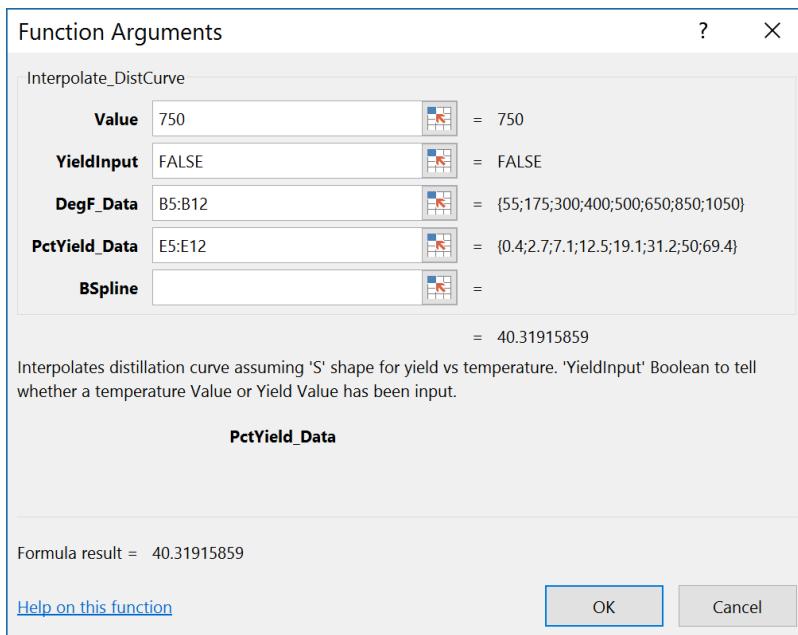
Distillation data (yield vs temperature) should be interpolated/extrapolated in such a way as to guarantee a “S” shaped curve. This is ensured in the Interpolate\_DistCurve routine by transforming the yield data using the NORMSDIST & NORMSINV routines and then performing interpolation/extrapolation on this transformed data.

***This routine should only be used for yield vs temperature and is not appropriate for working with other types of data sets.***

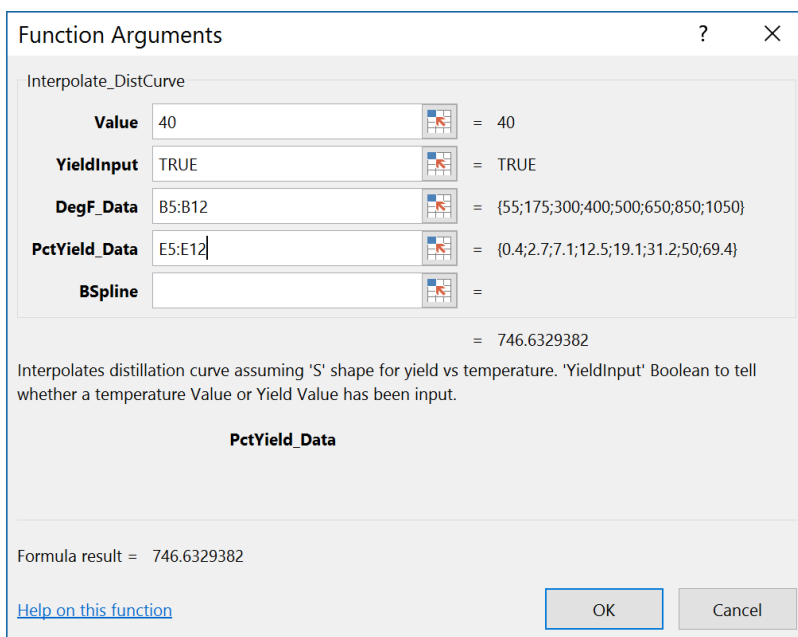
You'll be starting with a given set of corresponding temperature & yield values from which you want to extract a new value. The block of cells that designate the given temperature values will be passed into the macro as the variable "degF\_Data". The block of cells that designate the given cumulative yield data will be passed into the macros as the variable "pctYield\_Data"; these values are to be scaled from 0 to 100.

You will be calling the macro to either estimate a yield from a temperature value or a temperature from a yield value. Both of these calculations can be done using the same macro. If you input a temperature value to calculate a yield, associate the cell with the temperature value as "Value" & let "YieldInput" be FALSE (since you did not input a yield value); the macro will interpret Value as a temperature (in °F) & return a cumulative yield. If you input a yield value to calculate a temperature, associate the cell with the yield value as "Value" & let "YieldInput" be TRUE (since you did input a yield value); the macro will interpret Value as a yield(in %, 0 to 100) & return a temperature (in °F).

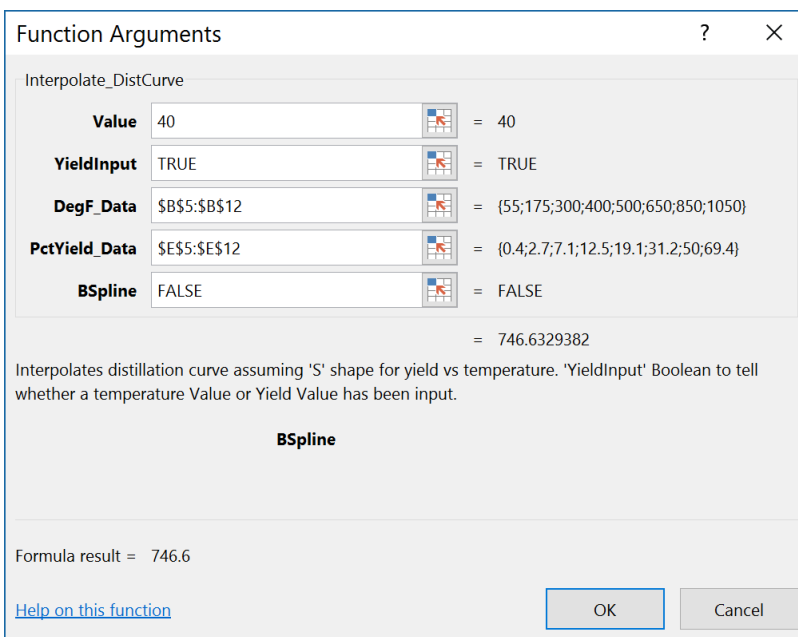
In the example above, the degF\_Data values are in cells B5:B12 and the pctYield\_Data are in E5:E12. The following shows the dialogue box to determine the yield at 750°F; note that the result is 40.4 vol%.



The following shows the dialogue box to determine the temperature corresponding to a 40 vol% yield; note that the result is at 746.6°F.



Note there is one more argument, BSpline, that has not been specified. This is an optional value that has a default value of FALSE. This directs the routine to use spline interpolation (using smooth, piece-wise cubic functions) for interpolation of the transformed volume curve instead of the default linear interpolation. For this example there is very little difference in the results. At 40 vol% yield the result is 746.6°F if linear interpolation is used & a 40 vol% yield; note that the result is at 746.5°F if spline interpolation is used.



Function Arguments ? X

Interpolate\_DistCurve

<b>Value</b>	40	=	40
<b>YieldInput</b>	TRUE	=	TRUE
<b>DegF_Data</b>	\$B\$5:\$B\$12	=	{55;175;300;400;500;650;850;1050}
<b>PctYield_Data</b>	\$E\$5:\$E\$12	=	{0.4;2.7;7.1;12.5;19.1;31.2;50;69.4}
<b>BSpline</b>	TRUE	=	TRUE

= 746.5429286

Interpolates distillation curve assuming 'S' shape for yield vs temperature. 'YieldInput' Boolean to tell whether a temperature Value or Yield Value has been input.

**BSpline**

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Formula result = 746.5

[Help on this function](#) OK Cancel