Parametric Tables

Example: Setting up a parametric table to calculate drag force relative to a changing velocity.

1.) Enter all known equations into EES equations window.

$$\begin{align*}
\text{Key Properties of Air:} \\
T &= 20[^\circ\text{C}] \\
P &= 101.3[^\text{kPa}] \\
rho &= \text{Density(Air, T=T, P=P)} \\
\text{Assumed Temperature of Air:} \\
\text{Assumed Pressure of Air:} \\
\text{Density at Assumed Conditions:} \\
\text{Drag Coefficient:} \\
C_d &= 0.35 \\
\text{Dimensionless Drag Parameter:} \\
\text{Cross Sectional Area of Front End of Car, converts ft}^2 \text{ to m}^2 \text{ to stay in one unit system:} \\
A &= 36*\text{convert(ft}^2, \text{m}^2) \\
\text{Assumed Front End Area:} \\
\text{Drag Force:} \\
F_d &= \left(\frac{1}{2}\right)\rho v^2 C_d A
\end{align*}$$

*Figure 1: All known equations entered in equations window in EES.*

2.) One variable will be fluctuated in order to build a parametric table, so make sure one of the equation variables isn’t defined (i.e. in this case we will be changing the velocity and observing the output drag force, so we need to make sure velocity isn’t already defined).

*Figure 2: Clicking on the red check mark provides the shown information.*

3.) Create a new parametric table (Tables $$\rightarrow$$ New Parametric Table) from the EES “tables” menu.

4.) Select the changing variables in the “Variables in table” column (in this case we are observing velocity and drag force). Depending on the experiment, the number of runs may need to be altered. Select “ok” once desired parameters are set.
5.) At this point, the parametric table will pop up on the screen. To change values of a variable, simply right click on the variable and select “alter values”. The units of the variable can also be set by right clicking on the variable and selecting “properties”. For this example, the velocity was varied 5-25[m/s].
6.) To solve the parametric table, simply click on the green arrow on the top, left corner.

![Parametric Table](image)

*Figure 5: Parametric table with drag force and velocity.*

7.) To plot the parametric table results, use the “plots” menu at the top of the EES screen.

   Plots → New Plot Window → X-Y Plot

Choose the corresponding variables and set the proper axis ranges.

![New Plot Setup](image)

*Figure 6: Plot setup window*
Figure 7: Resulting plot.