Accessing EES Fluid Properties

1.) Select unit system

Options \rightarrow unit system \rightarrow unit system

Unit System	Specific Properties	X
SI	💽 Mass (kg)	
C English	🔿 Molar (kmol)	
		E Stor
Temperature Units	Pressure Units	
Celsius	⊖ Pa ⊖ bar	
C Kelvin	🖲 kPa 🔿 MPa	
		🗸 ок
Energy Units	Trig Functions	•
O J	Degrees	Y Cane
💽 kJ	C Radians	

Figure 1: Unit preferences menu.

Failure to stay in this unit system will produce undesirable results (i.e. if you are trying to find the density of water at a provided temperature and pressure, make sure the provided units and EES units coincide). If the provided units are mixed, conversions can be accessed through EES. EES has built in commands to convert temperatures, pressures, etc. from one unit system to another. Use of this function can be found in the help menu under "convert function".

rentemp(C,F,28)
FEs Solution
Unit Settings: SI C kPa kJ mass deg
⊤ = 82.4 [F]
ng Lengths, Other Units} ng a length of 28 inches to ft.}
ng Lengths, Other Units} ng a length of 28 inches to ft.} nvert(in,ft) 🕵 Solution
ng Lengths, Other Units} ng a length of 28 inches to ft.} nvert(in,ft) ¹ S Solution Main
ng Lengths, Other Units} ng a length of 28 inches to ft.} nvert(in,ft) Main Unit Settings: SI C kPa kJ mass deg
ng Lengths, Other Units} ng a length of 28 inches to ft.} nvert(in,ft) Main Unit Settings: SI C kPa kJ mass deg

Figure 2: Conversion commands and solutions menu

Options \rightarrow function info \rightarrow select "Fluid Properties" bubble

Any fluid/ fluid property combination can be selected from the following menu. The fluid formula that will be pasted into the equations window is shown at the bottom of the menu. Each variable used in the formula must be defined before EES will find a solution.

Example: using EES to define density of water at state 1

Function Information	N N N			
 Math and string functions Fluid properties Solid/liquid properties Heat Transfer Mechanical Design User-defined 	 EES library routines External routines 			
? Function Info	AirH20 C Brines NASA ? Fluid Info			
CompressibilityFactor Conductivity [Btu/hr-ft-R] Cp [Btu/lbm-R] Cv [Btu/lbm-R]	Siloxane_1 Siloxane_2 Siloxane_3 Steam			
Density (lbm/(t3) Dipole (debye) ek_Lu [R] Enthalpy (Btu/lbm]	Steam_IAPWS Steam_NBS SulfurDioxide SulfurHexafluoride			
Independent Properties Temperature [F]	Pressure [psia]			
Ex: rho[1]=Density(Steam_IAPWS,T=T[1],P=P[1]) [1]				
🕵 Paste	X Done			

Figure 3: Fluid properties function window.

{Density Callup Pasted Into Equations Window} rho[1]=Density(Steam_IAPWS,T=T[1],P=P[1])

Figure 4: Density Call-Up Pasted In Equations Window

*rho[1] = array variable representing density (can be changed through "function information" menu or after formula is pasted to equations window)

*T[1] = array variable independent property 1. Represents temperature (must be defined in equations window)

*P[1] =array variable independent property 2. Represents pressure (must be defined in equations window)

Note: EES automatically uses array variables when defining functions. These variables can be changed to whatever variable the student wants to use (i.e. in multiple state systems, arrays can be very useful, but in solely trying to find the density at one state, "T", "P", and "rho" may be sufficient. See window with new variables below)

Function Information	2 ¥ X
 Math and string functions Fluid properties Solid/liquid properties Heat Transfer Mechanical Design User-defined 	C EES library routines C External routines
? Function Info ○ Real fluids ○ Ideal gases	C AirH20 C Brines ? Fluid Info
AcentricFactor CompressibilityFactor Conductivity [Btu/hr-ft-R] Cp [Btu/hm-R] Cv [Btu/hm-R] Density [bm/ft3] Dipole [debye] ek_LJ [R] Enthalpy [Btu/lbm]	R717 R718 R74 RC318 Siloxane_1 Siloxane2 Siloxane3 Steam Steam_IAPWS
Temperature [F]	▼ Pressure (psia) ▼
Ex: rho=Density(Acetone,T=T,P=P)	[1]
🔁 Paste	🗙 Done

Figure 5: Fluid properties function window using modified variables

The process in solving for the density of water with the given inputs is shown below. In solving a system of equations, it is suggested to use the built in "box" EES feature.

T = 65[F] P = 15[psi] rho=Density(Water,T=T,P=P)	{Temperature at State 1} {Pressure at State 1} {Density of Water With Given Ir	{Temperature at State 1} {Pressure at State 1} {Density of Water With Given Inputs}	
Es Solution Main			
Unit Settings: Eng F psia mass deg P = 15 [psi]	o = 62.34 [lb _m /ft ³]	T = 65 [F]	

Figure 6: Hightlighted solution.