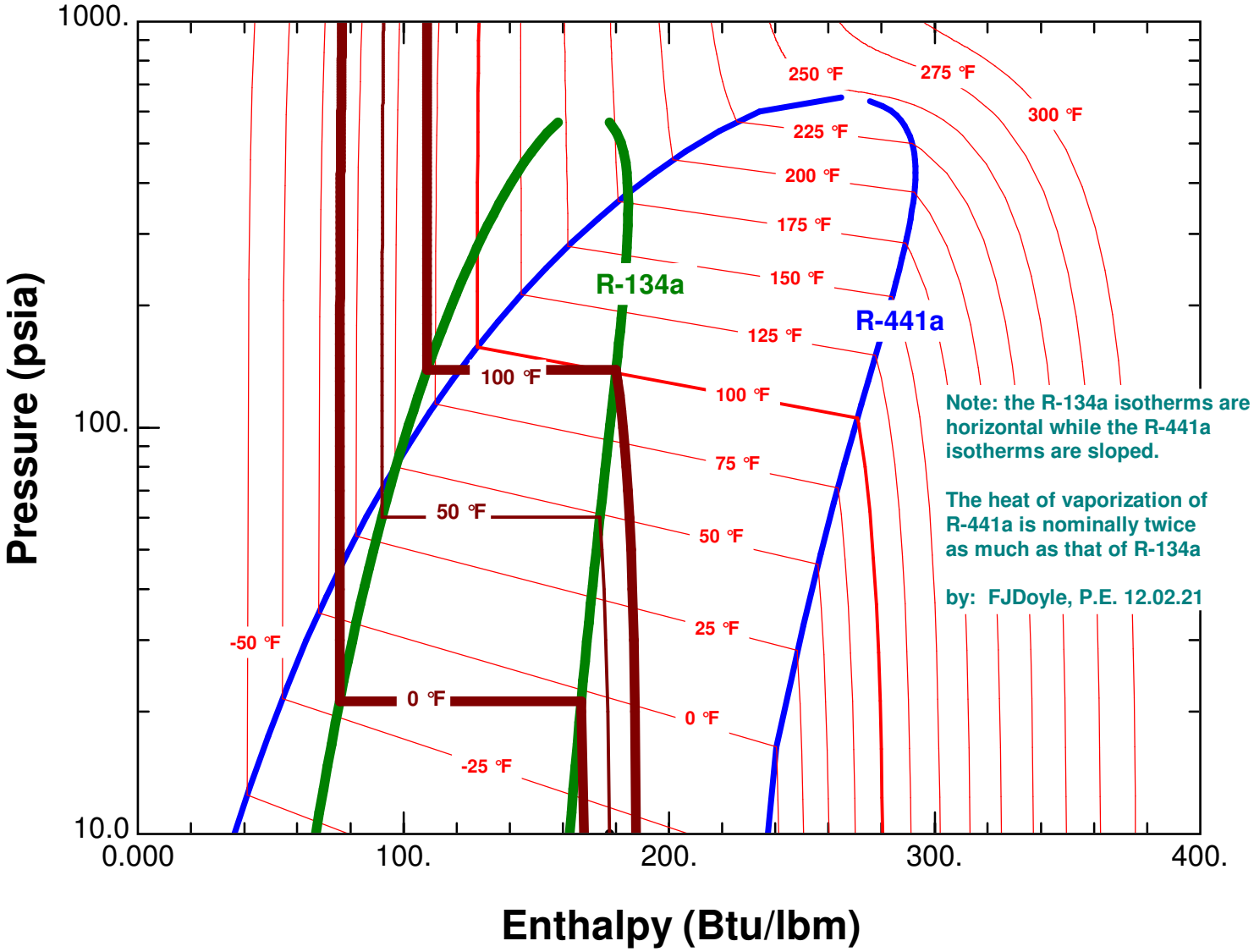
34: Pressure vs. Enthalpy plot: Compare R441a and R134a



This plot shows and compares the pressure, enthalpy and temperature of R-134a and R-441a.
The saturation lines for R-134a are "dull green" (wider), R-441a are "blue".
The isothermal lines for R-134a are "dull red" (wider), R-441a are "bright red"
From thermodynamic definitions R-134a is a "pure fluid" and R-441a is a "zeotropic" fluid mixture.

The refrigeration / airconditioning heat load removed in a refrigeration system is the product of the weight flow of the refrigerant and its heat of vaporization. The heat of evaporization of a fluid is the difference between the saturated vapor enthalpy and the saturated liquid enthalpy (the length of a horizontal line between either the "dull green" or "blue" curves). Clearly R-441a can absorb more heat at a given pressure than R-134a . Hence the weight of R-441a required to remove a fixed quantity of heat will be less than the weight of R-134a required to remove the same amount of heat in the evaporator.

In additon to the greater "heat of vaporization" of R-441a, the individual internal volumes of the condenser and evaporator in the system, as well as, the thermodynamics of a zeotropic fluid in a real system will effect the performance of the refrigeration system, and hence the required charge of R-441a.

Recall, the objective is to replace the R-134a refrigerant with R-441a, a "climate friendly" refrigerant. R-441a must produce the same temperature results in the "conditioned space". The required quantity of R-441a must be determined experimentally for each model of refrigeration / airconditioning system it is to be used in. It may not be optimally acceptable in all systems. R-134a systems which have controls that include analog or digital use of its thermodynamic refrigerant properties wiill, most likely require some modification to those specific controls. by FJDoyle, P.E. 12.02.22