Refrigerant Blends—A Better Understanding

The saturated liquid condition is often referred to as the bubble point. Analogy— a pot of liquid water with a heat source beneath it; as it begins to boil it forms bubbles in the liquid. The saturated vapor condition is referred to as the dew point. Analogy— a vessel full of water vapor; dew drops forming on the vessel wall. PT charts for the zeotropic blends list two columns next to each temperature: one for the saturated liquid (bubble point) and the other for the saturated vapor (dew point).

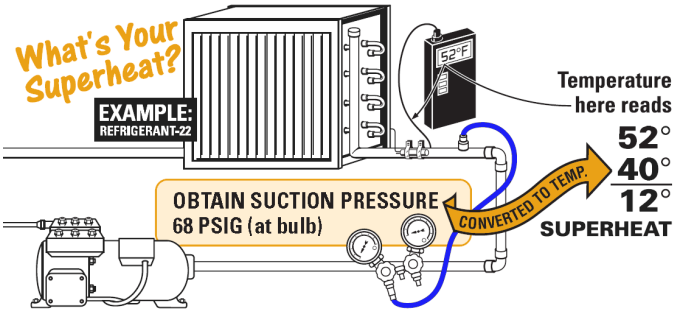
Some of the zeotropic blends have very low glide from l° F to 3°F. For these blends, the vapor and liquid pressures are only separated by 1 or 2 psi. Because the difference is quite small between the two values, some manufacturers' PT charts will only list one column for these blends. Blends with higher glide, greater than 5°F, will generally have both columns listed.

Using a two-column PT chart

When checking a superheat or subcool temperature the procedure is the same as for a single-component refrigerant. Superheat is checked by measuring the temperature of the vapor line, measuring the pressure, then subtracting the saturated temperature from the measured temperature. In the case of a blend, you simply read the saturated temperature next to the pressure in the vapor (dew point) column of the chart.

When checking the subcool condition you will measure the temperature of the liquid line, the pressure at that point and subtract the measured temperature from the saturated temperature at the end of the condenser. With the blend you read the saturated temperature next to the pressure in the liquid (bubble point) column of the chart.

For a single-component or azeotropic refrigerant, the operating pressure for the low side of a system can be found by cross referencing the desired coil temperature on the PT chart. For high-glide blends, however, the desired coil temperature is the average or midpoint temperature of the coil.



Setting Superheat & Subcooling

When a single refrigerant boils, any heat picked up after it reaches the vapor state will cause the temperature to rise above the saturated state (superheat). Similarly, when a single refrigerant condenses, any heat removed after it reaches saturated liquid will cause the temperature to go below the saturated state (subcooling).

The process is the same for higher-glide blends - the refrigerant will boil until it reaches saturated vapor, then any additional heat will cause it to superheat. The difference is that the blend changes temperature while boiling, so superheat should not be confused with temperature glide.

It is especially important to check the superheat settings for thermostatic expansion valves after a retrofit since the temperature glide of the blend can reduce the original superheat value. The superheat setting should be checked on the PT chart against the saturated vapor column (Dew Point). Subcooling should be checked against the saturated liquid column (Bubble Point).

Some PT charts might only show one column, but the data at lower temperatures will be for saturated vapor for setting superheat after the evaporator and the data at high temperatures will be saturated liquid for setting subcooling out of the condenser.

Sources: How to use a two-column PT Chart by Jim Lavelle (National Refrigerants)