



RS-53 (R470A) TEMPERATURE GLIDE

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The effects of zeotropic refrigerant temperature glides on cycle performance are misunderstood. Engineers commonly view the glides of zeotropic refrigerants as a problem. When offered a new refrigerant they will first look at the difference between the bubble and dew points at the same pressure listed in the manufacturers' saturation tables, a value that might be termed as a "thermodynamic" measure of the glide which has the advantage of being independent of equipment design.

While accepting that the difference between the dew and bubble points represents a comparative measure for the glides of different zeotropes, this value over-estimates the real evaporator glide, because flashing of the refrigerant in the expansion valve or cap tube reduces the glide. Even simple Rankine cycle computer models can grossly over-estimate the effect of refrigerant glide compared to an actual evaporator, resulting in the arbitrary rejection of refrigerant blends that combine good performance and an ASHRAE A1 rating with significantly lower GWPs than currently used major refrigerants, notably R-410A and R-404A.

The misapprehension arises because a key effect that has previously been ignored, i.e. the refrigerant coil loops within the heat exchanger causing the refrigerant to flow in opposite directions in adjacent loops, so the glide tends to be self-canceling. At an ambient temperature of 77°F (25°C), the air exit temperature achieved from the evaporator of ca 53.6°F (12°C) is similar to R-410A. In other words, the glide of RS-53 does not detract from its performance.