Last **Word**

Refrigeration Basics: Understanding Refrigerants with Glide

BY DON GILLIS

In this column, I'll touch on topics ranging from how condensers, compressors and evaporators work, to superheating and subcooling, to the refrigeration cycle, vapor injection and basic refrigeration system troubleshooting. In the *Emerson Refrigeration Basics* blog, I explain the key environmental considerations of refrigerants, how to account for refrigerant glide, and how the dew point impacts climate control equipment performance.

A refrigerant's environmental characteristics are determined largely by two factors: its impact on the Earth's ozone layer, or ozone depletion potential (ODP); and its potential to produce greenhouse gas emissions, or global warming potential (GWP). Chlorine-containing ODP refrigerants have been banned for use, while high-GWP hydrofluorocarbon (HFC) refrigerants are currently the target of global regulations (i.e., the HFC phasedown). Today, refrigerant manufacturers are introducing a variety of lower-GWP refrigerant alternatives to help commercial and residential customers achieve a full spectrum of sustainability goals.

In the U.S., federal and state regulations are accelerating the phasedown of the use of high-GWP refrigerants. Meanwhile, corporate sustainability objectives also are driving more companies to re-evaluate their choices of refrigerants and refrigeration systems.

Refrigerants are often comprised of a blend of two or more constituents. These individual components' different saturation temperatures can impact the refrigerant's performance characteristics. Working with refrigerants with glide requires understanding the boiling point of each of its constituents bubble point, or lowest condensing temperature of a constituent; mean condensing temperature; and dew point, or the highest condensing temperature of a constituent.

The difference between the boiling points of the first and last constituents is referred to as "glide. Essentially, the least volatile component condenses first, and each additional component of a refrigerant blend will start and end at different boiling points. The total temperature glide of a refrigerant blend is defined as the temperature difference between the saturated vapor temperature and the saturated liquid temperature at a constant pressure. An alternate definition is the temperature difference between the starting and ending temperatures of a refrigerant phase change within a system at a constant pressure.

The "dew point:" occurs when the final constituent in a glide refrigerant reaches the boiling point or saturated suction temperature and enters the vapor side of the system. Service technicians use this temperature measurement to set up a refrigeration system and check that it's operating properly. To accomplish this, technicians rely on a pressure-temperature (PT) chart that lists the relationship between pressures and temperatures for refrigerants. By changing the pressure of a refrigerant, a technician can:

- Set a coil pressure so that the chosen refrigerant produces the desired temperature;
- Check the amount of superheat above the saturated vapor condition at the outlet of the evaporator; and
- Check the amount of subcooling below the saturated liquid condition at the end of the condenser.

I will explore the concepts behind superheating and subcooling in future columns adapted from the blog series. For now, it's enough to understand that the "bubble" is referring to the subcooling side of the system, and the dew point is referring to the superheat.

Don Gillis has 27 years of HVAC industry experience including roles as an Installer, Service Technician, Service Manager, Tech. Support, Territorial Sales Manager, and a full time Instructor with Emerson. He is a licensed Journeyman, EPA 608 certified, and he is a judge at SkillsUSA Nationals. This column was adapted with permission based on the Emerson Refrigeration Basics Blog 1 R1-v3. For more information about the topics listed here and more, visit www.education.emerson.com.

TROUBLESHOOTING **ANSWER**

Why did the gears fail? The short answer is the machine is not being operated as it should. What happens is the flaker drum freezes to the evaporator under certain conditions when the safety disconnect is pulled. If they used the proper on-off switch the machine would cycle down normally and this would not normally happen.

Every overload switch that I have looked at trips within 200–250 milliseconds in a stall condition. Take a close look at the worm gear, the pressure does not release from the output gear when the overload trips, so several punches on the reset have an increasing pressure effect on the output gear.

If you have other insight please feel free to email me at swrightsr@wrightbrothersinc.com.