REFRIGERATION REVIEW

BTUs and Refrigeration

Refrigeration takes on many different looks, and I'm always intrigued when I have a discussion about how much heat you have to remove from a pound of water to make a pound of ice v. how much heat you have to remove from water vapor in air to condense it, which of course is the same amount of heat your body removes by the evaporation of good old fashioned sweat.

I can remember my father saying more than once, "God made the best refrigeration machine the elements and compounds on earth could provide by having water as the primary medium for sustaining molecular formation of cells and organisms, including mankind." Of course, I suppose we could all have been developed cold-blooded, and survived in some basic form, but evaporation cooling has obviously provided a means of surviving, and with water readily available, provides the natural aspiration cooling system that mammals with locomotion require.

When I ask how many BTUs it takes to freeze a pound of ice, some people can remember the answer is 144 BTUs/pound, and the basic term we use for Tons of Refrigeration (TR) is: the amount of heat removed in freezing a ton of ice in 24 hours. In Europe, they use the equivalent of kilowatts (kw) to describe the caloric equivalent. After I tell them that it takes 144 BTUs to freeze water to ice at no change in temperature, I then ask the question, "How much heat do you have to remove to condense a pound of water vapor out of the air, and turn the vapor into water?" Normally, most laymen would guess it would be a fraction of

the heat required to turn water into ice, and it's a shock to them to learn that it takes 1,000 BTUs to wring moisture out of air, and for every pound of water you evaporate off your skin, you are removing 1,000 BTUs of heat!

So, consider it Refrigeration 303 and just be aware that air can be by far the biggest heat removal requirement in a refrigeration system, and that in freezer applications, after you spend energy wringing moisture out of the air you then have to spend additional energy to melt it off the evaporator coils. But remember, that's just a fraction of what it takes to condense it out of the air.