# Definition of Refrigeration Horsepower

With the introduction of refrigerating machines in the first half of the 20th century, the new refrigeration industry was faced with a challenge. What recognizable measurement for "coldness" could be easily understood by the public?

Refrigerating machines and air conditioners moved heat and therefore could be rated in terms of BTU's per hour. The British Thermal Unit ( BTU ) is defined as the amount of heat necessary to raise the temperature of one pound of water one degree Fahrenheit from 58.5 to 59.5 degrees Fahrenheit. That is a very good engineering definition, clearly and precisely defined.

But, to the general public, "BTU's" were used in the measurement of something hot like a heater or boiler. "Coldness" was generally perceived to be something entirely different than heat!

Most consumers were used to iceboxes and cold storage ice warehouse facilities were common. So, in a stroke of marketing genius, the recognizable measurement for "coldness" was defined as a relationship to melting ice! Melting ice at 32 degrees Fahrenheit requires 144 BTU's per pound to become liquid at 32 degrees Fahrenheit. The Refrigeration Ton was defined as the heat absorbed by one ton of ice (2000 pounds) causing it to melt completely by the end of one day (24 hours).

Therefore: 1 Refrigeration Ton = 2000 Pounds x 144 BTU per Pound / 24 hours = 12,000 BTU's per Hour

The idea of Refrigeration Ton made it easier to sell equipment. The machine's capability could be compared to a quantity of ice. Imagine a salesperson trying to persuade a customer that a new-fangled "refrigerator" is equivalent to an icebox holding several hundred pounds of ice! "And just imagine...no more ice deliveries!" Today, the term is still in common use. **The capacity of most air conditioners is nearly always described in terms of the Refrigeration Ton.** Note that the Refrigeration Ton is defined as BTU's *per hour* which is work units divided by time units. Work done in a time frame is defined as power. Therefore, the Refrigeration Ton can be related directly to other definitions of power such as watts. 1 Refrigeration Ton = 3,515 Watts

But, to throw in some industry jargon, **refrigeration** capacity as opposed to **air-conditioning** capacity is often referred to as horsepower rather than tons. So what is the definition of “refrigeration horsepower”? I called the vice president of engineering at three different compressor manufacturers and asked where the term refrigeration horsepower came from. The good news is I got the same answer from all three of them. The bad news is they just laughed, said I was the first person who had asked and they really didn’t know.

But I can tell you what it isn’t. It isn’t the simple conversion of Ton to horsepower. As a simple power unit conversion 1 Ton equals 4.72 horsepower. Refrigerating horsepower isn’t mechanical horsepower. It isn’t the power input to the compressor. In fact, it isn’t a well defined engineering unit of measure at all.

I was able to track down a refrigeration engineer who graduated from college and started work the year I was born. He knew what was meant by refrigeration

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horsepower. The generally accepted definition is:
High Temperature refrigeration, 1 Hp = 12,000 Btu/hr (1 Ton)
Medium Temperature refrigeration, 1 Hp = 8,000 Btu/hr
Low Temperature refrigeration, 1 Hp = 4,000 Btu/hr

These definitions will help you identify approximate compressor or system capacities as sometimes listed in various manufacturers' catalogs. However my general advice is

Fagitaboutit!

Air-conditioning and refrigeration capacity is correctly defined as Btu/hr or watts, depending on whether you are using I-P or SI units.

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