TECH TIP # 15

HEATING, AIRCONDITIONING & REFRIGERATION DISTRIBUTORS INTERNATIONAL

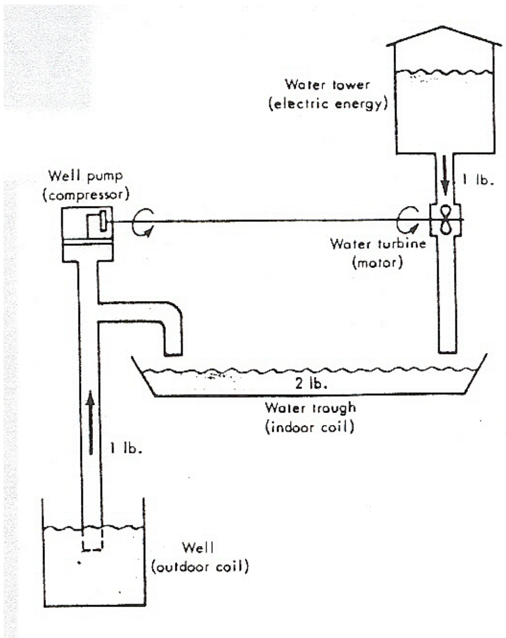
One of a series of dealer contractor technical advisories prepared by HARDI wholesalers as a customer service.

A HEAT PUMP REALLY SAVES ENERGY

An air source heat pump, presently the most popular package, supplies more heat to a home than the direct conversion (to heat) of the same amount of electricity necessary to drive the machine. For instance, one Kw of electricity - via a resistance wire - converts to 3413 Btuh of heat. One Kw of electricity driving a heat pump motor/compressor may ultimately result in, say 6,826 Btuh being generated. The ratio of the heat output divided by the heat input (heat equivalent to drive machine) is called coefficient of performance, or Heating Seasonal Performance Factor (HSPF) when evaluated over a considerable period of time - day, week, month, etc.

While the thermodynamic principle involved provides a ready explanation of the heat producing phenomenon, a simple analogy to a water turbine can provide an equally and more readily understood explanation.

Figure 1 shows a schematic of a simple water powered well system. The water trough which we wish to fill can be thought of as representing the indoor coil of an air source heat pump. To fill the trough, a water tower (analogy: electric energy) is located 15 ft. above a water turbine (compressor motor) which draws water from a well (the outdoor coil) 15 ft. below ground level.



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Now if one pound of water is merely drained from the tower and bypasses the turbine, the trough receives one pound of water for use and the HSPF is 1/1 or 1.0. This is equivalent to converting electricity to straight resistance heat.

But the 15 ft. lb. of potential energy (one lb. moved 15 ft.) could also drive the turbine and raise an additional lb. of water from the well 15 ft. below and discharge it into the trough. This of course is idealized and assumes no mechanical losses. Thus 2 lb. of water would now be in the trough while only one lb. of water (energy) was expended. In this case the HSPF for the system would be 2/1 or 2.0.

Another characteristic of the air source heat pump can also be demonstrated. As the well becomes deeper (analogy: outdoor air becomes colder) less water can be raised by the same one lb. of water driving the turbine. If the well were twice as deep, only 0.5 lb. of water could be raised for the same 15 ft. lb. of energy. The HSPF in this circumstance would be 1.5/1 or 1.5.

Similarly, for an air source heat pump, as the outdoor air becomes colder, less heat can be "pumped" and the HSPF decreases.