

Two-Speed Water-to-Air Heat Pumps

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Several manufacturers of water-to-air heat pumps have introduced product lines that appear to be significantly more efficient than similar single speed devices. Prospective users of these devices are advised to:

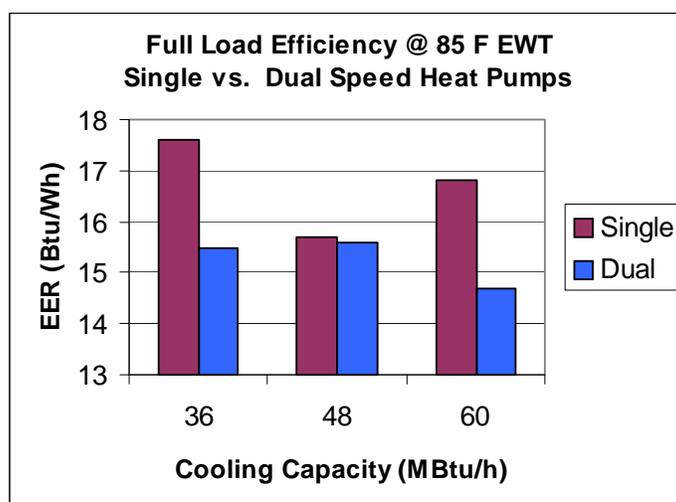
- Recognize the rating conditions for two-speed heat pumps that generate high cooling EERS [68°F entering water temperature (EWT)] are more favorable than the single speed condition (77°F EWT).
- Compare the efficiency of the two-speed with the single-speed unit at high-speed rating conditions.
- It is further suggested that in closed loop commercial applications, the performance of the equipment be compared at the WSHP cooling conditions (86°F EWT) and the GWHP heating conditions (50°F EWT) since these temperatures are near typical operation conditions.

While two-speed heat pumps do have some applicability in cold climate residential applications where there is typically a smaller cooling load than heating load, the potential savings will rarely match the improvement in rated efficiency in commercial applications. Economic value should be examined using actual performance rather than rated performance.

It should also be noted the newer ISO rating conditions do not include the fan power needed to distribute the air through the distribution system. This is typically 5% to 15% but could be much more if high static pressure fans are used to overcome friction in VAV systems or long undersized duct systems. Furthermore, the rating system does not include the corresponding cooling capacity performance deduction for fan power.

The ratings can be biased by operating a two-speed heat pump in low speed or capacity with the fan at full speed. This gives high efficiency but the unit will not be effective at lowering humidity, which is often needed much more when conditions are mild and the machine is operating at low capacity. If the machine is run at low speed (or capacity) with a lower fan speed so that humidity reduction is acceptable, the efficiency is usually well below the “rated” efficiency.

As an example please refer to the figure below that compares the efficiency of one manufacturer’s “premier” single-speed product line of heat pumps with its “premier” two-speed heat pumps. Although the two-speed units have much higher ratings, the single-speed units have significantly higher efficiency in two of the three units and slightly higher efficiency in the other case at 85°F EWT which is typical for cooling conditions in commercial applications.



Also dual capacity machines typically cost more and have are more complex control schemes. More complex devices typically result in more required maintenance and service technicians with a much higher level of skill and hourly service rate. The complex control schemes may also make it more difficult to determine if the device is operating in the intended manner.