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From Experience

What's in a Name: Deciphering Efficiency Ratings for Industrial Air Systems

When designing mechanical air systems, engineers consider how everything works together to meet conditioning requirements. We manipulate air and water temperatures and properties by the specific equipment selected. And while we understand all of the measures and terminologies involved with the selection of industrial heat pumps and air conditioning systems, and the implications that different selections can have on the bottom line, not everyone does. That's why we've compiled this handy reference guide outlining the various ratings and factors involved. Feel free to use this as a starting point as you review technical documentation regarding industrial air systems!

A Guide to Industrial Air Systems Efficiency Ratings

Measurements	Definitions	Additional Information
Seasonal Energy Efficiency Ratio (SEER) *AHRI 210/240-2023*[1]	SEER is a measure of the total heat (Btu) removed from the conditioned space during the annual cooling season (Btu/h) divided by the total electrical energy (Watt-hours) consumed by the air conditioner or heat pump during the same season.	The higher the SEER, the more efficient the system.
Energy Efficiency Ratio (EER) *AHRI 210/240-2023*[1]	EER is a ratio of the cooling capacity (BTU/h) to the total power (Watt-hours) at any given set of rating conditions.	Like SEER, the higher the EER, the more efficient the system. So, what's the difference between these? SEER equals the cooling output of a system divided by its overall power consumption during the cooling season (i.e., summertime). EER is similar except it measures the "instantaneous" efficiency rather than over an entire season.
Integrated Energy Efficiency Ratio (IEER) *AHRI 340/360-2022*[1]	A weighted calculation of mechanical cooling efficiencies at full load and part-load Standard Rating Conditions, expressed in Btu/(W*h).	The IEER represents a single metric for the annualized preface of the mechanical cooling. It is based on a volume weighted of three building types and 17 climate zones, and includes four rating points at 100, 75, 50 and 25 Percent Load at condenser conditions seen during these load points.
Heating Seasonal Performance Factor (HSPF). *AHRI 210/240-2017*[1]	The HSPF rating measures energy efficiency of heat pumps designed for heating purposes. HSPF is calculated as total heat output during heating season (Btu)/total electrical energy input during heating season (W*h).	The higher the HSPF, the more efficient the heat pump. HSPF varies depending on the region and design heating requirement.
Coefficient of Performance (COP) *AHRI 210/240-2023*[1]	COP is the ratio of the produced cooling effect of an air conditioner or heat pump (and/or produced heating effect for the latter) to its network input. Expressed as: Power (kw) drawn out/power (kw) provided.	The higher the COP rating, the more efficient the heat pump is at providing heat. COP is particularly important in regions with colder climates, where heat pumps need efficiently provide heat even when outdoor temperatures are low.

[1] *All information within the table is sourced as noted from the Air-Conditioning, Heating & Refrigeration Institute (AHRI).*

EXPERIENCE IN BRIEF

Product literature may also reference terms such as SEER2, EER2, COP2, HSPF2. These terms represent the equipment efficiency under new testing and calculation procedures which began January 1 of this year. Note, however, that these ratings/factors apply to equipment below 65,000 Btu/h, which is generally more applicable in residential and commercial spaces (which includes office space), not industrial use.

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