

$$kW = \left(\frac{Flow_{cfm} \times Static_{in.w.c.}}{6,356 \times \eta_{Fan} \times \eta_{Belts} \times \eta_{Motor} \times \eta_{VSD}} \right) \times .746$$

Where:

- kW = Input to the system to produce the flow and static pressure.
- $Flow$ = Flow rate in cubic feet per minute. Generally speaking, we try to use a field measurement for this. If that is not available we will use a value from a tab report. Lacking that we will use a design metric from the original drawings or an equipment submittal.
- $Static$ = The fan static pressure in inches water column. Since fan static as defined by AMCA is difficult to measure in the field, we usually try to derive this number from the fan curve using two other field measurements like flow and fan speed or flow and power. Lacking those measurements we will use a value derived from a TAB report or the design value.
- 6,356 = A units conversion constant that is good for air at approximately 0 - 2,000 feet_{msl} and between -40°F and 120°F.
- η_{Fan} = Fan static efficiency. We usually try to get this number from the fan curve or from the fan's rated brake horse power (bhp), flow and static. Lacking that, we will make a geometrically similar fan selection (same flow rate, static, wheel diameter, wheel type, and speed) using manufacturer's software and use that efficiency.
- η_{Belts} = Belt efficiency. Well adjusted V belts typically have an efficiency of 97-98%.
- η_{Motor} = Motor efficiency. We usually try to get the motor performance curve and select the efficiency from the curve for the bhp that the fan wheel is extracting from it. If we can't get the motor curve, we use a similar motor selected from MotorMaster™ International. In all cases we adjust the efficiency for the motor operating point vs. using the motor's rated nameplate efficiency.
- η_{VSD} = Variable speed drive efficiency. Where possible, we try to get the manufacturer's data for this. But this data is difficult to obtain and not consistent in its development. Lacking manufacture specific data, we use generic data as published by the Department of Energy on their Industrial Best Practices web site.
- .746 = Horsepower to kW conversion constant.