

Brushless DC Blowers: The Real & Hidden Advantages



For years brushless DC tubeaxial (box) fans have been growing in use, importance and market share for cooling electronics in cabinets and enclosures for computers, telecommunications and medical equipment. As more electronics, at higher package densities, are incorporated into appliances the impact, value and benefits of brushless DC are creating more and more interest for brushless DC in traditional AC applications. It has long been common knowledge that DC motor technology offers specific user advantages versus AC:

- Total and simplified speed control
- Linear speed/torque relationship
- Motor efficiencies up to 4 times higher versus comparable AC units

Motors used in air moving devices and the resultant performance of fans and blowers are perfect illustrations for the true benefits of brushless DC versus AC performance. The benefits of designing and specifying brushless DC blowers as an alternative to standard fans also becomes self-evident.

Air Mover Comparison

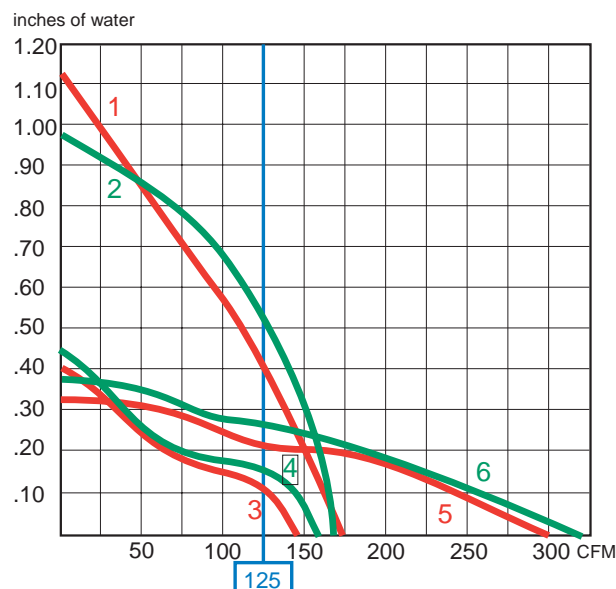
Here are six standard air moving products:

1. 5.25" standard brushless DC motorized impeller
2. 5.25" standard AC motorized impeller
3. 5.31" DC tubeaxial (box) fan
4. 5.31" AC tubeaxial fan
5. Fan Tray with three brushless DC fans
6. Fan tray with three AC fans

The following table shows the key ratings for six products:

Product	CFM	dBA	Watts	Max°C
1	174	62	21	50
2	170	60	45	55
3	147	48	9.5	72
4	159	50	26	80
5	300	50	15	75
6	318	56	54	60

All fans and blowers are rated and listed for specification as operating at zero static pressure (back pressure) and pressure is usually calculated using inches of water as the measurement. In reality, every application whether in an enclosure, in duct work for ventilating, or on a ceiling or wall for an exhaust application deals with static pressure. Pressure is resistance the air moving device encounters in pulling air into or pushing the air out and through the exhaust side of the fan or blower. The air performance graph plotting the performance of each product below shows the CFM versus Static Pressure for each product.



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If we select a CFM operating point of 125 CFM, look at the performance capabilities of each product relative to static pressure. As long as static pressures are very low, the fans stay in the ball game, but as pressures rise blowers become the best choice, because even adding more fans in a fan tray will not satisfy the air power needed to move air effectively against a higher static pressure.

Just to summarize the graph in table form, for the 125 CFM operating point that is desired, it is easy to evaluate the advantage of motorized impellers. At an operating point of 125 CFM the static pressures (in H₂O) for each product are as follows:

1	2	3	4	5*	6
.40"	.50"	.11"	.16"	.21"	.26"

* This fan tray should not be operated at less than 150 CFM judged by the flattening out of the curve.



5.25" motorized impeller (blower) and a 5.31" tubeaxial fan

Further Evaluation

Beyond air flow and operating performance at higher static pressures, the advantages of using brushless DC in appliances, or any other application are clearly worth considering:

- **SPEED CONTROL & NOISE** are much easier to control using brushless DC because due to the linear speed torque relationship which means the speed is easily controlled simply by controlling the voltage. Most DC motors operate with the same performance at $\pm 30\%$ voltage. The ability to control speed via voltage provides engineers with an effective means for controlling noise levels, i.e. a speed decrease resulting in a reduced noise level of 3dB lowers the noise level by 50%.
- **LIFE EXPECTANCY** – Brushless DC motors run cooler than AC motors. Because of their higher efficiency brushless DC motors produce less heat internally which significantly extends bearing system life and in turn extends the operating life of the motor and the entire brushless DC blower package.
- **EFFICIENCY**, there is no question about the advantage of brushless DC. Pick the wattage rating, or choose any ratio you like, such as CFM per watt, brushless DC is outstanding when compared to AC. Not all brushless DC motors are equal so it is important to compare the efficiencies and performance levels of similar products.
- **BELLS & WHISTLES** are another important consideration. If there are needs for such features as Hall Effect monitors, alarms, temperature sensors, speed sensors, or other special requirements, brushless DC is the easiest, most cost effective solution.
- **VALUE-ADDED BLOWER BOXES** are easily designed using motorized impellers. There is no need for a scroll housing, so these blowers can be placed in boxes for plug'n-place assembly to use their full radial air flow or to provide directed air flow depending on the specific application. The advantages of using blower boxes are fewer component parts for the user, easier assembly and a more cost effective air moving device.