

With top-end pricing, motorised impellers are upwards of £50 with larger versions as much as £150

KEEP YOUR COOL: SECOND-SOURCING FANS, CUTS LEAD TIMES

Understanding the basics of fan technology can help cut lead-times by second-sourcing ex-stock alternatives. Charcroft's emech specialist, Jeff Gurr, explains

Fans are often one of the last components to be specified into a design because, typically, they are needed as a work-around to an unforeseen problem with over-heating. This presents the buyer with a pressing need to find stock and find it fast, despite typical fan lead-times of between eight and 16-weeks. Finding stock of the specified fan, or finding a drop-in replacement, can mean the difference between keeping the project on time or a lengthy wait until the production schedule can get back on track.

The trick to second-sourcing fans is to have a basic understanding of different fan technologies and the critical parameters that make a particular fan suitable as a drop-in replacement.

Fan technology comes in three basic formats: axial fans, radial blowers and motorised impellers. An axial fan has blades which circulate around a central axis which is designed to suck air in



from the back and blow air out through the front. They are typically used in applications which have a fair degree of space and need a fast air-flow to dissipate heat. Radial blowers are used where there is less free-space and, therefore, a greater resistance which means more pressure is needed to guarantee adequate air-flow. They suck air into the centre of the blower and blow it out the side at 90 degrees.

At the top of the technology scale, motorised impellers are used in high-density applications where component volume creates high back-pressure, forcing the impeller to create more pressure to force air through the equipment. A motorised impeller has a central motor which sucks air into the middle and blows it out around the whole 360 degree circumference. While fans and blowers are usually supplied in a housing or cage, an impeller housing is usually specified by the end-user.

Fan compatibility

The key parameters for determining whether a fan is a drop-in replacement are size, voltage, airflow and noise.

Most manufacturers of axial fans offer common sizes and voltages so inter-changeability issues such as electrical supply, fixing centres and enclosure aperture sizes are usually not a problem. However, levels of airflow, back pressure and noise can often vary between fans from different manufacturers. Specifications for radial blowers and impellers tend to be more manufacturer-specific but substitutions can still be made with careful comparison of the key ratings.

Airflow and back pressure ratings are determined by the quality and power rating of the fan motor and blade design. Airflow is typically measured in cubic feet per minute (CFM) ranging from around 19 CFM to 1,100 CFM, although it can also be quoted in cubic meters per hour (m³/hr) or litres per second (l/s).

Back-pressure is most commonly measured in inches of water (in H₂O), which is the force required to push a column of water one inch above its resting level, although it can also be quoted in Pascal (of which there are 249 per inch of water), or pounds per square inch (PSI). Back-pressure ranges from around 0.5 in H₂O for a small axial fan up to 4.0 in H₂O for a motorised impeller or specialised radial blower.



Charcroft's emech specialist, Jeff Gurr, guides buyers through the forest of fan options

20 THERMAL MANAGEMENT

Noise is measured at a given distance (typically 1m) and is usually quoted in dBA or A-weighted decibels. This scale adjusts the standard decibel scale to compensate for the human ear's increased sensitivity to sounds at mid-frequency rather than sounds at high or low frequencies.



Feedback: the 3rd lead

Often a fan will have an additional lead which can provide tachometer information about the fan speed and functions or be attached to an alarm. Most fans are supplied without this lead and immediately become a special part when one has been added by the manufacturer. However, some manufacturers, such as Comair Rotron, include a 3rd lead as

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standard, making it possible to use them as drop-in replacements for special fans which have had the tachometer lead added as an optional extra.

Making it fit: semi-custom parts

When there is simply no drop-in alternative available off-the-shelf, then semi-custom fans, blowers or motorised impellers can often combine fast delivery with customer-specific features. For example, semi-customisation of standard Comair Rotron fans can include an E2 coating to ruggedise the fan against harsh environments, custom triggers to activate an alarm when the fan reaches a certain number of revolutions per minute (RPM) or a thermal profile tailored to a particular application.

Customisation can also include supplying complete fan assemblies with connectors and harnessing, integrated thermal sensors, custom labels, threaded inserts, gaskets and mounting hardware as well as fitted finger guards. The option of using IP-sealed connectors and UL-rated harness materials can make semi-custom fans suitable for use in tough environments.

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Cost-performance ratio

Cost is also an important factor. Small axial fans are the lowest cost, ranging from around £1 to £5. These usually have a minimum order quantity (MOQ) of around 3,000. Larger axial fans (circular or square) span a price range of £10 to £35 with an MOQ of 100. The cost of radial blowers roughly matches that of the larger axial fans, at prices of around £15 to £30. With top-end pricing, motorised impellers are upwards of £50 with larger versions as much as £150 for standard, off-the-shelf versions.

The cost of semi-customising standard fans depends on the degree of customisation but would typically add around 25 to 30 per cent to the cost of the standard product (Fig 1).

Many manufacturers focus on a particular segment of the price range, making either low-cost or high-end fans. Other manufacturers, such as Comair Rotron, provide a range of fans which cover the full price spectrum.

By matching size, voltage, airflow and noise it is possible to cut the lengthy lead times for fans, blowers or impellers by

replacing them with off-the-shelf, drop-in alternatives. Some manufacturers include a 3rd lead as standard, allowing off-the-shelf parts to be used as replacements for other manufacturers' semi-custom parts. Where no direct alternative is available, customising off-the-shelf product can be faster than the lead time for some standard parts.

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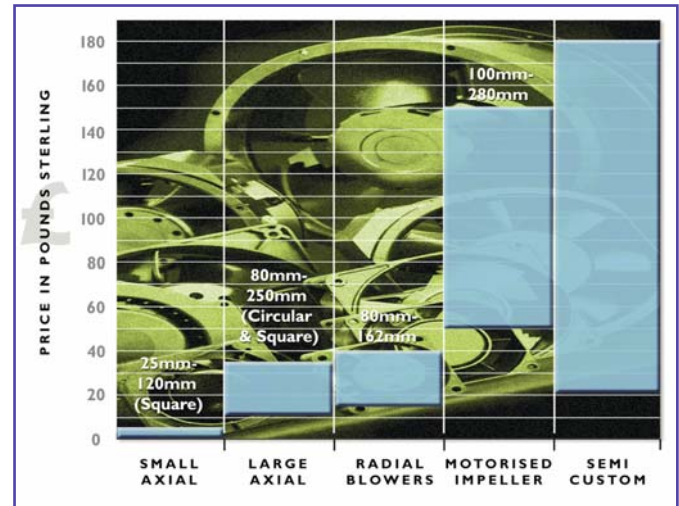


Fig 1: Comparison of price ranges for fans, blowers and motorised impellers

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