

# Consume Less Compressed Air

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You probably don't spend much time thinking about all the applications in your plant that require compressed air, but it is a costly utility that can easily account for one-third of a plant's total electricity usage. Yet, compressed air is often viewed as a fixed cost and overlooked when process improvements are considered. If that's the case in your plant, it may be time to revisit that approach. You may be able to save tens or even hundreds of thousands of dollars annually by significantly reducing compressed air consumption in your drying and blow-off operations.

Other positive effects result from making changes, too, such as less noise, improved worker safety, and more precise, repeatable drying and blow-off. So, what types of changes should you consider? If you're using open pipes, pipes with drilled holes or pipes with slits, you should consider air nozzle or knife packages. While open pipe systems are fast, easy and inexpensive to manufacture, the drawbacks are many, including high air and electrical consumption, problems complying with Occupational Safety & Health Administration (OSHA) noise level requirements, and compromised worker safety in the form of hearing loss and injuries sustained if a worker accidentally blocks the opening in the pipe.

## Reduce Costs by 95 Percent

Some drying and blow-off operations are particularly well-suited to regenerative blower and air knife use. Using blower air instead of compressed air can return thousands of dollars annually to the bottom line. Furthermore, air knife/blower packages offer clean, heated air; low operating noise (even without sound enclosures); and easy installation and operation. In general, the following applications are ideal candidates for air knife/blower systems:

Instances in which velocity rather than impact is required.

When oil in the compressed air causes quality problems.

Large areas—more than 2 feet (61 cm).

Situations in which heated air is needed.

When air knives can be placed 4 inches (10.2 cm) or closer to the target surface.

Performance and efficiency gains are dependent on the individual components used in the air knife/blower system or package. There are many factors to consider including air knife length, air slot size, blower horsepower and a range of supplemental components. Working with a single supplier that provides a complete package helps to ensure optimal performance.

## Air Stream Integrity-A Must Have

Most air knives feature slim lines to facilitate placement into a wide spectrum of manufacturing environments, but that's where design similarities usually end. Some

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air knives incorporate a protruding leading-edge design that directs the air flow out of the knife in a straight stream, producing an air stream that retains its integrity better than other air knives. This design takes advantage of the Coanda effect and air entrainment to generate a uniform and constant air stream.

The Coanda effect induces the supplied air to attach itself to the surface of the air knife and helps maintain the integrity of the air stream further downstream, creating a condition conducive to entraining ambient air to increase the total volume of air. The result of this leading-edge design is a uniform, high-volume, constant air stream along the entire length of the knife, and elimination of the spotting and blotching problems associated with some air knives. Another advantage is that the leading edge acts as a visual guide for positioning the air stream, pointing out the direction of the flow to ensure maximum target coverage.

### A Bit about Blowers



Similar to air knives, there are different types of blowers. Performance and maintenance requirements vary considerably, so be sure to research alternatives carefully. Regenerative blowers are often recommended to supply air knives due to their minimal maintenance requirements and greater operating efficiency. More specifically, the dynamic operating principle recycles a certain amount of air, enabling regenerative blowers to provide performance comparable to many multi-stage or positive-displacement blowers.

### Amplify Intensity & Efficiency

When using compressed air, a variable air amplifier is an option to reduce costs. Air amplifiers produce a constant, high-velocity air stream for very targeted drying and blow-off applications. Efficiency is maximized because additional free air is pulled through the unit, along with the compressed air.

Commonly used for spot drying, blow-off and exhaust operations, variable air amplifiers are ideally suited to robotic applications as well, typically covering 3/4 to 4 inches (19.1 to 101.6 mm) at a distance of 6 inches (152.4 mm). These amplifiers often require up to 90 percent less compressed air than open pipes and 60 percent less than air nozzles.

### Maximum Efficiency in Small Areas

When space is limited and the process cannot tolerate any temperature increases, low-flow air knives and compressed air are promising options as they can deliver a high-velocity, uniform air flow across the entire length of the knife. Drying and blow-off are fast and efficient, while minimal air is used. Compared to a 3-inch (8-cm) pipe with three drilled holes, a 3-inch (8-cm) low-flow air knife uses approximately 92 percent less air.

Another appealing attribute of low-flow air knives is the noise level, which falls under 70 dB(A)—and in many applications—even lower than many compressed air options. Designed for small areas, these air knives are typically mounted close to the target as the maximum knife length (or combined length of all knives) is limited to less than 2 feet (61 cm). Moreover, applications that only require one or two air knives can experience significant operating cost reductions by using low-flow models.

### Air Nozzles: A Better Direction

Air nozzles convert a low-pressure volume of compressed air into a targeted high-velocity concentrated air stream, flat fan or curtain of high-impact air. Ideal for use in many applications, air nozzles come in a variety of types, capacities, sizes and materials. They are also widely used for moving materials, and cleaning, drying and cooling parts. The high impact provided by these nozzles ensures effective drying and blow-off, even for round or oddly shaped products.

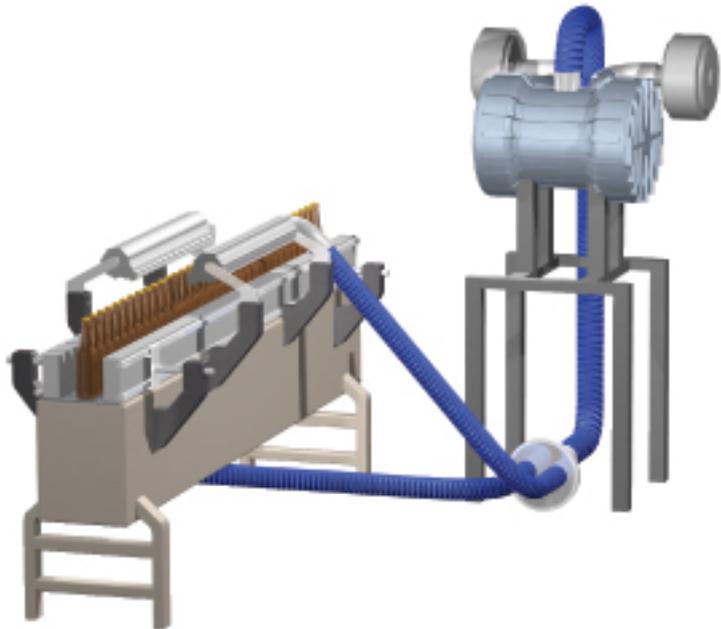
The benefits air nozzles bring to every operation include a significant reduction in compressed air consumption compared to open pipes, up to a 60 percent reduction in perceived noise levels, depending on initial air pressure, improved safety (the design of many air nozzles prevents dead-ending should the nozzle accidentally be placed against a flat surface, for example) and more complete drying, even in cracks and crevices.

### Key Selection Considerations

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Most drying and blow-off operations can benefit from the use of air nozzles. But before you can select the nozzle best suited to your operation, you need to understand the following:

Capacity, air pressure and how the nozzle is positioned all impact noise. Higher flow rates and pressures generally increase noise levels. Similarly, obstructions in the nozzle's path or spraying against objects also boost sound levels.

Effective spray coverage is the width of the spray pattern for a flat-fan air nozzle, which comprises a minimum spray force measurement. This coverage can be used as a guide for spacing nozzles. Effective coverage generally increases as distance from the nozzle increases.

Lineal impact indicates relative force per unit of distance across the spray width. Flat spray patterns have fairly uniform impact distribution across the effective spray coverage. Spacing of nozzles in a header, according to the effective spray coverage, provides consistent lineal impact across the entire target surface.

Maximum specific impact is a direct indication of spray intensity applied to a surface. It provides maximum force per unit of area information, which can be used to compare spray effectiveness under various conditions.

Both lineal and specific impact increase with pressure.

When capacities are the same, a nozzle with a narrower coverage has greater impact than one with a wider coverage.

To minimize air consumption and reduce noise, specify the lowest-flow nozzle.

To reduce noise caused by air impacting its target, increase the distance between the nozzle and the target when possible.

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To reduce the number of nozzles required, position nozzles to swipe sideways across a moving target at a comparatively shallow angle.

When creating an air curtain, place nozzles up to 12 inches (305 mm) apart.

When using air nozzles for cleaning, angle the nozzles 15° to 45° to ensure contaminant removal.

These guidelines can help you with the specification process, but you should consult the experts for additional information. Any plant with a drying or blow-off operation can benefit from an evaluation to determine the potential savings and efficiency gains of making changes to its systems. Certainly, if open pipes are currently used, reductions in compressed air consumption are possible and quickly offset the cost of any new equipment.

If air nozzles are already in use, evaluating alternatives, such as variable air amplifiers, low-flow air knives or air knife/blower packages, is a good idea to see if further savings can be realized. Find a manufacturer of air products willing to work with you to provide an objective assessment of your operations. The vendor should offer a broad product line, have a proven track record with applications similar to yours and be willing to provide references.

*For more information, please email Barber via [jon.barber@spray.com](mailto:jon.barber@spray.com) or visit [www.spray.com](http://www.spray.com) [1].*

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