PERFECT A·S·S·I·S·T

by Robert Farrell, owner and president, Farrell MarCom LLC

Laser cutting assist gases: Is compressed air the right choice?

Nearly all fabricators are familiar with assist gases. Although nitrogen and oxygen are the most popular of these gases, it's important to mention that compressed air is gaining in popularity.

So how does a fabricator know what assist gas is the best choice for its operations? A good place to start is by talking to the early pioneers of air-assist cutting, such as laser manufacturer Cincinnati Inc. (CI). The company began researching and developing the process in 1998. To provide more information, CI's Matt Garbarino, director of marketing communications, and Drew Schneider, product applications manager, explain how the various assist gas options differ and the applications where compressed air is appropriate.

To start, can you briefly explain the purpose of assist gases in laser cutting?

Schneider: Neither fiber nor CO_2 lasers rely solely on a beam of light for cutting metal. Rather, the process utilizes an assist gas. Injected at the nozzle, an assist gas releases energy and helps transfer heat more intensively and effectively than the beam alone. More specifically, oxygen initiates a chemical reaction known as an exothermic reaction while nitrogen creates an endothermic reaction. Air is a combination of both.

So nitrogen, oxygen and compressed air can all be used as an assist gas?

Garbarino: Yes, all three are common assist gases. Initially, oxygen was the most popular gas for laser cutting. Later, it was learned that nitrogen produced a cooler cut that delivered cleaner edges – perfect for applications where edge →

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Matt Garbarino, director of marketing communications, Cincinnati Inc.

quality and aesthetics were critical. Today, nitrogen remains the most widely used gas for laser cutting, although many are finding compressed air to be a better alternative.

If nitrogen provides the cleanest cuts, why use anything else?

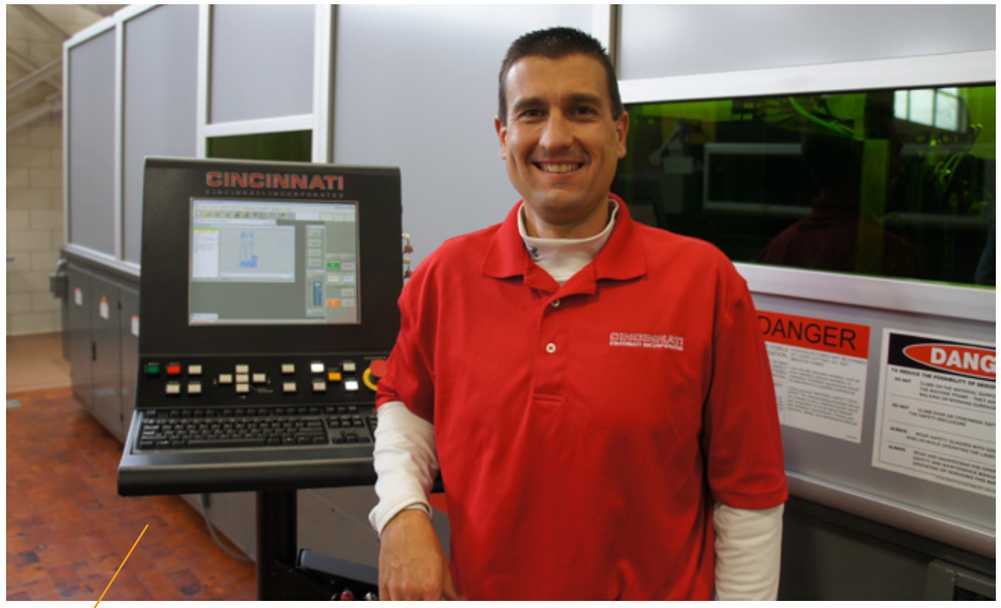
Garbarino: Time and cost are two big reasons for substituting compressed air for nitrogen. Compressed air is less expensive than nitrogen and oxygen, and it also offers faster cutting and, therefore, increased throughput.

How do assist gases compare in terms of cost?

Schneider: In some instances, the cost of the gas alone can run as high as 90 percent of the total operating cost. Compressed air is considerably less expensive than nitrogen and oxygen, but more than the initial purchase price, the long-term savings are immense. One customer reported that compressed air allows them to run machines at less than $4 per hour. This equates to about a 90 percent savings over a CO_2 laser and about 75 percent less cost than using nitrogen on the same machine.

Does using a diluted gas have a negative impact on machine performance?

Garbarino: Not at all. Remember, compressed air is approximately 80 percent nitrogen. The goal is to utilize this high concentration of nitrogen while at the same time leveraging the cost-saving benefits of substituting slightly more diluted gas. →



Drew Schneider, product applications manager at Cincinnati Inc.

Matt Garbarino, director of marketing communications at Cincinnati Inc.

Is air-assist cutting a new approach?

Schneider: Air-assist cutting has been around for nearly 20 years, and over that period, its use has steadily grown. When compressed air was first introduced for use with CO_2 lasers, mode quality was a major limitation. However, this has improved significantly, and today, compressed air is efficient and popular for cutting a variety of materials. A growing number of fabricators are using air to laser cut steel, stainless steel and aluminum.

You mentioned different types of materials. Is thickness a factor for using compressed air?

Schneider: We, along with many of our customers, have run cutting tests on the full range of material types and thickness. However, in the mild steel range of 1/4 in. and thinner, compressed air is roughly 3 percent faster than nitrogen. In the stainless steel range, from 3/4 in. down to 20 gauge, compressed air is about 22 percent faster. In the aluminum range, from 0.190 in. down to 0.032 in., compressed air is approximately 14 percent faster.

Compared to the clean edges associated with nitrogen and oxygen, how much quality is sacrificed when using compressed air?

Garbarino: Generally speaking, compressed air produces a laser-cut edge quality that is at least comparable to parts cut with oxygen or →

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nitrogen. If we were to call the nitrogen cut edge quality a 10, then the edge quality resulting from an air-assist cut would be about an eight. Air-assist edge quality is more than satisfactory for most powder coatings to adhere, eliminating the need for secondary cleaning operations.

Is air-assist edge quality acceptable for welding applications?

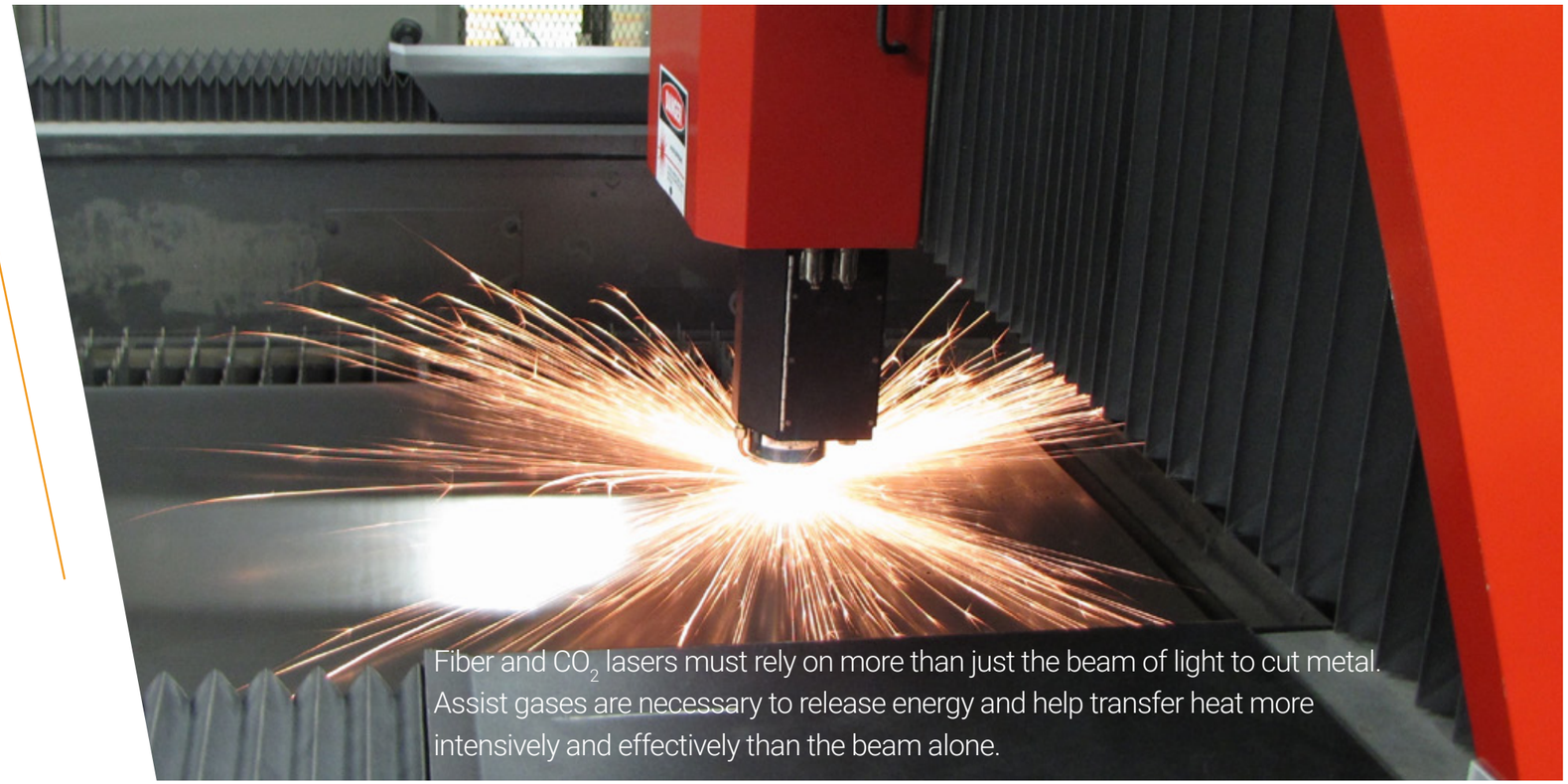
Schneider: Some of our customers are using air for welding applications. What their success is, I don't know. We're beginning to run some tests in this area and should have more information soon.

When is it not the best option to use compressed air?

Schneider: There are clearly times when nitrogen or oxygen is a better choice. Nitrogen produces cooler cuts and is an inert gas, meaning that there is no chemical reaction when cutting stainless steel. This prevents oxidization from occurring, leaving a clean, shiny edge that eliminates secondary descaling operations. Fabricators that serve customers throughout the medical, food processing and aerospace industries, for example, should continue their use of nitrogen. Additionally, some cosmetic parts cannot show any blemish whatsoever – again, these applications would not be the best candidates for air-assist cutting.

Can existing laser cutters be adapted for compressed air?

Garbarino: Yes, the process is relatively easy and cost-effective. Even most existing older model lasers can be retrofitted to cut with →



Fiber and CO_2 lasers must rely on more than just the beam of light to cut metal. Assist gases are necessary to release energy and help transfer heat more intensively and effectively than the beam alone.

compressed air. Although there is an initial investment for the proper equipment, tapping compressed air as an assist gas will generate sustainable cost and time savings while boosting productivity.

What's your advice to those considering compressed air?

Schneider: The bottom line is that when edge quality is absolutely critical, nitrogen or oxygen remains the best option. However, compressed air is an efficient and cost-effective alternative for many. It's generally used to cut thin material and most stainless parts, especially those used in assemblies. But, it's key to take a look at the parts being cut and investigate how much is spent on the assist gas. Finally, it's recommend to run some tests and determine the best gas for a particular application. ●

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