CLEARING THE AIR

by Jeremiah Wann, president and CEO, Imperial Systems Inc.

When fabricators understand the ins and outs of downdraft table dust collection systems, employee health and safety improve

For many metalworking applications, a plasma cutter table is a key piece of equipment. This essential tool, however, generates high heat and a lot of fine metal particles. It also produces slag, metal fragments and sparks that can ignite metal dust.

To manage the fumes produced from the plasma cutting process, a downdraft table is an efficient and effective solution. But, it also needs to be attached to a correctly designed dust collection system for it to do its job. A poorly designed system may fail to capture all of the fumes, requiring oversized fans to pull air from a surface that's too large for the system.

Capturing fumes from plasma cutting tables is important for health, safety and compliance issues, and the most efficient way capture fumes is with a downdraft table with multiple zones.

For industrial cutting tables, separating the airflow into zones greatly improves efficiency. To make the most of a plasma cutting table, it's important to understand the ins and outs of the systems that keep employees safe while operating these essential pieces of equipment.

DOWNDRAFT TABLES

For plasma cutting, the surface of the table is a series of metal bars. Sheets of metal are placed on the surface and the cutting head moves over the metal, generating fumes, slag and scraps as it cuts. After the slag and solid material fall through, they are collected and removed from the space under the table. Fine particulates in the form of metal smoke and fumes, however, rise up from the cutting surface.

To keep the fumes from escaping into the air, a dust collector on a downdraft table constantly pulls air down through the table through filters to remove the metal fume particles. Figure 1 shows a plasma cutter running with the dust collector turned off, while Figure 2 shows the ▸



Figure 1. A plasma cutter running with the dust collector turned off.

same cutter with the dust collector turned back on.

To remove the fumes properly, the fan in the dust collector system must be strong enough to pull the right amount of air, which is measured in cubic feet per minute (CFM). Because this airflow is produced by fans, a system that requires a high amount of air, unsurprisingly, requires large fans.

A small downdraft table less than about 5 ft. by 10 ft., can sometimes be handled by a basic dust collector system where one duct pulls air from the whole space under the cutting surface. For tables larger than this, having a fan powerful enough to move that much air at once becomes very inefficient and expensive. It's likely that the downdraft across the entire table surface would not be strong enough to pull in fumes.

IN THE ZONE

Instead of having huge fans and a huge dust collector to handle all that airflow, most industrial cutting tables are zoned. As shown in Figure 3, the space under the cutting surface is separated into zones down the length of the table. Ducts are run to each zone, and can run along the side of the table or through the center. Both setups work, although some companies recommend the central ductwork because it distributes the downdraft more evenly.

As the cutting head moves over the metal being cut, it is only generating fumes above one zone at a time. Because of this, the dust collection system only needs to pull air from that zone at that time. For all of the other zones, a damper closes off the airflow. The damper for the active zone opens so air and fumes can be pulled from the exact area where the cutting head is operating. The size of each zone depends on the size of the table, especially the width.

In the AKS Cutting Systems plasma cutting table seen in Figure 4, the ducts are in the center of each zone. The pneumatic controls on each damper are automatically activated to open the duct when the cutting head is over the respective zone, and close it when the cutting head moves on. Most cutting tables use a similar system, although ▸

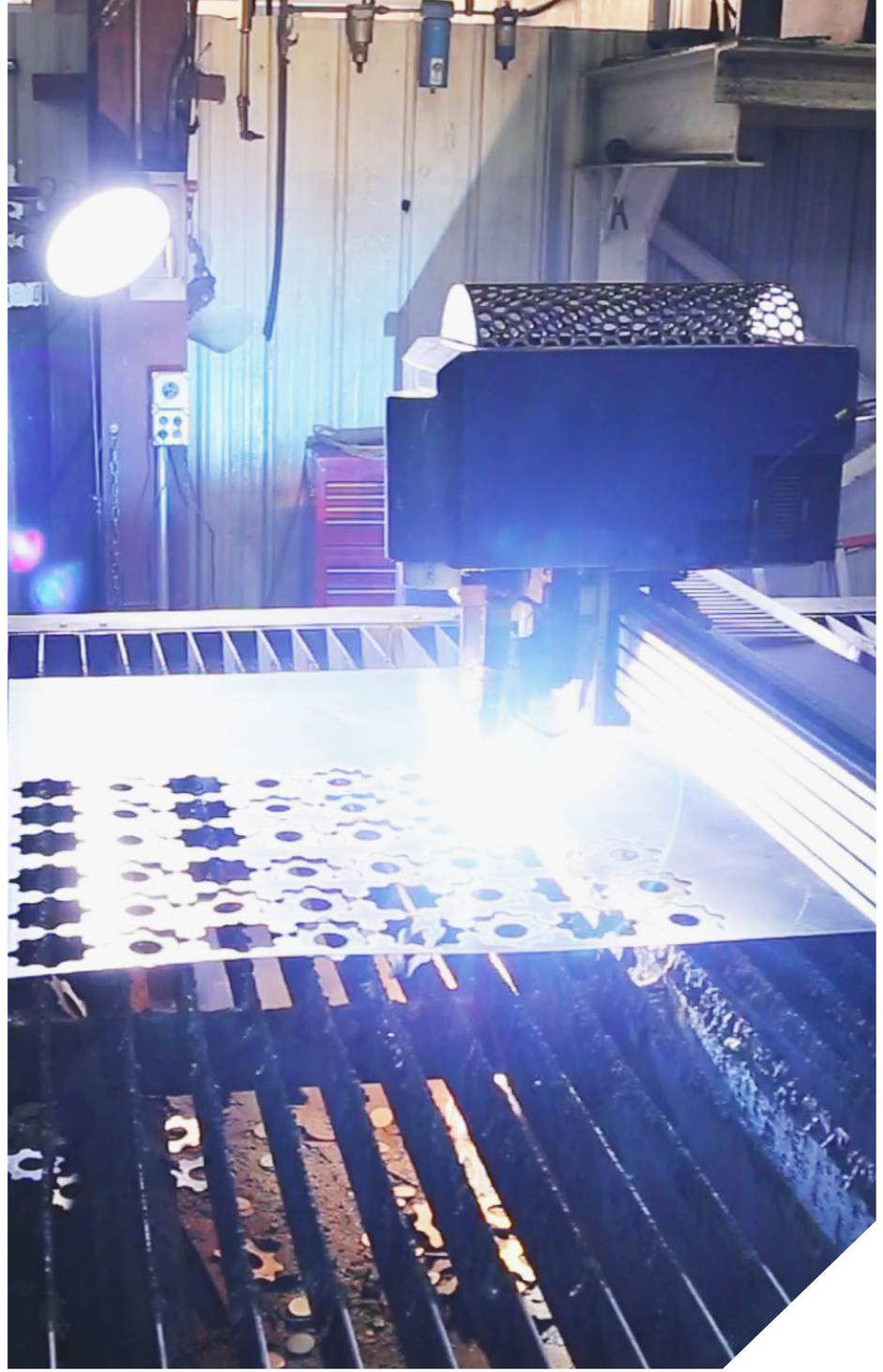


Figure 2. A plasma cutter running with the dust collector turned on.

Figure 3. To efficiently handle high airflow, the space under the cutting surface of most industrial cutting tables is separated into zones down the length of the table.



To manage the fumes produced from the plasma cutting process, a downdraft table is an efficient and effective solution. But, it also needs to be attached to a correctly designed dust collection system for it to do its job.

the control mechanisms to open and close the dampers may be different. The location and shape of the dropout space for slag and debris may also be different.

For these zones to operate efficiently, they need to be connected to a dust collection system. This system can be only for the downdraft table, or it can have other points of capture elsewhere in the shop. In many workplaces, the dust collector handles the downdraft table and also has several source capture points, such as hoods or fume arms. The collector will be designed for each company's individual needs.

FILTER FACTS

Matching the dust collector to the downdraft table means calculating the CFM of air that needs to be pulled through the active zone. This determines how powerful the fan needs to be. It also determines how many square feet of filter media are needed in the collector, referred to as the air to cloth ratio. When there's not enough filter media surface area, the filter media can become clogged with dust.

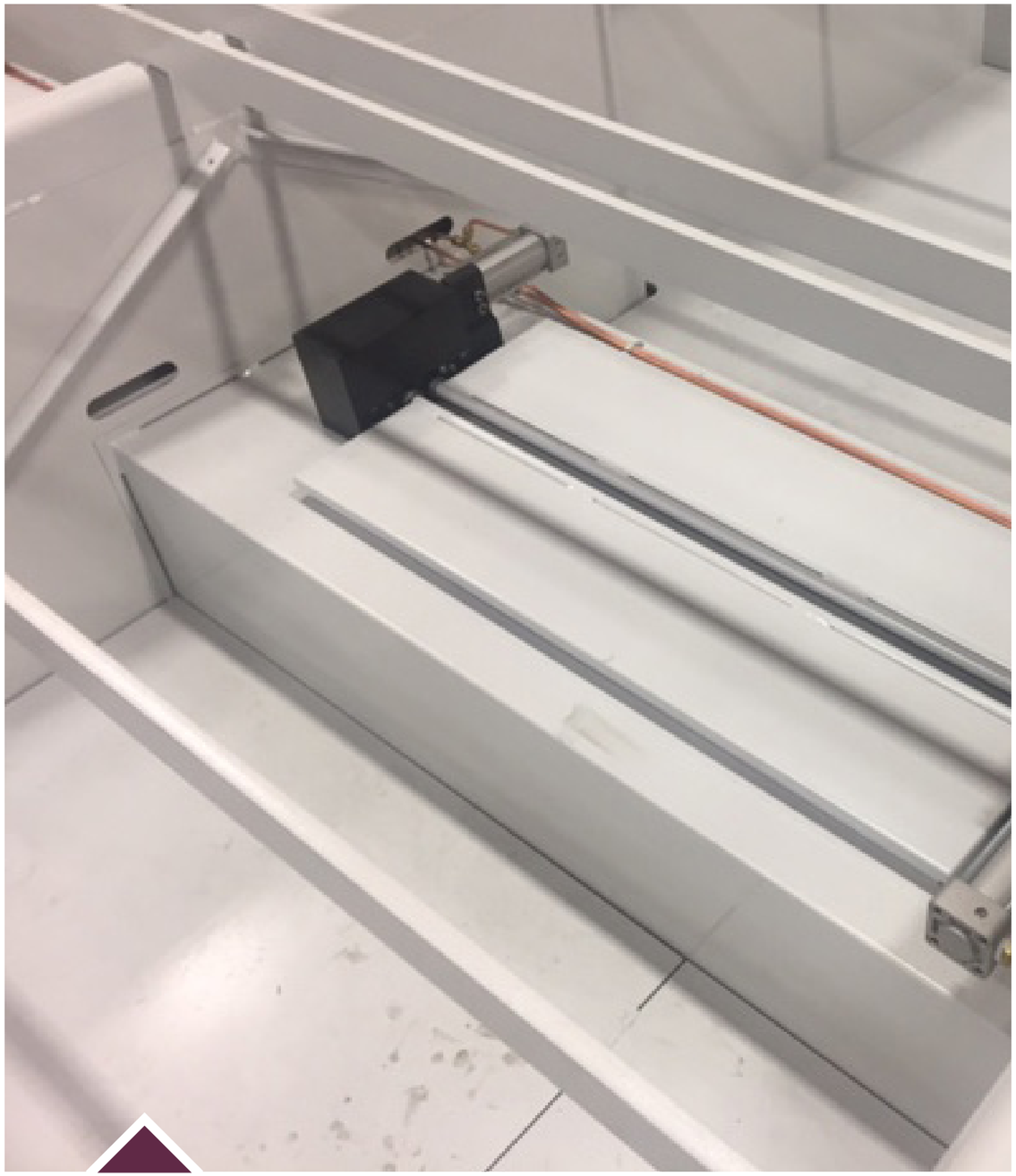


Figure 4. In many plasma cutting tables, such as the one seen here, ducts are placed in the center of each zone.

Many manufacturers of plasma cutting tables, including AKS Cutting Systems, choose a cartridge filter dust collector, such as the Imperial Systems' Cmaxx, to partner with their cutting tables. Cartridges pack a lot of surface area into a small space. They're cleaned by pulses of compressed air, which keeps them working well. While some baghouses also use compressed air to clean filters, a baghouse is not nearly as compact or easy to work with as a cartridge filter system.

Another advantage of a cartridge filter system for downdraft tables is the high efficiency of cartridge filters. Nanofiber filters are rated at MERV 15, the recommended efficiency for capturing fine metal particles created by cutting and welding. Filters with a lower MERV rating many not be suitable for the sub-micron particles created by these processes.

It is strongly recommended that all filters in these types of dust collectors be fire-retardant. With the heat and sparks generated by the plasma cutting table, there is always a possibility of a spark reaching the filters. To prevent dangerous situations from happening, a spark trap will prevent most sparks from getting through, but if one does, the fire-retardant filters will not catch on fire.

Capturing fumes from plasma cutting tables is important for health, safety and compliance issues, and the most efficient way to capture fumes is with a downdraft table with multiple zones. Because the zones allow the dust collection system to work only where it is needed, fabricators and manufacturers will save on energy expenses and see improved efficiency. To garner those benefits, the dust collection system must be sized correctly for the size of the cutting table. ■

AKS CUTTING SYSTEMS

IMPERIAL SYSTEMS INC.