Safety

Dry Ice Blasting: Reducing the Risks of a Cleaner Machine-Cleaning Method

James Langford | May 04, 2023

Using dry ice blasting to clean machining equipment can meet all three traditional requirements for a successful business practice: It's faster, better and cheaper than the alternatives.

It's even safer, in some respects, though it comes with some unique risks.

Using the technique without appropriate precautions can cause health issues from frostbite to difficulty breathing and even suffocation, experts and regulators warn.

Prepping for those hazards in advance, with safety policies and appropriate personal protective equipment, is vital for businesses trying to maximize the benefit of a technique that can help them compete more effectively while countering the challenges of high inflation and a shrinking workforce.

How Dry Ice Blasting Works

The way dry ice blasting works is simple, in theory. Like sandblasting and bead blasting, it uses pressurized air to direct a cleaning medium (in this case, carbon dioxide from pellets or microparticles) toward equipment with accumulated grime.

What's unique is that the dry ice particles vaporize on contact, leaving behind none of the secondary waste created by sand or beads, thanks to carbon dioxide's unique chemical properties.

When cooled to a temperature of -109 degrees Fahrenheit (-78.5 Celsius), the gas turns into a solid, a process referred to as sublimation because it avoids the liquid state altogether.

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The same holds true in reverse. As a result, the temperature spike fueled by friction when frozen carbon dioxide particles strike a solid during dry ice blasting causes them to revert to their initial gaseous state.

"The only remaining waste products are the dislodged contaminants, which can be vacuumed or swept away," explains Cold Jet, a pioneer in dry ice technology. Cold Jet first used the procedure to remove paint from airplanes in the 1970s and has been developing it commercially since ***the late 1980s.***

The company says dry ice blasting reduces costs because it can be done by one person rather than a crew—and in minutes, in some cases, rather than hours. That's a major benefit as manufacturers grapple with a labor shortage of as many as 2.1 million workers by 2030.

Because it doesn't require water or create extra waste, dry ice blasting can be used when equipment is hot and online, Cold Jet says, eliminating the need to shut down machinery and take it apart.

Dry ice is also nonabrasive, so unlike scraping or scrubbing with chemical solvents, it doesn't risk corroding equipment or wearing it down, Cold Jet says.

The process is suitable for industries from aerospace to aviation, automotive and semiconductors. Since there's no secondary waste, workers don't have to worry about residues mixing with contaminants and becoming toxic, a particular benefit in food production.

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Those advantages illustrate why manufacturing facilities are supporting growth of 8 percent a year in the dry ice market, which researcher Future Market Insights predicts will expand to ***$300 million by 2032***.

As the market swells, however, it's important to remember that any work with carbon dioxide requires care.

The gas is colorless, odorless and tasteless. In high concentrations, it can cause suffocation and death, and in lower ones, lead to symptoms from headaches to increased heartbeat, dizziness and shaking, according to the ***U.S. Occupational Safety and Health Administration***, the nation's top workplace safety regulator.

Any carbon dioxide concentration above 0.5 percent in the atmosphere is dangerous, Florida International University says in a fact sheet detailing precautions for employees working with dry ice.

Dry Ice Safety Guidelines

"Leave [an] area containing dry ice if you start to pant and [breathe] quickly, develop a headache or your fingernails or lips start to turn blue," the university warns. "These are signs that you have breathed in too much carbon dioxide and not enough oxygen."

Cold Jet, meanwhile, recommends a variety of safety precautions for customers. Among them:

- Ensure effective ventilation in areas where dry ice blasting is used.
- Monitor carbon dioxide levels so they don't exceed regulatory limits. In the U.S., OSHA caps exposure for workers at 5,000 parts per million averaged over an eight-hour workday and limits acute exposure to 30,000 parts per million for 15 minutes.
- Place warning signs at entrances to areas where carbon dioxide may accumulate.
- Wear appropriate PPE, including:
    - A self-contained breathing apparatus when in rooms with high levels of carbon dioxide
    - Gloves when handling dry ice; tongs may be used as well
    - Safety eyewear
- Do not use tightly sealed containers to store or transport dry ice. Pressure created by evaporation could burst the container, Cold Jet notes.

What safety precautions does your business take for dry ice blasting? Tell us in the comments below.

