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'AIR' ON THE SIDE OF CAUTION

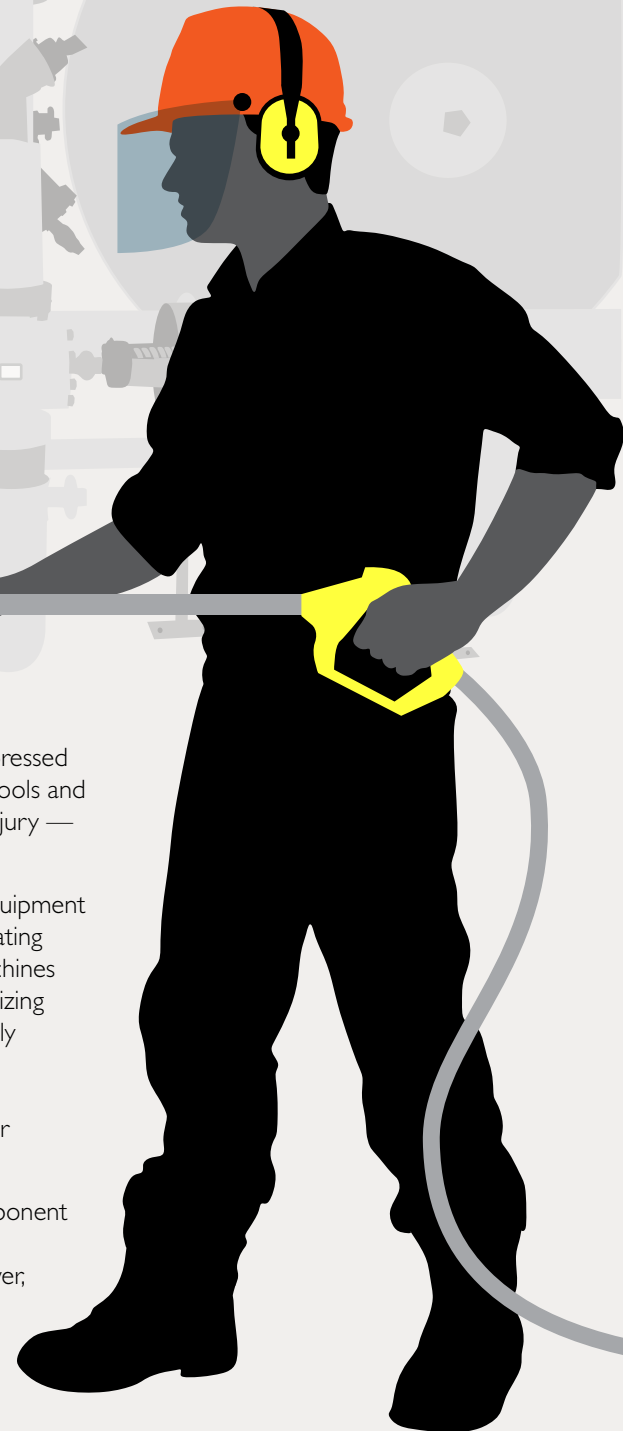
Stay Safe with OSHA-Compliant Safety Air Guns

Introduction

Cleaning errant chips and debris off equipment, parts and surfaces using compressed air is an important aspect of industrial housekeeping. But without the proper tools and precautions, cleaning with compressed air can put workers at serious risk of injury — and employers at risk of OSHA citations and penalties.

Powered by compressed air, safety air guns minimize the danger of cleaning equipment in hazardous or hard-to-reach areas. They are ideal for cleaning conveyors, rotating equipment, cutting tools, ovens, electrical equipment and other dangerous machines (even as those machines continue to run), from a safe distance, thereby minimizing the risk of operator injury. In addition, cleaning with compressed air is inherently much faster than — and often a preferable alternative to — using a vacuum. And because today's advanced safety air guns are designed to be comfortable and ergonomic, they provide hours of fatigue-free operation and boost worker productivity.

When properly deployed and operated, safety air guns are an important component of a comprehensive workplace safety and health program, helping employers minimize accidents and injuries while complying with OSHA standards. However, the key phrase is, "when used properly." This whitepaper will discuss some of the issues that stand in the way of operating air guns in a safe and OSHA-compliant manner, along with strategies for reducing accidents and injuries



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through the proper use and selection of safety air guns.

Cleaning with Compressed Air, and the OSHA Standards

There are three key safety issues related to cleaning with compressed air in the workplace. These issues, and the OSHA standards that govern them, are:

- **Output Pressure** (1910.242[b]) – Air guns and other pneumatic equipment require high-pressure compressed air to operate effectively, which is why most factory air compressors deliver between 80 psi (pounds per square inch) and 120 psi. However, if an air-gun nozzle is “dead-ended” – the tip of the air gun is blocked by an object or human skin – OSHA mandates that the static pressure at the point of blockage cannot exceed 30 psi. That's because at high operating pressures, compressed air forced through the skin into body tissues can cause an air embolism (air bubbles in the blood stream), which can be fatal if it reaches the heart, lungs or brain.
- **Chip-Guarding** (1910.242[b]) – Using an air gun to clean parts or equipment can stir up loose particles or chips that may fly back into the operator's eyes, face or skin. OSHA requires employers to protect air-gun operators and nearby co-workers by implementing effective chip-guarding methods and providing Personal Protective Equipment (PPE) such as protective eyewear and gloves.
- **Noise** (1910.95[a]) – Prolonged exposure to excessive workplace noise can put workers at risk of permanent hearing damage. OSHA requires employers to implement hearing-conservation programs that keep the volume and duration of noise below permissible exposure limits. Although this OSHA standard does not dictate specific requirements for air guns, the use of high-noise air guns can contribute to excessive noise in the workplace.

Let's take a closer look at each safety issue, focusing on some easy ways to comply with the corresponding OSHA standards.

Output Pressure

In 29 CFR 1910.242(b), OSHA states that compressed air used for cleaning must be “reduced to less than 30 psi, and then only with effective chip-guarding and personal protective equipment.” To clarify further, OSHA also issued a directive (STD 01-13-001) explaining the phrase “reduce to less than 30 psi,” noting that it refers to “the downstream pressure of the air at the nozzle.”

Nevertheless, safety and plant managers often misinterpret this OSHA standard, concluding that the only way to comply is to reduce the air pressure delivered by the air compressor to 30 psi – thus degrading the performance of safety air guns and other pneumatic tools.

“Many people misinterpret this standard and reduce their plant air compressor output to less than 30 psi,” says Tom Tremblay, President of Chicopee, Mass.-based Guardair Corporation, the largest US manufacturer of OSHA-compliant safety air guns. “But the fact is, to effectively run pneumatic equipment, high-pressure compressed air is required.”

The proper approach is to use a safety air gun with a nozzle engineered to operate at 80 psi to 120 psi during normal operation – but also designed to limit the static pressure below 30 psi should the tip become blocked. This can be accomplished with a nozzle designed to divert air away from the main orifice should the tip becomes blocked, or with a nozzle designed to prevent the tip from being blocked.

Safety air guns with these safeguards enable facilities to comply with the OSHA standard without reducing plant air pressure.



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Chip-Guarding

In 29 CFR 1910.242(b), OSHA calls for effective chip-guarding measures to prevent loose debris from flying back into the operator's eyes, face or skin when using a safety air gun in close quarters. The OSHA directive on output pressure (STD 01-13-001) also provides clarification on chip-guarding, explaining that OSHA defines "effective chip-guarding" as "any method or equipment [that] will prevent a chip or particle (of whatever size) from being blown into the eyes or unbroken skin of the operator or other workers."

One effective way to protect workers from flying particles and satisfy OSHA requirements is to use a safety air gun featuring a nozzle designed to divert a portion of the main airflow through slots around its periphery to form a protective air cone. This air cone helps prevent chips and other loose debris from flying back toward the operator, thereby satisfying OSHA's requirements for chip-guarding. Should the nozzle tip become blocked, this design also limits the output pressure to less than 30 psi by diverting the primary airflow through the slots.

While using a protective-air-cone nozzle is an acceptable strategy for complying with OSHA's requirements for chip-guarding, the agency notes that it also may be necessary to install separate baffles, barriers or screens to protect other nearby workers exposed to flying chips or particles. The level of protection required depends on the application and the work environment.

SEVEN SAFETY TIPS FOR SAFETY AIR GUNS

1 Identify and remove homemade air guns.

Homemade and modified air guns are dangerous, inefficient and lack safety features designed to meet OSHA standards. Use a pressure gauge to verify non-compliant guns, then disconnect and properly dispose of them.

2 Only use OSHA-compliant safety air guns.

Safety air guns incorporate features that limit the static air pressure below 30 psi at the point of blockage, per the OSHA standard.

3 Choose the optimal safety air gun for the application.

When it comes to selecting a safety air gun, one size does not fit all. Selecting the right one for the job will maximize the performance of the device as well as operator comfort. Here are some of the key factors to think about:

- Is it a close-in or far-away application?
- Is high thrust needed to remove debris or will low thrust work?
- What size air compressor is available?
- Are additional safety features needed? (e.g., chip-flyback protection, noise-limiting nozzle design, etc.)

4 Understand the three key OSHA standards pertaining to the use of safety air guns.

- Output Pressure — 1910.242(b) and STD 01-13-001
- Chip-Guarding — 1910.242(b) and STD 01-13-001
- Noise — 1910.95(a)

5 Never use a safety air gun for self-cleaning.

Using an air gun to clean off clothes or skin should never be allowed, as the compressed air can enter the bloodstream and cause serious internal injuries. Although there's no specific language forbidding this practice in the OSHA standards, the agency addressed the issue in a 1994 letter of interpretation, asserting that employees should not be allowed "to use compressed air for cleaning themselves or their clothing," citing the risk of injury.

6 Consider ergonomics.

Today's top-performing safety air guns boast ergonomic features such as contoured grips and palm-switch triggers, which help minimize hand fatigue and discomfort.

7 Think about safety before work starts.

Before working with safety air guns:

- Ensure that workers are wearing adequate Personal Protective Equipment (PPE).
- Check the components of the compressed-air system and verify that they're in working order.
- Make sure that connectors are compatible, properly fitting and tight.
- Inspect the gun and verify that no debris is lodged in the barrel.
- De-pressurize the compressed air line before connecting the safety air gun, and re-pressurize after connecting.
- Look at the work area and determine where the debris will go during cleaning. Always blow debris towards a safe direction.



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Noise

The negative effects of excessive noise are cumulative, which is why OSHA has established permissible limits based on the level of workplace noise and exposure time. The use of air guns can contribute to excessive noise in the workplace by raising both the sound level and the duration of the exposure. However, because some safety air guns feature noise-limiting technology, their use can help employers comply with 29 CFR 1910.95 – the OSHA standard for occupational noise exposure.



A CLOSER LOOK AT OSHA-COMPLIANT AIR-GUN NOZZLES

In the event that an air-gun nozzle is dead-ended, OSHA mandates that the static pressure at the point of blockage cannot exceed 30 psi. Guardair Corporation, the largest U.S. manufacturer of OSHA-compliant safety air guns, employs active and passive nozzle design in its air guns to achieve compliance with the OSHA standard.

Nozzles that use passive design rely on their design configuration to keep the static pressure below 30 psi, while nozzles that use active design include a safety mechanism such as a spring or valve that activates when the pressure gets too high. Below are three examples:

	Unblocked State	Blocked State
<p>Venturi nozzle (passive design)</p> <p>During normal operation, high-pressure compressed air enters the nozzle and joins ambient air drawn in through the venturi side ports, creating enhanced thrust exiting the nozzle. In the event that the nozzle tip is blocked, 100% of the incoming compressed air is diverted through the dual venturi side ports. By design, the nozzle is engineered to limit static pressure at the point of blockage to less than 30 psi, thereby meeting the OSHA standard for output pressure.</p>		
<p>Whisper Jet nozzle (passive design)</p> <p>High-pressure compressed air enters the nozzle and is directed through a series of narrow slots positioned 360 degrees around the periphery of the solid conical nozzle tip. The compressed air exiting these slots produces high-speed jets that adhere to the conical nozzle tip and draw in surrounding ambient air. The result is high thrust at very low noise levels, thereby aiding in compliance with OSHA's noise-exposure standard. By design, the solid conical nozzle tip prevents direct blockage of the slots, meeting the OSHA standard on output pressure as well.</p>		
<p>Air Shield nozzle (active design)</p> <p>During normal operation, high-pressure compressed air enters the nozzle and a portion is diverted through slots positioned 360 degrees around its periphery, forming a protective air cone. This air cone shields the operator from "chip fly-back," thereby meeting the OSHA standard on chip-guarding. In the event that the nozzle tip is blocked, a spring mechanism diverts 100% of the incoming compressed air through the slots. By design, the nozzle is engineered to limit static pressure at the point of blockage to less than 30 psi, thereby meeting the OSHA standard for output pressure as well.</p>		



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Homemade Hazards

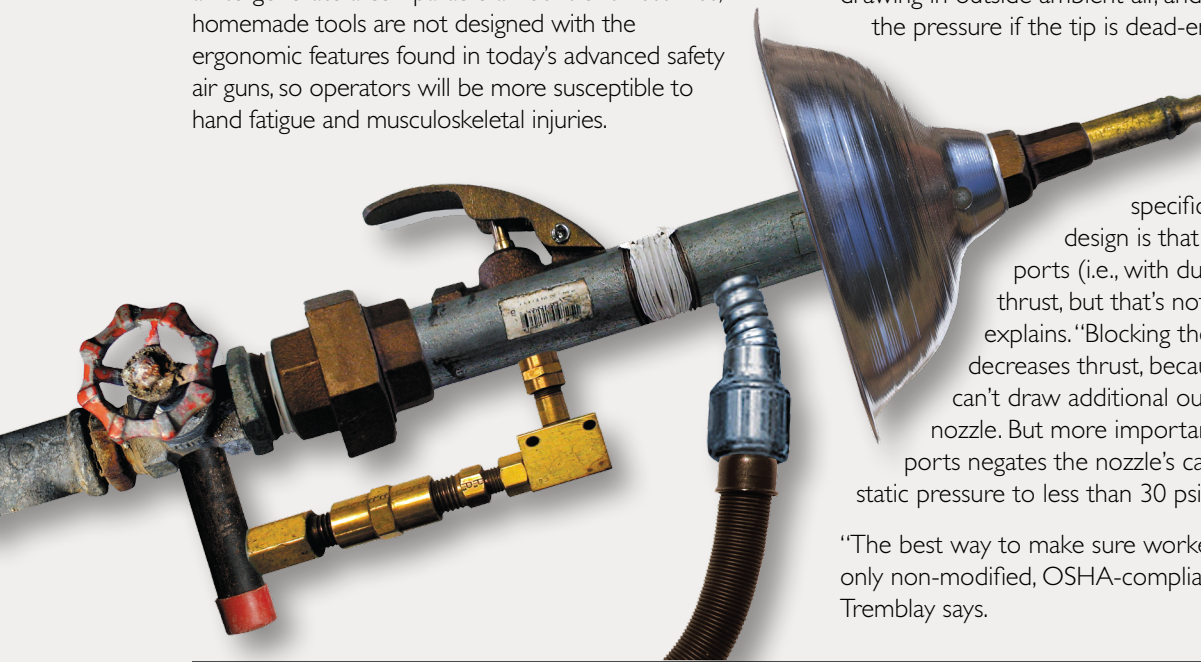
There's another serious safety issue concerning the use of air guns in the workplace. This arises when workers fabricate homemade "blowguns" or "air lances" under the illusion that doing so saves time or money. Homemade tools lack critical safety features such as output-pressure (30 psi) compliance, or a dead-man trigger designed to protect the operator and nearby co-workers if the device were to be dropped accidentally.

There are several additional factors to keep in mind regarding homemade tools. Using a straight pipe or other type of makeshift blowgun will be far less efficient than using a commercially available safety air gun, as the homemade tool will need significantly more compressed air to generate a comparable amount of thrust. Plus, homemade tools are not designed with the ergonomic features found in today's advanced safety air guns, so operators will be more susceptible to hand fatigue and musculoskeletal injuries.

Equally dangerous is the modification of commercial air guns in an attempt to enhance performance. Modified air guns do not comply with the OSHA standards and will not be as effective as commercially available safety air guns.

"Making such modifications can compromise built-in safeguards and even hurt the device's performance," Tremblay says.

As an example, he points to Guardair safety air guns that feature a venturi nozzle, which has two side ports. These ports serve a dual purpose: They boost thrust (the effective cleaning force produced by an air gun) by drawing in outside ambient air, and they serve to vent the pressure if the tip is dead-ended.



"One myth that's specific to our venturi nozzle design is that blocking the side ports (i.e., with duct tape) will increase thrust, but that's not true," Tremblay explains. "Blocking the venturi ports actually decreases thrust, because the side ports can't draw additional outside air into the nozzle. But more importantly, taping the side ports negates the nozzle's capability to limit the static pressure to less than 30 psi if the tip is blocked."

"The best way to make sure workers are safe is to use only non-modified, OSHA-compliant safety air guns," Tremblay says.

Conclusion

Safety air guns are the fastest, safest and most efficient tool for industrial cleaning with compressed air. However, like any piece of industrial equipment, modifying or misusing a safety air gun can increase the risk of injuries and OSHA violations.

The optimal way to protect workers and meet OSHA standards for output pressure, chip-guarding and noise is to use an OSHA-compliant safety air gun.

