EXAIR® WHITE PAPER

Understanding Compressed Air Safety and Savings

Why is compressed air safety a concern?

Compressed air is commonly referred to as the "fourth utility" because it is very common as a resource within manufacturing, mining and processing environments. Employees or contractors in every industrial company or setting are exposed to compressed air's effects regularly and it should be handled with responsibility and care. The primary dangers from compressed air come from high pressure and noise exposure. Personnel being exposed to compressed air which exits an open line or non-safety nozzle at a higher pressure than 30 PSI risk the air entering the bloodstream and causing air embolism, a serious health risk.

hearing loss is the most commonly recorded occupational illness in manufacturing

Improper use of compressed air commonly exceeds OSHA's noise exposure standards and causes noise induced hearing loss (NIHL). The CDC reports NIHL is one of the most common occupational diseases and the second most self-reported occupational illness or injury. According to the National Association of Manufacturing, there are 12.3 million people working in the manufacturing sector, which accounts for approximately 9% of the U.S. workforce. According to the Bureau of Labor Statistics, occupational hearing loss is the most commonly recordable occupational illness in manufacturing accounting for 1 in 9 recorded illnesses. More than 72% of these occur among workers in manufacturing.

Limiting pressure and noise is effectively done by using products which are purposefully designed to meet these strict OSHA safety standards.

Are there regulations that govern the use of compressed air?

Yes, OSHA has two important standards relevant to compressed air. Standard 29 CFR 1910.242(b) is specific to compressed air use for cleaning and states – "Compressed air shall not be used for cleaning purposes except where reduced to less than 30 p.s.i. and then only with effective

chip guarding and personal protective equipment." OSHA's own interpretation goes on to state, "the downstream pressure of the air at the nozzle (nozzle pressure) or opening of a gun, pipe, cleaning lance, etc., used for cleaning purposes will remain at a pressure level below 30 psi for all static conditions. The requirements for dynamic flow are such that in the case when blockage of the air exit (dead-ending) occurs a static pressure at the main orifice shall not exceed 30 psi".

And because compressed air can be loud and result in hearing loss when it is used through poor nozzles, open tubes and pipe, or home-made blowoffs, their noise exposure standard is important. This standard 29 CFR 1910.95(a) outlines the allowable time a person can be exposed to a specific decibel level as follows:

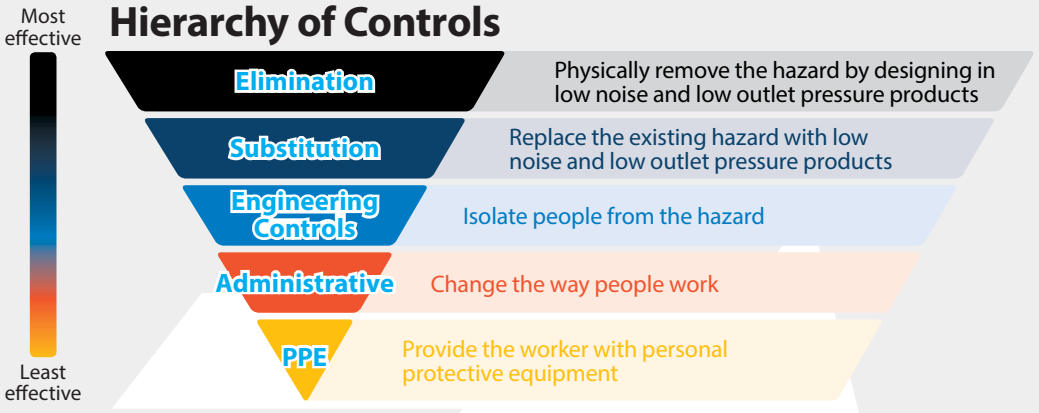
OSHA Maximum Allowable Noise Exposure							
Hours per day (constant noise)	8	7	4	3	2	1	0.5
Sound level dBA	90	91	95	97	100	105	110

OSHA Standard 29 CFR - 1910.95(a)

Limiting pressure and noise is effectively done by using products which are purposefully designed to meet these strict OSHA safety standards. There are many different options for using compressed air within a machine or out on the plant floor but many of them do not take these two important OSHA standards into account. Engineered compressed air products, made for end use compressed air applications, should possess the ability to prevent blockage of the compressed air orifice and keep noise below allowable thresholds. Products to consider are engineered air nozzles, air knives, air amplifiers and safety air guns which are outfitted with an OSHA compliant nozzle. Acceptable air nozzles and other end-use products are designed to prevent blocking of the outlet orifice. They are also manufactured with precision to create a non-turbulent airflow which keeps noise to a minimum.

How can engineers effectively limit pressure and noise?

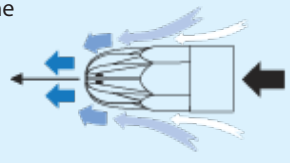
By following the CDC's Hierarchy of Controls, engineers can eliminate loud and unsafe pressure nozzles by first designing with quiet and pressure safe engineered compressed air products like air nozzles, air knives and air amplifiers. Engineers should also take steps to replace existing products with engineered solutions that meet the OSHA standards 29 CFR 1910.242(b) and 29 CFR 1910.95(a).



Elimination and substitution are the most effective methods because they are typically permanent installations and can be achieved with little effort. It can be as simple as adding these products to an existing drawing or adding a compression fitting to an open tube and screwing in a nozzle. Isolating people from the hazard is not always possible in the complex setup of a manufacturing plant. Changing the way people go about doing their job is also a long and complicated process. Personal Protective Equipment (PPE) is too often discarded, modified or forgotten.

How do engineered air nozzles work?

Air Nozzles use the Coanda effect to amplify compressed airflow up to 25 times or more. As illustrated on the right, compressed air (black arrows) is ejected through a series of nozzles on the outer perimeter. As the air travels along the outer wall of the nozzle, surrounding air (blue arrows) is entrained into the stream. The airstream that results is a high volume, high velocity blast of air **at minimal consumption.** The air is always ejected so it can vent safely, **well below OSHA dead end pressure requirements**, should the nozzle end be blocked.



Do they come in different versions?

Engineered compressed air nozzles come in many shapes and sizes, as well as materials. Manufacturers generally separate them by their force values with product lines containing standard force air nozzles and high force air nozzles. Force is also directly related to air use, the more high energy compressed air a nozzle uses, the more force it produces and the more work it can get done. The material of construction makes a significant difference in where the nozzle should be used. Zinc/Aluminum and Brass material is good for general industrial use without the presence of corrosives or extreme temperatures. Stainless steel material will combat corrosion and high temperatures. PEEK thermoplastic and PVDF plastic materials combat chemical environments and also have good temperature ratings. These plastics are also non-marring which makes them good for applications with sensitive surfaces or finishes.

Are there similar, related products?

Yes, related products which possess the OSHA compliant qualities of eliminating dead-end pressure and reducing noise levels include: Air Knives, which produce a laminar sheet of air over a wide area used for cooling, cleaning, drying and blowoff. Air Amplifiers use the Coanda effect to amplify the volume of total air flow delivered to a surface or process. They are very good at venting and exhausting fumes, cooling and drying. Air Wipes provide a 360° blowoff and are used to clean or cool wire, cable, and extruded profiles. The best safety air guns are outfitted with engineered air nozzles so that they possess the same qualities as the nozzles.

Select from the products on the right to learn more

EXAIR.com®


Super Air Amplifiers


Super Air Knives


Super Air Wipes


Safety Air Guns

Money Savings Potential

The other benefit that an engineered compressed air solution provides is the ability to use less of your compressed air. These products are designed to operate as efficiently as possible and reduce the use of costly compressed air. Designing machines and processes, which require compressed air, with engineered compressed air products will result in the most efficient use of air. Retrofitting processes and machines with engineered products can reduce the cost of manufacturing and provide a very quick return-on-investment from the compressed air savings.

For Example: A major North American Bakery has been working on specific legs, one at a time, of their production process to reduce compressed air consumption throughout their plant. This specific example used a home-made compressed air nozzle to de-pan rolls from their baking pans.

They had fabricated their own nozzle by capping off a 3/8" pipe and drilling a 9/64" hole in the cap. Running at 80 PSIG this "nozzle" consumed 25.4 SCFM. When retrofitting the pipe to use an engineered air nozzle the result was 17 SCFM at 80 PSIG, clear savings of 8.4 SCFM. There were ten nozzles used for removing rolls from the pans and it was a two shift per day operation. The following savings calculation is for one production line, in many facilities there will be more, and more opportunities for savings on additional lines.

- Savings = 8.4 SCFM per nozzle (ten total)
  8.4 x 10 = 84 SCFM total
- Two Shifts per day = 960 minutes
  250 working days per year = 240,000 minutes
- Yearly Air Savings = 20,160,000 ft^3 saved

  Using the average compressed air cost of \$0.25/1,000 ft^3 we can further quantify the savings.
- 20,160,000 ft^3/1,000 = 20,160
  20,160 x \$0.25 = \$5,040.00 total savings per year

The total investment for the engineered compressed air nozzles (EXAIR model #1100) was \$360.00, for a simple ROI of 26 days.

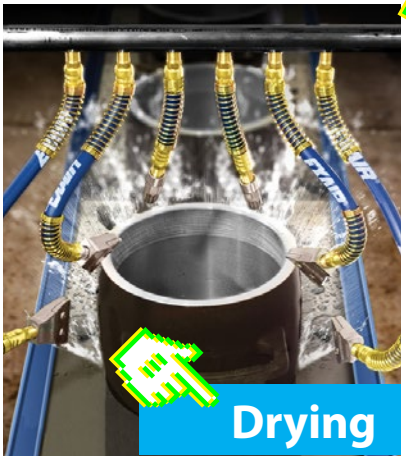
The force value of the home-made "nozzle" was 1.04 pounds at 80 PSIG. The air amplification characteristic of the engineered air nozzle allowed for a significant reduction in compressed air consumption while still being able to maintain a force value of 1 pound at 80 PSIG inlet.

Select from the products below to learn more

What are some typical applications that use these types of products?

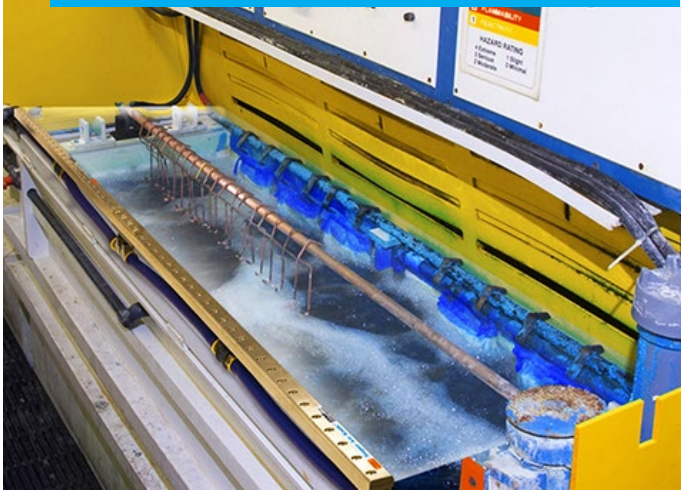
As previously mentioned these products excel at using compressed air safely and efficiently for applications such as blowoff, cleaning, drying, cooling, ventilating, circulating, part ejection, part manipulation and environmental separation.

Cooling



Drying

Environmental Separation



Blowoff

Cleaning

Ventilating

Part Ejection

Part Manipulation

Air Circulation

Technical Support

EXAIR has a staff of application engineers ready to assist you in selecting the appropriate model for your application.

They can be contacted at **1-800-903-9247**.

Or you can email them at **techelp@exair.com**

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