Testing for Micro-Organisms in Compressed Air:

What Food and Beverage Processors Need to Know.

The Safe Quality Food Institute (SQFI) has introduced a new Safe Quality Food Manual (ISO 22000) in the U.S. According to the standard, food processors *must test annually* for factors including particulate, water, oil, microbiologicals and relevant gases, and ensure their compressed air system meets the appropriate quality standard.

If you are a food or beverage processor, this should raise a fundamental question: ***"What's in my compressed air?"*** A wide variety of contaminants can end up in compressed air, with most falling into one of these groups:

- Hydrocarbons
- Viruses
- Bacteria
- Moisture (liquid water or water vapor)
- Oil
- Solid particles (whatever makes it past intake filter)

Some impurities, such as lubricating oil, can be part of the mechanics of a compressed air system. Other impurities including dust (dry or wet), water (liquid or vapor) and oils (aerosol or hydrocarbon) originate in the ambient environment, so the quality of intake air is a key factor. Whatever their source, if impurities are not effectively removed from the compressed air, they can contaminate product, impair production results, increase costs and damage your reputation.

ISO 8573

As a food and beverage processor, you are now required to evaluate the purity of your compressed air against a recognized standard, at least annually. The most common quality standard is ISO 8573:2010. Depending on your application, the standard covers three categories of contaminants (dirt, water, oil) with ten classes of purity within each category (the lower the class, the higher the air quality). Note that a process involving compressed air may require a different purity class for each contaminant category.

ISO8573:2010 – Contaminants and purity classes

ISO 8573-1: 2010	Dirt				Water		Oil
	Maximum number of particle per m^3			Mass concentration mg/m^3	Vapor pressure dewpoint	Liquid g/m^3	Total oil (aerosol liquid and vapor) mg/m^3
	0.1 – 0.5 micron	0.5 - 1 micron	1 – 5 micron				
0	As specified by the equipment user or supplier and more stringent than class 1						
1	≤ 20000	≤ 400	≤ 10	-	≤ -70°C/-94°F	-	0.01
2	≤ 400000	≤ 6000	≤ 100	-	≤ -40°C/-40°F	-	0.1
3	-	≤ 90000	≤ 1000	-	≤ -20°C/-4°F	-	1
4	-	-	≤ 10000	-	≤ +3°C/+37.4°F	-	5
5	-	-	≤ 100000	-	≤ +7°C/+44.6°F	-	-
6	-	-	-	≤ 5	≤ +10°C/+50°F	-	-
7	-	-	-	5 – 10	-	≤ 0.5	-
8	-	-	-	-	-	0.5 – 5	-
9	-	-	-	-	-	5 – 10	-
X	-	-	-	> 10	-	> 10	> 10

Halting Growth of Micro-Organisms

Potential for growth of micro-organisms in a compressed air system is tied to the moisture level (dew point) of the compressed air. In simple terms, if there is moisture in your compressed air, micro-organisms such as mold and bacteria have the environment they need to grow and thrive. While it's true that as air is compressed, much of the moisture present in the intake air will condense, enough moisture remains to allow micro-organisms to proliferate.

The most common approach to removing the moisture in compressed air is refrigerated air drying. This cools the compressed air so more moisture condenses. However, refrigerated dryers cannot reduce the air's dew point below the freezing point of water (32˚F/0˚C). To ensure an extremely low dew point (a common standard for food and beverage processing is -40˚F/-40˚C), a desiccant-type dryer may be required. Proper filtration of both intake air and compressed air are also important steps to ensure high quality air.

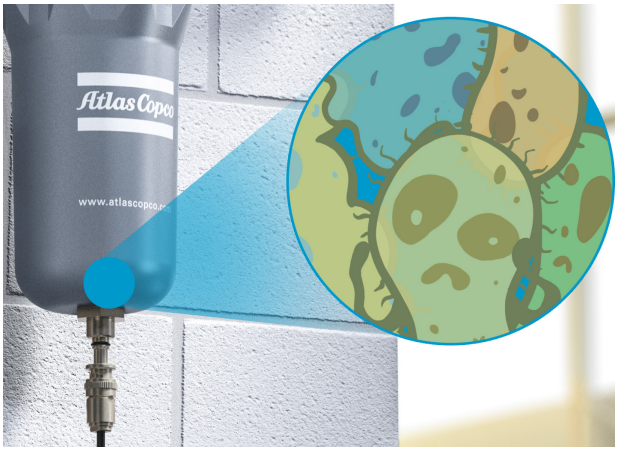
Air Testing

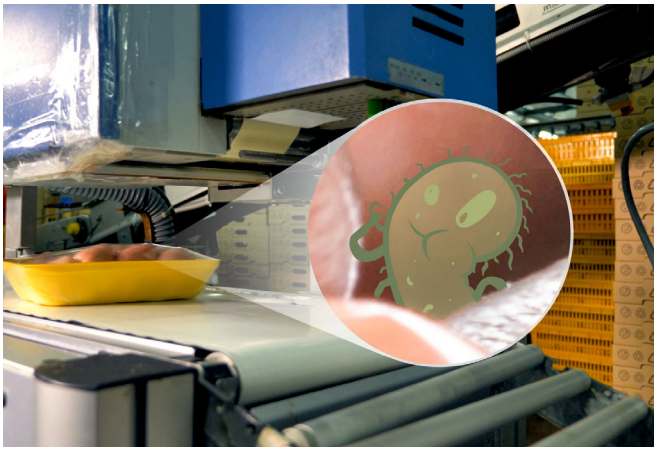
Compressed air testing should be a fundamental safety mechanism for your facility, like fire extinguishers and PPE. To ensure that your air systems meet the new requirements, you'll need a carefully designed and implemented Compressed Air Monitoring Program to verify the effectiveness of your facility's air filtration, air drying, and air system maintenance. A good starting point is a professional audit of your system for compressed air or other gases. A comprehensive air audit includes these elements:

- Leak detection (ultrasonic and acoustic camera)
- Supply side audit (pressure testing, flow metering, cost)
- Demand side audit (dew point monitoring, flow metering, effectiveness)
- Air quality testing (controlled sampling of your air, lab testing and comprehensive report)

Professional air testing is simple, effective, non-intrusive and affordable. It helps deliver key benefits for your business:

- Protects your product quality
- Protects your brand
- Guarantees peace of mind





The right size and quality of filtration is key to ensuring clean, safe compressed air.

FAQs

Who is affected by the new air quality testing requirements?
Air quality testing will be required in many food industry sectors, such as:

- Primary plant production
- Primary animal production
- Aquaculture
- Food manufacturing
- Pet food manufacturing
- Animal feed manufacturing
- Animal product manufacturing
- Dietary supplement manufacturing
- Storage and distribution
- Manufacturing of food packaging
- Quality code

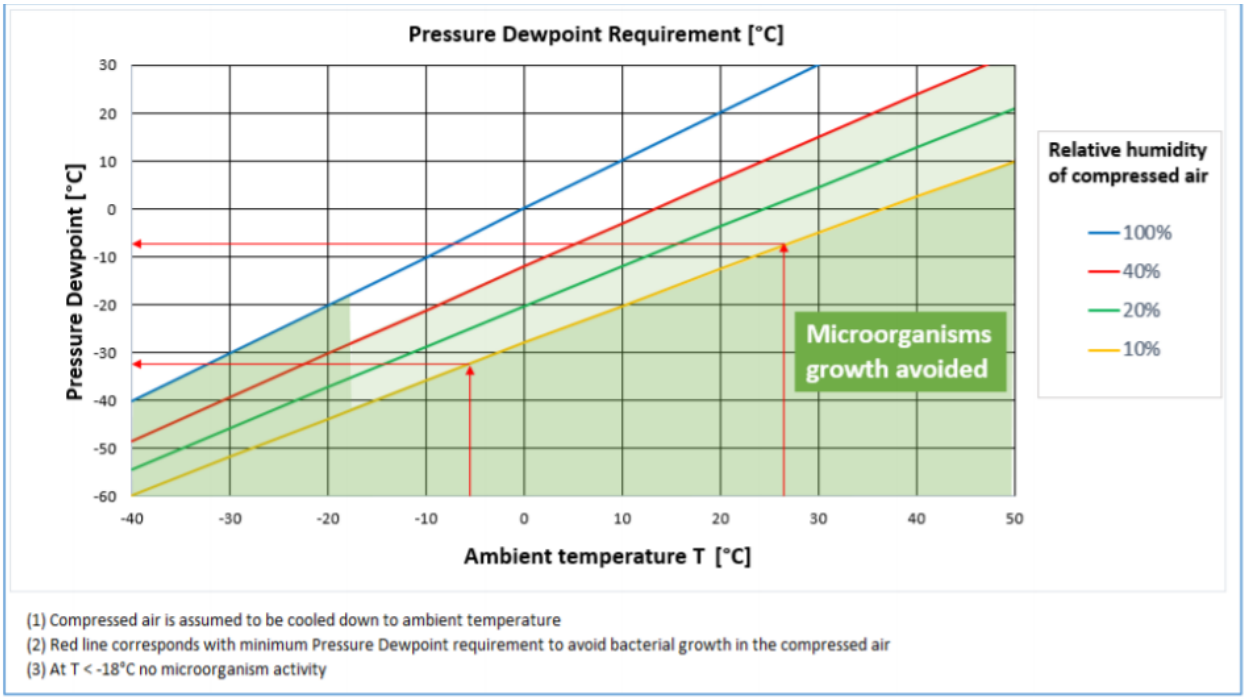
Should food and beverage processors be concerned about micro-organisms?
Without a quality compressed air system then – yes! The health and safety of foods and beverages are jeopardized by the presence of harmful micro-organisms. This is true across aspects of food and beverage processing, including the use of compressed air. Whether compressed air is part of a production process, such as food transfer and packaging, or part of a food or beverage product itself, companies must ensure that compressed air does not contribute to the growth of micro-organisms.

Can micro-organisms exist in the compressed air supply?
Anything present in ambient air will be present in untreated compressed air. While much of the moisture, oil and aerosols come out of solution under pressure, the air must be properly treated, typically through filtration and drying, to provide hygienic, high quality compressed air.

How does compressed air figure into concerns about micro-organisms?
Since micro-organisms typically need a warm, humid environment to thrive, food and beverage companies should take steps to remove moisture from compressed air used in their processes. In the industry's hygiene-critical applications, a compressed air pressure dew point (PDP) of -40°F/°C is often specified. This is also referred as ISO 8573-1 Class 2.

Can my production be completely risk free when it comes to micro-organisms?
Removing heat and moisture is the most effective approach to minimizing the risks associated with micro-organisms in a compressed air stream. Drying compressed air to a pressure dew point (PDP) of -40°F/°C (ISO 8573-1 Class 2) removes moisture that micro-organisms need to thrive.

How important is the quality of the air piping system in reducing micro-organisms?
Piping quality is especially important. Compressed air should be properly treated, through filtration and drying methods appropriate for your processes, before it is introduced into the piping system. Once piping becomes contaminated, it can be difficult to return it to a hygienic state.



What different classifications of filtration systems exist for the compressed air supply?

Air treatment components are available to remove a wide range contaminants such as solid particles, liquid water, water vapor, oil vapor and odorants, as well as micro-organisms such as bacteria, fungi and viruses. In most automation applications, including food and beverage processing, the focus is removing solid particles and water. For example, water separators remove condensate, using either a coalescing principle or a centrifugal design. A coalescing separator flows compressed air from the inside to the outside of a filter element. These filter cartridges must be replaced regularly. A centrifugal separator causes a rotary motion in the air, forcing particles to accelerate in a radial outward movement. Once they reach the outside, they drain into a bowl. No maintenance is required for this process.

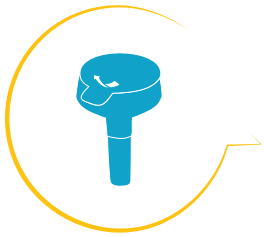
Do other benefits come from drying compressed air?

Yes. Dry compressed air eliminates the introduction of moisture into pneumatic piping, controls and tools, which helps prevent corrosion and improve overall system reliability. A variety of drying technologies are available, such as refrigerant and desiccant, each with its own advantages. It's important to note that drying compressed air consumes energy. Significant energy savings can be achieved by selecting the right drying technology and dew point for the application.

What is the procedure for checking compressed air for micro-organisms?

Air should be sampled at the point of use to determine whether micro-organisms are present. Therefore, choosing a method for sampling and testing microbial contamination in compressed air is an important decision. Working with your product safety team, an air system professional can help you evaluate your needs and specify appropriate sampling and testing methods.

Testing Options



Basic Testing

Customers can purchase a simple, disposable detection device for measuring oil aerosol in compressed air. This simply alerts you if aerosol is present in your compressed air.

These are available from Edmac at *https://www.edmac.com/3003371692.html*

Simple Lab Testing

A kit is available to order which will allow you (the customer) to take a small air sample and send it to a laboratory for air-testing. Note, this test **does not include microorganisms** testing. The analysis provided would cover all points in the list provided below.

These are available from Edmac at *https://www.edmac.com/3003471690.html*

Oxygen	Water Vapor	Halo. Solvents
Nitrogen	Nitrogen Dioxide	VHC
Carbon Dioxide	Nitric Oxide	VHHC
Carbon Monoxide	Sulfur Dioxide	Oil and Particles
Methane	Nitrous Oxide	Odor
Dew Point	THC	

Professional Testing

This will involve a technician or trained auditor visiting the facility and taking a small air sample which will be sent off to a laboratory. The process is managed by Atlas Copco. Air testing is also part of our AIRScan program. A fully detailed report including analysis of any microorganisms is provided. One of our auditing team would then discuss the results with you. The cost varies depending on location and testing needs. In addition to the data shown above, you also receive full details on any bacteria growth including:

Analyte	Sample Results
Mold at source MEA media	< 7 cfu/m^3
Bacteria at source TSA media	< 7 cfu/m^3
Mold Blank MEA media	< 10 cfu/filter
Bacteria Blank TSA media	< 10 cfu/filter

Atlas Copco Compressors LLC

300 Technology Center Way, Suite 550, Rock Hill, SC 29730
Phone: (866) 546-3588

www.atlascopco.com/air-usa