Air and Other Gases

Definition:

Compressed air monitoring: A program that includes particles, water, oil, and microbiological and relevant gaseous testing in compressed air or other gases. Verification of the effectiveness of compressor maintenance and filtration that a management facility has in place.

Applicable Code Requirements

- *3.5.4*
- *4.5.5*
- *9.5.51*
- *10.6.5*
- *11.5.5*
- *12.5.3*
- *13.5.3*
- *17.5.5*

Review Glossary Terms

- *Risk Assessment*

Implementation & Audit Guidance

What does it mean?

This applies to compressed air that comes into contact with exposed food products (e.g., pneumatic conveying), food contact surfaces, and interior surface packaging. It does not apply to air that does not come into contact with food or food contact surfaces.

Purity means the absence of contaminants that could cause a food safety hazard. Pure air means the air is free of risk for contamination of the products. Essentially, the air must not contribute to any contamination of the product.

Why is it in the Code & why is it important?

Compressed air can be a source of chemical and microbiological contamination. Potential contaminants can include particulates, including dirt (microorganisms, atmospheric dirt and solid particulates, rust, and pipe scales), water (water vapor, condensed liquid water, and water aerosols), and oil (oil vapor, liquid oil, and oil aerosols).

Food operations must verify and validate that the compressed air used is appropriate and does not serve as a source of contamination. When compressed air meets exposed product or direct product contact surfaces, the air compressor must use food grade oil.

Preventive maintenance programs need to ensure that an appropriate filtration program is in place at the point-of-use and that filters are cleaned or changed at a frequency appropriate to the product and process or following any maintenance to the air supply source or equipment. Any maintenance must be done in a hygienic manner.

Wherever the compressed air meets the food, either directly or indirectly, high-efficiency filters are to be in place at the point-of-use where the air enters the final section of tubing (not in the compressor room). This will significantly reduce the risk of microbial contamination of the food from the air. The recommended final stage of filtration in these food contact areas should have a rating of 0.01 microns with an efficiency of 99.999% (or as determined by appropriate risk analysis). Sufficient filtration is to be in place directly upstream of the final stage to protect the final stage from oil and water aerosols.

Nozzles and air hoses are to be in good condition, properly repaired, and maintained in a hygienic state (e.g., cleaned and sanitized). Hoses and nozzles are to be kept off the ground.

It is generally advisable to locate the filtration as close as practically possible (near the "point-of-use," or the point where air contacts the food), to not have long lengths of piping/tubing between the microbial removal filter and the air/food contact point.

Testing can be conducted to validate the compressed air-filtration control system's effectiveness based on the risk to the product; however, testing must be conducted at a minimum of once a year. Testing can be done in-house or by a contracted party. Test requirements and the number of samples will be based on the risk to the product and process. Microbiological testing can include testing for aerobic plate count and/or indicator organisms as appropriate to the operation. Testing for moisture is to be considered if moisture is a potential risk to the product (e.g., dry operations).

Aseptic sample collection needs to be used. There are a wide variety of measures available, including the use of air sampling equipment, use of sterile sponges, membrane filtration, and others.

The site may consider the following controls for particulates:

i. Intake filters to remove atmospheric dirt and solid particulates.
ii. Microorganisms – A point-of-use filter, minimum 0.01 microns, prevents pathogenic microorganisms from contaminating food. An effective PM program should be in place to maintain the integrity of the filter. Validation from the filter manufacturer is often considered adequate validation.
iii. Water, including vapor, liquid, and condensed. A dryer in the compressed air system provides effective control. An effective PM program should be in place.
iv. Oil, including vapor, liquid, and aerosols. The presence of coalescing filters in the compressed air system effectively removes contamination. An effective PM program should be in place to maintain the integrity of the filter.

RIO Road to Audits (Records, Interviews, and Observations)

Records	Interviews	Observations
The following are examples of records and/or documents to assist in the implementation and review of this topic: ▪ *Risk Assessment* ▪ *Maintenance (including preventive) records* ▪ *Manufacturer data specification sheet* ▪ *Preventive maintenance records* ▪ *Applicable SSOPs*	The following are examples of people to interview to assist in the implementation and review of this topic: ▪ *Maintenance* ▪ *Quality/Technical manager* The following are examples of questions to ask to assist in the implementation and review of this topic: ▪ *How was the standard for microbiological purity of compressed air determined?* ▪ *What are the methods/ process for testing?* ▪ *How often is the program and methods reviewed?* ▪ *What is the process when the test results do not match the specification?* ▪ *What is the process and frequency for changing the filters?*	The SQF auditor may observe the following or similar activities: ▪ *The condition of air compressors* ▪ *Compressed air system at the point-of-use* ▪ *Changing filters (if possible)* ▪ *Cleaning and sanitation practices*

Additional References

For general compressed air quality standards within a food plant, ISO 8573-1 standards are a very good reference. These standards provide a good baseline for quantifying compressed air quality relative to moisture and oil content (carryover from compressor), as well as general particulate contamination. ISO 8573-1 does not, however, provide guidance for microbial contamination. For areas where the compressed air comes in direct contact with food or food contact surfaces, ISO 8573-7 provides a standardized method for collecting compressed air samples for microbial testing; however, it leaves the user to determine the acceptable type and level of CFU content.