

Validation of System for Air Quality

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Contaminants in Compressed Air

- **Three Contaminants in Compressed Air:**

1. Oil
2. Water
3. Particles

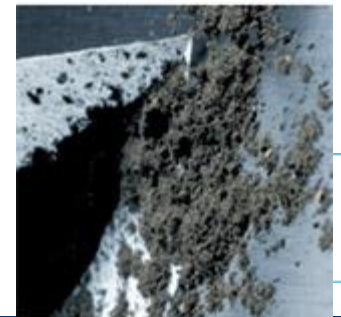


- **Air Quality** is the measure of presence of these contaminants in the compressed air.



Where do the contaminants come from?

1. Oils are used as **lubricants** in the compressors.
2. Water is present naturally in the air in the form of relative **Humidity**.
3. Small particles usually measured in Microns are present naturally in air.
4. **Corrosion** particles flake off due to high flow rate.



What can these contaminants do?

1. Health of Machinery & Piping:

One cubic meter of untreated compressed air contains almost **200 million** dirt particles and a lot of water, oil, lead, cadmium and mercury. These contaminants can:

- **Corrode** your piping system which in turn causes pressure losses.
- Cause **constrictions** and **blockages**.
- **Reduce the life** of filters and drains.
- **Reduce the service life** of your machines
- Reduce the **functionality** of your machines.
- **Cost additional energy**



What can these contaminants do?

2. Health of Product:

- Moisture can provide the suitable environment for **microbial growth**.
- **Corrosion** Particles when flake off, can be transported along with air to the final product, where they can be a health hazard for the consumer.
- Dirt particles contain **pipe scale** which can accumulate in your final product.
- Oil contains **hydrocarbons**, that can be hazardous for health.



The ISO 8573-1 Standard

ISO 8573-1:2010 is an international standard that:

- Categorizes air quality into different **classes**.
- Specifies maximum permissible Contamination **levels** for each class.
- Each class refers to certain Industrial **applications**.



Table of Air Quality

ISO 8573.1 Quality Classes of Compressed Air

Class	Solid Particles max particle size in - microns	Humidity		Oil mg/m ³
		Dew Point		
		°C	°F	
1	0.1	-70	-94	0.01
2	1	-40	-40	0.1
3	5	-20	-4	1
4	15	3	38	5
5	40	7	45	>5
6	-	10	50	-

Table of Air Quality

ISO 8573-1:2010	Solid particles				Water		Oil
	Max. number of particles per m ³			Mass concentration	Pressure dew point	Liquid	Total oil content (liquid, aerosol and vapour)
	0.1 ... 0.5 µm	0.5 ... 1 µm	1 ... 5 µm	mg/m ³	°C	g/m ³	mg/m ³
0	In accordance with specifications by the device user, stricter requirements than Class 1						
1	≤ 20,000	≤ 400	≤ 10	–	≤ -70	–	0.01
2	≤ 400,000	≤ 6,000	≤ 100	–	≤ -40	–	0.1
3	–	≤ 90,000	≤ 1,000	–	≤ -20	–	1
4	–	–	≤ 10,000	–	≤ +3	–	5
5	–	–	≤ 100,000	–	≤ +7	–	–
6	–	–	–	≤ 5	≤ +10	–	–
7	–	–	–	5 ... 10	–	≤ 0.5	–
8	–	–	–	–	–	0.5 ... 5	–
9	–	–	–	–	–	5 ... 10	–
X	–	–	–	> 10	–	>10	>10

Compressed air quality classes according to
ISO 8573-1:2010

Air Quality for Food & Pharma Industry

- Food & Drug manufacturing facilities require higher quality of air
- Since these products are to be **ingested** by **Humans** or **Animals**
- Therefore air must be **Completely oil free** and must contain very few parts of water vapor.
- So air quality of class **1 or 2** is essential for food & pharma Industries.
- It brings a great responsibility on the manufacturer of food & pharma Industry to take care of air quality.



Air Quality for Food & Pharma Industry

- According to “BCAS-British Compressed Air Society”, The following air quality standards should be followed by a food & pharma Manufacturer:
- **Direct** Contact of air with the product:
Particles : water : oil = **2:2:1** (as per ISO 8753-1)
- **Indirect** Contact of Air with the Product:
2:4:2



BCAS Food & Beverage Grade Compressed Air Guideline

ISO 8573-1:2010 Purity Class	Particles			Water		Oil
	By Particle Size (maximum number of particles per m ³)			Vapor Pressure Dewpoint		Aerosol & Vapor
	0.1 - 0.5 micron	0.5 - 1.0 micron	1.0 - 5.0 micron	°C	°F	mg/m ³
Direct Contact 2:2:1	400,000	6,000	100	≤ -40	≤ -40	≤ 0.01
Indirect Contact 2:4:2	400,000	6,000	100	≤ +3	≤ +37	≤ 0.1
Microbial Contaminants	Hazard analysis shall establish the risk of contamination by microbiological contaminants from compressed air. The level of control identified as being required over microbiological contaminants in the compressed air shall be detected using the test method specified in ISO 8573-7.					

Oil in Compressed Air

- Oil can contaminate the **whole plant** in a very short time
- Oil has very **low vapor pressure**, so bringing the plant back to clean condition is a big challenge.
- **Cleaning** of piping choked with Oil is very **expensive**.
- Oil contains **hydrocarbons** that are hazardous for health.



Instruments Available for Oil Monitoring

- OilGuard PRO:
Constantly monitors oil
- Measuring range **0.001 - 20 mg/m³**



Moisture in Compressed Air

- Moisture can be hazardous for compressed air especially for food industry.
- Moisture provides the right temperature and environment for **microbes** to grow.
- Moisture will lead to **blockages** in valves and pneumatic components.
- It causes the piping to **corrode**.
- Remember your compressed air system is designed for air – not water.



Instruments for Moisture Monitoring

AirSecure

- Monitors dew-point
- Alarms when critical value is reached



dewguardPRO

- Monitors dew-point and network pressure.



Particles in Compressed Air

- The small particles (Dust, pipe scale, Microbes and rust) present in the compressed air may **clog**, **block** or **constrict** the **pipng**.
- These particles reduce the **service life of filters** and other equipment a great deal.
- Compressed air applications such as packaging, cleaning, Food Filling require 100% **clean** air.
- Continuous monitoring of particles is necessary.



Instruments Available for Particles Monitoring

- PC 400 by CS-Instruments
- Particle counter upto $0.1\mu\text{m}$



Moisture is dangerous yet inevitable!

- Corrosion is something, that can prove to be the most hazardous problem for your system.
- The corrosion can cause **pressure drops**, **air contamination** and **leakages**.
- Since moisture is everywhere, and we cannot avoid it.
- The best possible solution is to use piping that does not corrode easily.
- GI Pipe is cheap yet prone to Corrosion, Use **Aluminum** piping to avoid corrosion.



The Solutions

1. **Monitor** your system for moisture, oil and particles.
2. Identify in-efficiencies, air Leakages & pressure drops.
3. Use **oil free** compressors
4. Decrease the **RH factor** of your intake air
5. Use **Aluminum** or **Stainless steel** piping that does not corrode easily
6. Keep the environment of your intake area clean.



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THANK YOU!

