



Air you can trust: Oil Free Compressed Air in Modern Industry

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2. Understanding Air Quality Standards
3. Applications
4. Exploring Oil-Free Technologies
5. Measurement Technology and Verification
6. Q&A Session



Compressed air quality according to ISO 8573-1

The DIN ISO 8573 series of standards deals with compressed air quality in nine parts. Parts two to nine include test methods. Part 8573-1 classifies compressed air by a maximum content of impurities (particles, water and oil) that may be contained in the airstream.

Air qualities in accordance with ISO 8573-1:2010

| Class | Solid particles, max. number of particles per m ³ | | | Pressure dew point °F | Oil content (liquid, aerosol, oil vapor) mg/m ³ |
|-------|---|---------------------|---------------------|-----------------------------|--|
| | 0.1 μm < d ≤ 0.5 μm | 0.5 μm < d ≤ 1.0 μm | 1.0 μm < d ≤ 5.0 μm | | |
| 0 | In accordance with the unit operator's or supplier's specifications, stricter requirements than class 1 | | | | |
| 1 | ≤ 20,000 | ≤ 400 | ≤ 10 | ≤ -100 | ≤ 0.01 |
| 2 | ≤ 400,000 | ≤ 6,000 | ≤ 100 | ≤ -40 | ≤ 0.1 |
| 3 | - | ≤ 90,000 | ≤ 1,000 | ≤ -4 | ≤ 1 |
| 4 | - | - | ≤ 10,000 | ≤ 37 | ≤ 5 |
| 5 | - | - | ≤ 100,000 | ≤ 45 | > 5 |
| 6 | - | - | - | ≤ 50 | - |

■ Measured in accordance with ISO 8573-4, ref. conditions 14.5 psi [a] absolute, 68 °F, 0% RH

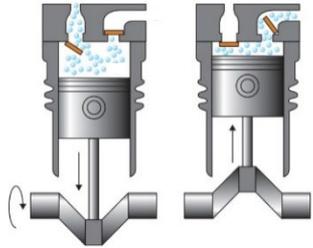
■ Measured in accordance with ISO 8573-3

■ Measured in accordance with ISO 8573-2 and ISO 8573-5, ref. conditions 14.5 psi [a] absolute, 68 °F, 0% RH

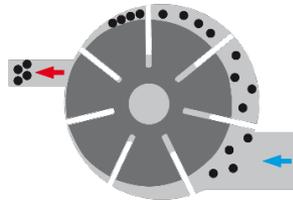
So where does the oil come from in compressed air?



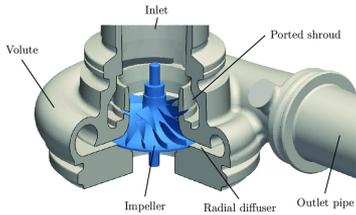
Oil in the Compressor



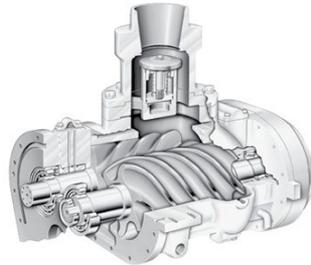
Piston type



Vane type



OF CF Type



Screw type

| Type of compressor | Oil carry over at compressor exit | ISO 8573-1 Class |
|-----------------------|-----------------------------------|------------------|
| piston oil lubricated | 10 – 180 mg/m³ | Class 5 |
| vane oil lubricated | 1 – 180 mg/m³ | Class 3-5 |
| screw oil lubricated | 1 – 20 mg/m³ | Class 3-5 |
| oil free compressor | 0 – 3 mg/m³ | Class 1-4 |

What influence does the ambient air have? Does an oil-free compressor guarantee oil-free air?

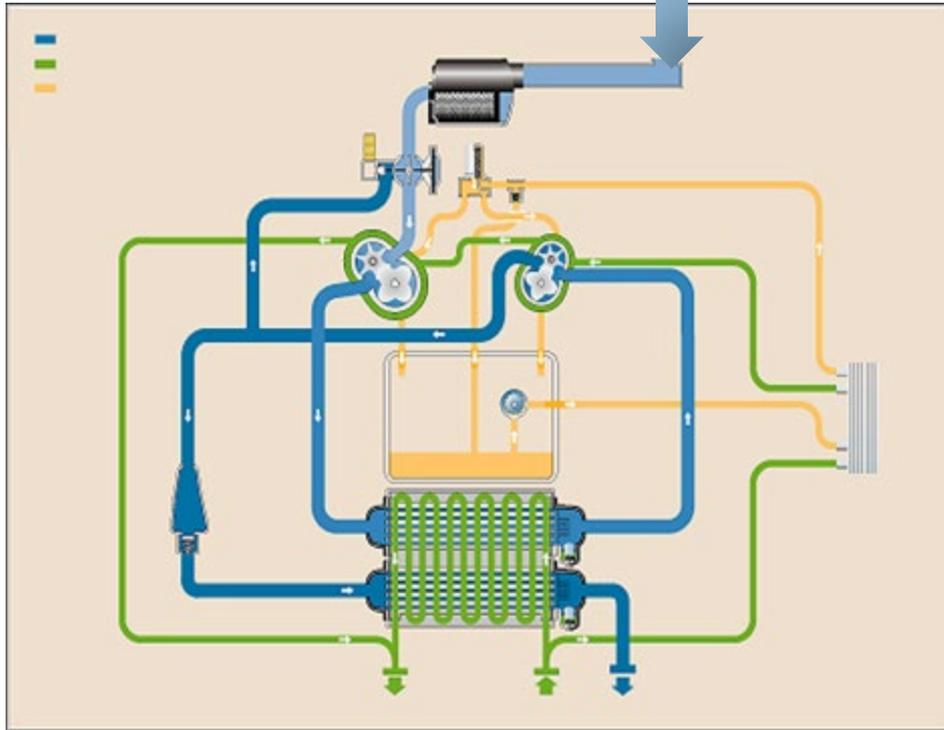


0.01 to 0.3 mg/m³ (Class 1-3)



Up to 5 mg/m³ (Class 4)

Oil-free Compressor



If the ambient air drawn into the system is free from hydrocarbon compounds, we could achieve Class 1 certification...

...regardless of the absence of other hydrocarbons in the intake air!

And what was Class 0 again?

| Class | Oil content (liquid, aerosol, oil vapor) mg/m ³ |
|-------|---|
| 0 | elements than class 1 |
| 1 | ≤ 0.01 |
| 2 | ≤ 0.1 |
| 3 | ≤ 1 |
| 4 | ≤ 5 |
| 5 | > 5 |
| 6 | - |

- › One oil droplet weighs approx. 20mg
- › One oil droplet per m³ air (Class 5)
- › A fingerprint leaves about 3-5mg oil/grease (Class 4)
- › The smell of oil is detectable at 0.3 mg/m³ (Class 3)



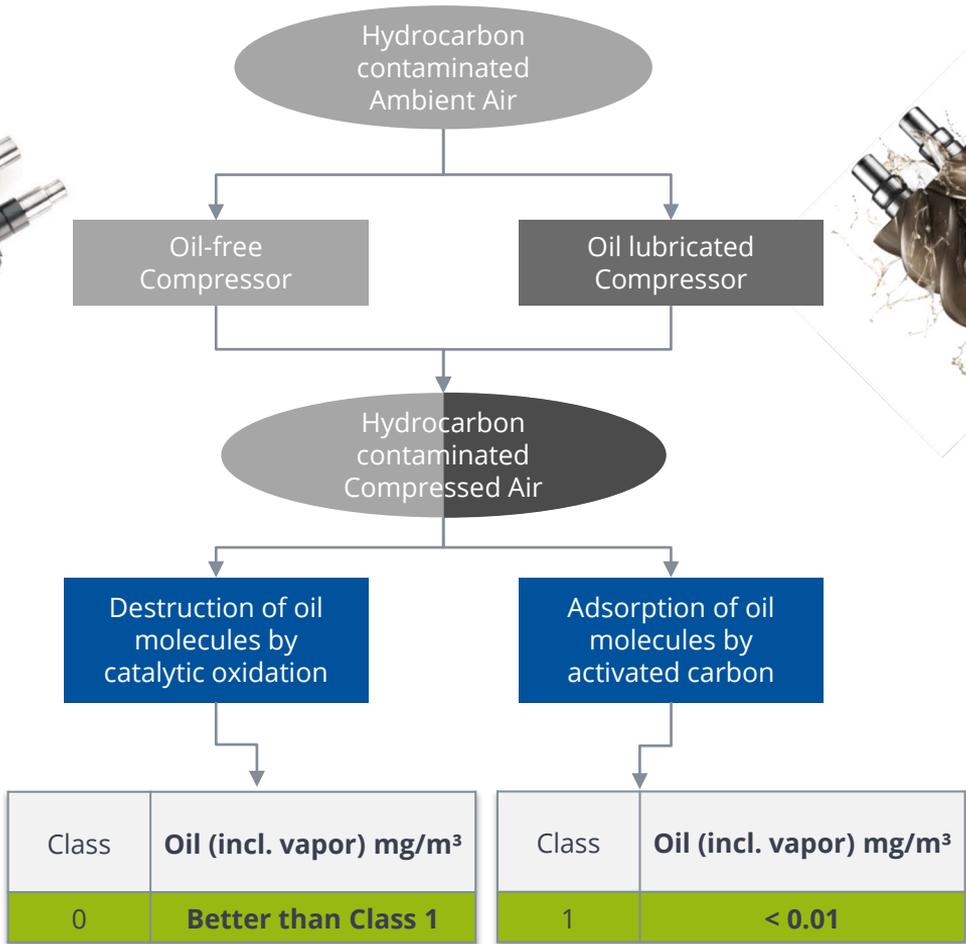
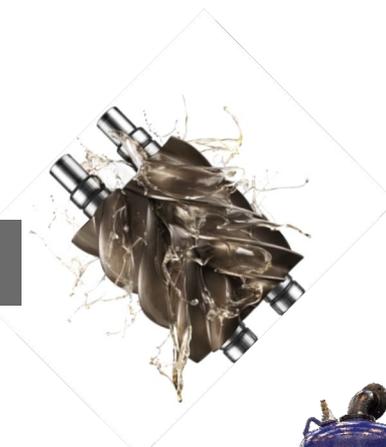


Food-grade lubricants, designed to be non-toxic and safe for incidental contact with food, are used in compressed air systems to prevent oil contamination, but how safe are they?

| Application | Category based on the National Sanitation Foundation (NSF) classification. | | |
|--------------------------------|--|----|----|
| | H1 | H2 | H3 |
| Rare contact with food | | | |
| No contact with food | | | |
| Food oil for cleaning purposes | | | |
| Use as compressor oil | | | |

There is no H1 compressor oil specifically designed for direct food contact

Products for Oil-free Compressed Air



| Class | Oil (incl. vapor) mg/m ³ |
|-------|-------------------------------------|
| 0 | Better than Class 1 |

| Class | Oil (incl. vapor) mg/m ³ |
|-------|-------------------------------------|
| 1 | < 0.01 |



1.2.0



1.4.0



1.2.1

Direct Contact

- Direct exposure to compressed air.
- Requires strict filtration and purification methods to maintain food safety.
- Common in applications like drying, packaging, and mixing.



1.4.1



1.3.1

Indirect Contact

- Compressed air does not directly touch products.
- Used for powering equipment like pneumatic conveyors and pumps.
- Still requires regular maintenance and monitoring for quality assurance.

Filtration

- Particulate filters to remove contaminants.
- Regular replacement and maintenance of filters.

Drying

- Monitoring moisture levels to prevent microbial growth.

Oil-free

- Oil-free technologies like carbon adsorption towers and catalytic converter technology to remove oil particles.
- Reliable oil-free air prevents production interruptions, ensuring smooth and uninterrupted food processing.

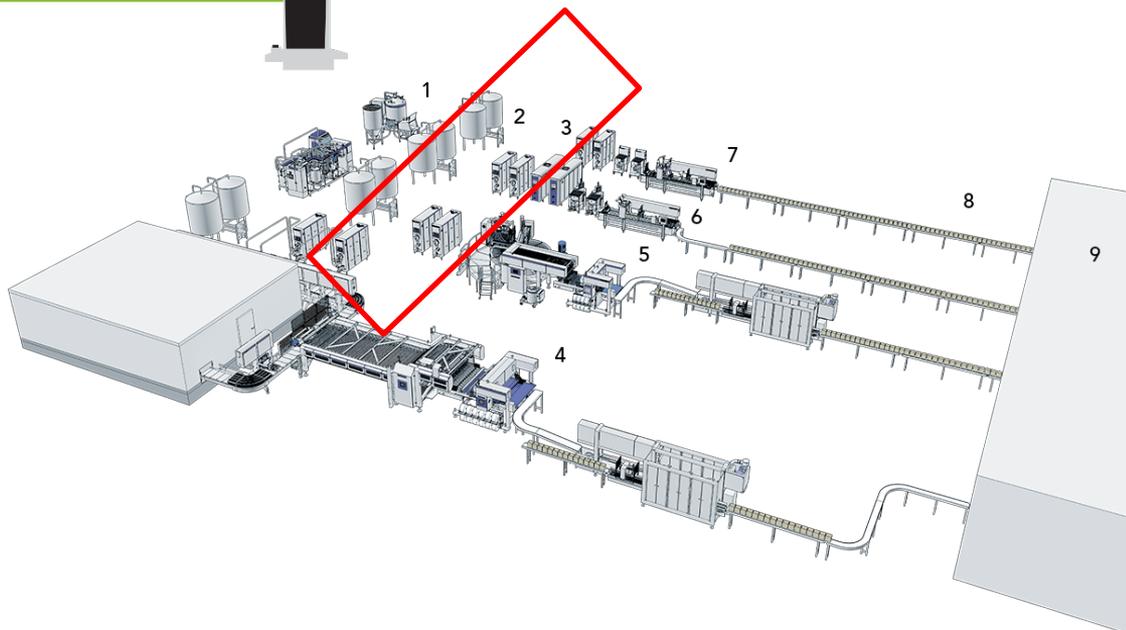
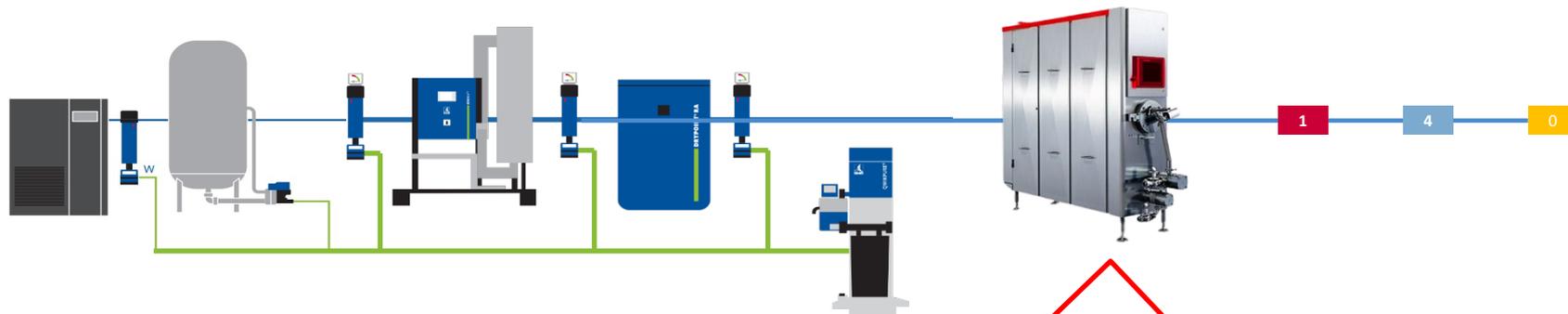




Carefully planned designs and preventive maintenance are key to managing risks associated with compressed air systems.



Ice Cream Production | Overrun



Direct Contact Air Quality: 1.4.0

Continuous Ice Cream Freezer

Point of use

1 – CLEARPOINT SX Super Fine Filter

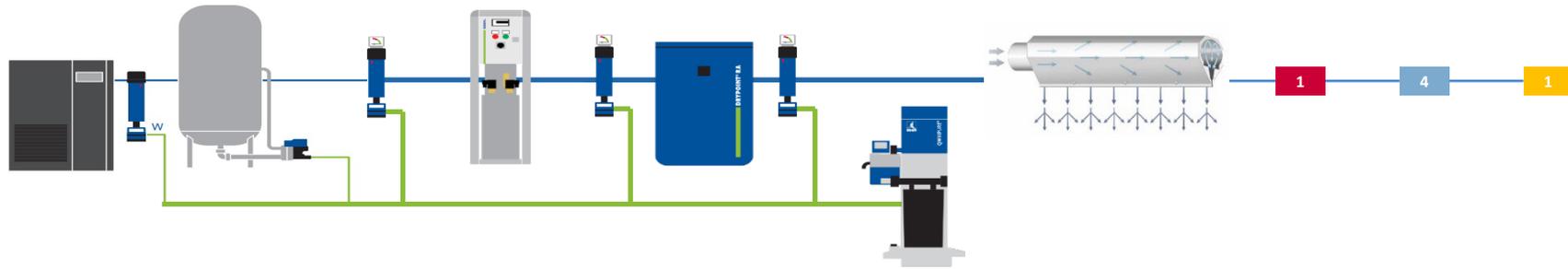
4 – DRYPOINT RAx Refrigerant Dryer

0 – BEKOKAT



In a chicken nugget factory, an air knife machine is used to remove excessive breading from the nuggets before they are cooked.

Chicken Nugget Production | Air Knives



Direct Contact Air Quality: 1.4.0

Air Knife Machine

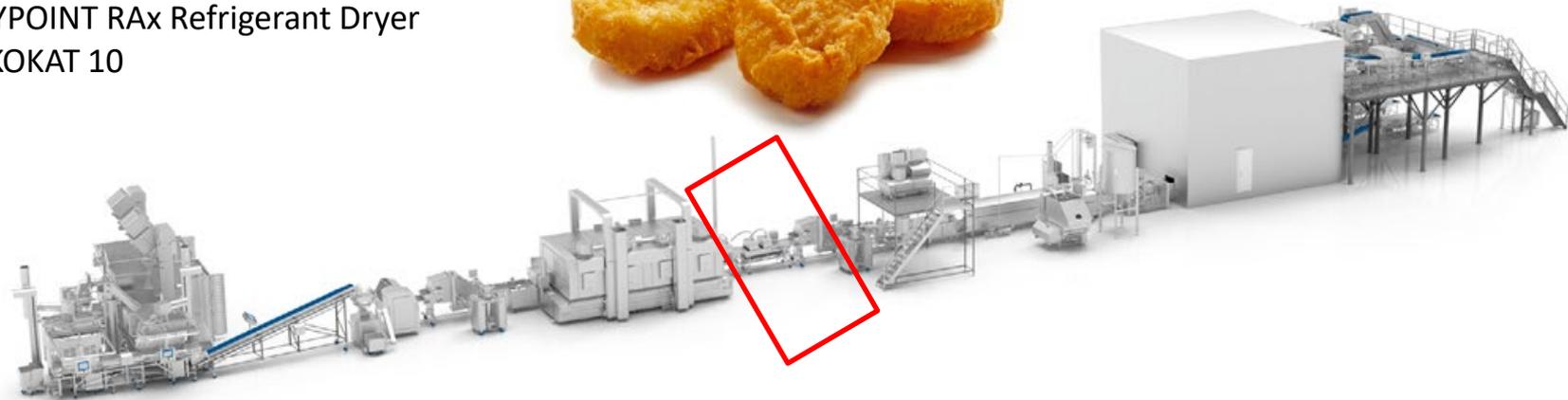
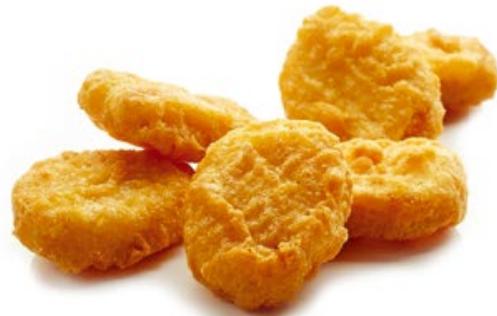
Point of use

Small flows

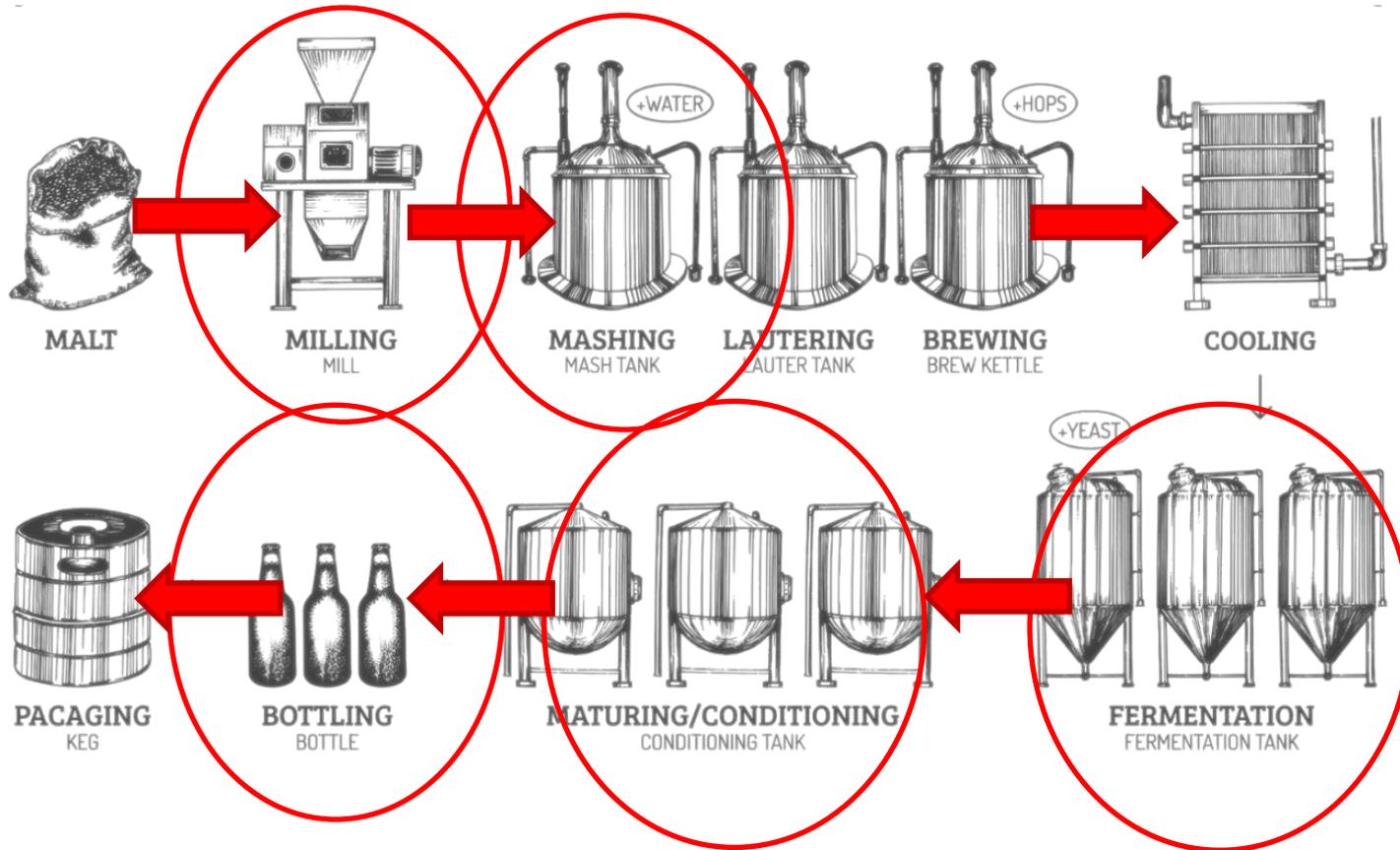
1 – CLEARPOINT SX Super Fine Filter

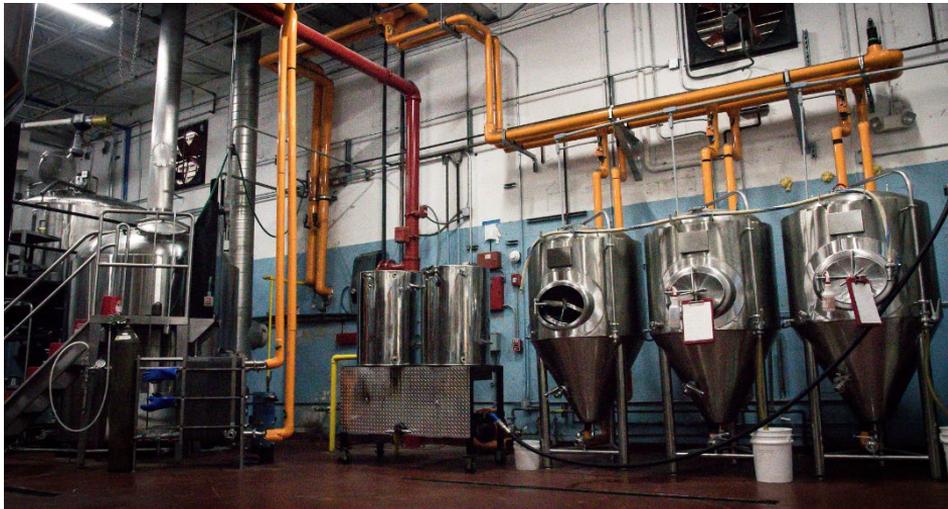
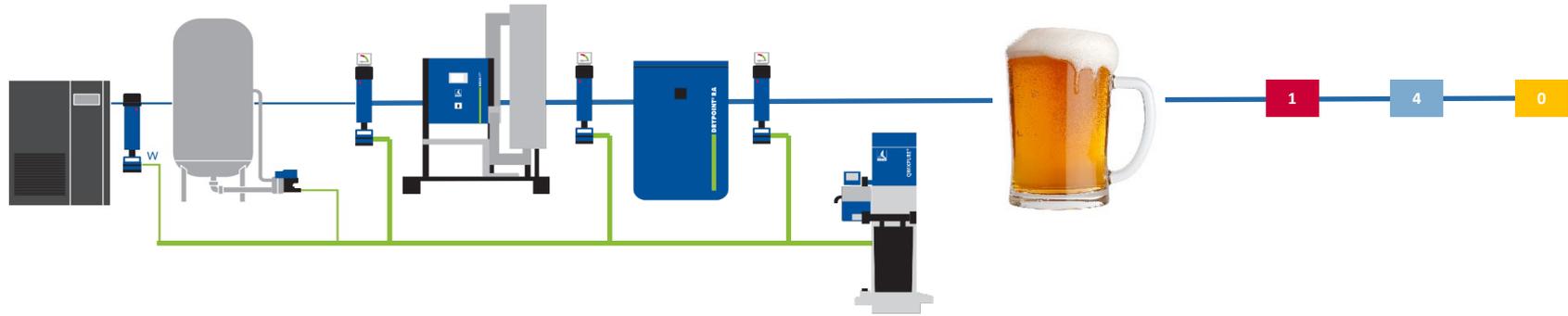
4 – DRYPOINT RAX Refrigerant Dryer

0 – BEKOKAT 10



Beer Processing





- In a brewery, compressed air is where the process begins, pushing ingredients like malted grains and hops through pipes, precisely measured for the perfect brew.



Contaminant-free compressed air is equally vital in the mashing phase, where it aids in the precise mixing of malted grains and water, preserving the integrity of the ingredients.

Fermentation



In fermentation, compressed air's controlled introduction of oxygen is fundamental for yeast activity. The absence of oil ensures the purity of the air supply, safeguarding the fermentation process from any potential adulteration.



In this stage, the beer is conditioned to develop its flavors. Oil-free compressed air is mandatory here, as any contamination could cloud the beer or affect its taste, compromising its visual appeal and flavor profile.



In the final stage, compressed air powers the bottling machinery. It ensures precise filling, capping, and labeling of bottles. Utilizing oil-free compressed air is non-negotiable here. Even the slightest contamination could spoil the beer, rendering it unfit for consumption



Activated Carbon Adsorption Technology



Oil-free Compressors



Catalyst Technology

Filter Types and Contaminants

| Filter Type | Solid Rough Particles | Solid Aerosols | Oil Droplets/Oil Aerosol | Oil Vapor |
|---|-----------------------|----------------|--------------------------|-----------|
| Coalescence | X | X | X | |
| Activated Carbon Adsorber/Activated Carbon Filter | | | | X |



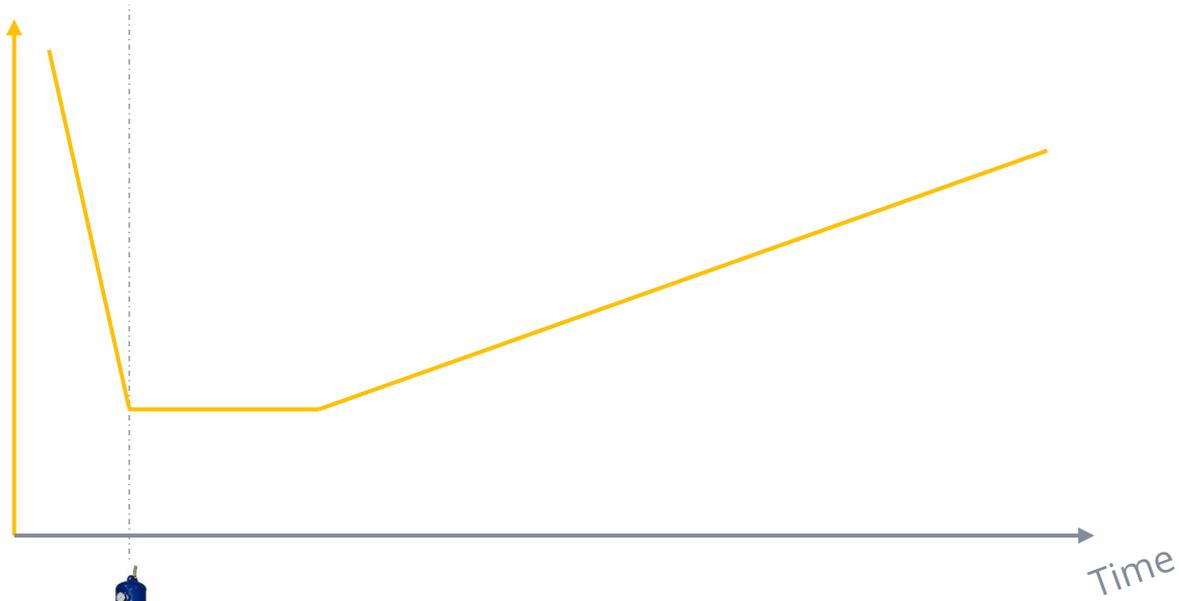
Activated Carbon Adsorption Technology



- Advanced purification: Carbon tech adsorbs oil, enhances air quality.
- Contaminant removal: Air passes through carbon for oil-free results.
- Quality essential: Carbon adsorption yields oil-free, high quality air.
- Achieves quality Class 1 air

Carbon adsorption vs oil content over time

Outlet Oil vapor





- Oil-free compressors: used in F&B, assured quality, safety, and hygiene.
- Air purity and reliability: good for low-contamination areas like food and pharma.
- Weighing pros and cons: higher costs balanced by air quality, suitable for stringent industries.



- Game-changing catalytic converter technology: employs catalysis to chemically convert oil vapor into harmless byproducts, ensuring oil-free compressed air.

CLASS 0

ISO 8573-1

- Catalytic converters: Enhance efficiency, reduce upkeep, prolong life, aid sustainability.
- Economic & environmental: Cut maintenance, energy, resources.
- Quality boost: Vital for Food and Beverage , catalytic converters ensure pure air, elevating products.



- Cost balance: Initial investment for catalyst tech weighed against benefits.
- Considerations: Addresses oil but may need extra filtration for other impurities.
- Balanced allure: Energy savings, longer life, better air quality make catalytic converters attractive for efficient, eco-conscious industries.



Catalytic Converter vs oil content over time

Outlet Oil vapor





- Crucial for Various Sectors: Oil vapor monitoring ensures quality, longevity, and efficiency across industries like food, pharma, and electronics.
- Stringent Purity Standards: Sectors like food and pharma rely on clean air for product integrity.
- Real-time Monitoring and Efficiency: accurate tracking, alerts, and system optimization, essential for compliance, uptime, and quality in these sectors.

Verified oil-free air!

In conclusion, adopting oil-free compressed air showcases a commitment to product integrity, regulations, and innovation in the food and beverage industry.



Questions, Guidance, or Advice We are here to help



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