BEKO TECHNOLOGIES

Whitepaper Food Safety
Utilising Pure Compressed Air

Better through Responsibility

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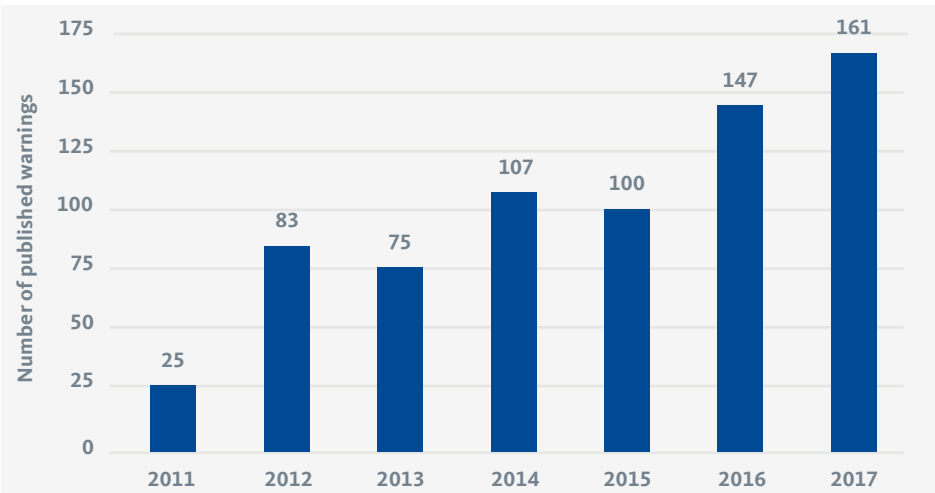
Compressed air –
An underestimated coefficient for safe food

One of the essential tasks in today´s food business is ensuring the safety of food. Production and manufacturing companies in the food industry are increasingly under pressure to fulfil legitimate high quality standards. At the same time, consumer requirements are increasing and food hygiene and food safety are focused on by public attention more intensely . The industry must respond with intelligent quality management systems which guarantee compliance with limiting values at every point in the production process.

Recalls in the German food industry increased by 61 percent between 2015 and 2017. These have been reported by the Federal Office for Consumer Protection and Food Safety (BVL), which has been publishing its warnings on the food *warning portal* since 2011. 25 food-products were recalled back in 2011, this then went up to 100 in 2015 and 161 products in 2017. The most frequent reason for the recall was micro-biological contamination i.e. bacteria and virus impurities.

The increasing numbers of recalls does not mean that food in Germany has become unsafe in recent years. It actually indicates that controls have improved and that manufacturers notify faults earlier in order to prevent large-scale scandals. However: Recalling food is expensive and harms the company´s image. Producing companies in the food industry therefore place high importance on safe production processes. An important “own goal” for causing contamination is often underestimated: compressed air medium.

Figure 1: Food Warnings in Germany 2011-2017



Compressed air – present in almost all production processes

A tour around companies in the beverages and food industries clearly indicates the extensive use of compressed air and therefore its importance for the manufacturing process. Compressed air is used, among other things, as a transport medium for powdery substances or for the evaporation of liquids and frequently comes into direct contact with the food. Increased care and attention is thereby imperative. Contamination in the compressed air caused by micro-organisms, mineral oils, oils or particles can contaminate the end product and cause enormous decreases in quality levels. Continuous compressed air treatment and processing reduces this risk and is an important factor for a qualitative high-grade product - to protect the consumer.

› **Reliable compressed air treatment, processing and faultless monitoring of your quality are imperative prerequisites for food safety today.**

[1] https://de.statista.com/statistik/daten/studie/616934/umfrage/warnungen-vor-lebensmitteln-in-deutschland/

[2] Bundesamt für Verbraucherschutz und Lebensmittelsicherheit: Statistik zu Fünf Jahre www.lebensmittelwarnung.de (2016)

When compressed air comes into contact with food

Insufficient compressed air purity „only“ leads to financial damage, poor product quality and the thereby resulting reworking in many industries. The food industry is different, contaminated compressed air has long-ranging consequences and can even result in health problems for consumers. Manufacturing and production processes for beverages and food therefore specify particularly high requirements for compressed air quality.

› Direct contact:
e.g. as process air (blowing air, transport air) which are directed specifically at, and come into contact with, the product or the packaging for the product.

Non dry food
such as beverages, fish, vegetables ice cream, among others, require compressed air quality pursuant to ISO 8573-1:2010 of 1:2:1.

Compressed air makes ice cream creamy
The “bit extra” in ice cream production refers to the injection of compressed air into the basic ice cream mass in order to give it its cream-like, creamy consistency. The compressed air comes into very intensive contact with the ice cream in this process. The smallest oil content or also some germs will make the ice cream uneatable.

Dry food are also subjected to increased requirements with regard to humidity and moisture.
Compressed air quality classification pursuant to ISO 8573-1:2010 is therefore recommendable: 1:2:1.

Compressed air transports coffee powder

Compressed air is utilised to transport coffee powder during coffee production. The compressed air must be completely dry and pure so that the coffee powder does not get lumpy or contaminated.

In packaging machinery: Compressed air comes into indirect contact with the food. Compressed air quality classification pursuant to ISO 8573-1:2010 applies: 2:4:2.

Compressed air in filling technology

Compressed air is utilised for filling processes in the food and beverages industries to shape the plastic packaging. If the compressed air is contaminated with pollutants, then these enter the product via the packaging.

› Indirect contact:
Compressed air is mixed with normal ambient air in an application and contacts the product/packaging in a so-called “diluted” form.

Definition to DIN-ISO 8573-1

Direct product contact:

- Particle Class 1 (1,0 µm)
- PDP Class 2 (-40°C)
- Residual oil Class 1 (0,01 mg/m³)

Indirect product contact:

- Particle Class 2 (1,0 µm)
- PDP Class 4 (+3°C)
- Residual oil Class 2 (0,1 mg/m³)

Do you know the quality of your compressed air?

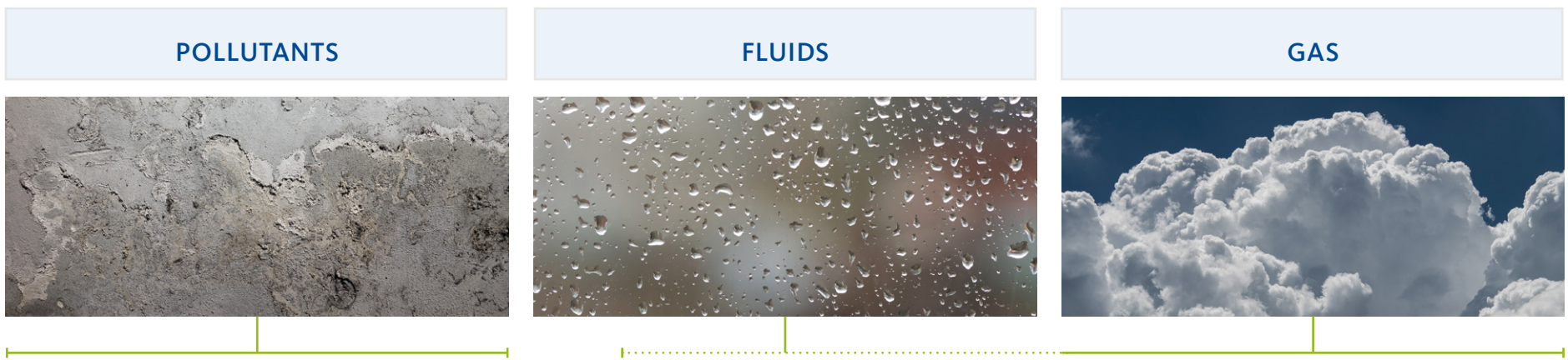
Compressors often suck in considerable pollutant quantities with the atmospheric air. If it is not known which impurities are contained in the aspiration air, then it is impossible to ensure precisely defined compressed air quality classes without appropriate treatment. This is regardless of the type of air compression involved

Contamination is also possible with oil-free compressing compressors!

This situation also does not alter even when individual compressed air system components, such as the compressor, are certified with quality class 0 for special aspiration conditions.

› **It is therefore essential for a safe process to, on the one hand measure the compressed air faultlessly and, on the other hand, to inspect whether it complies with the specified requirements.**

Figure 2: Possible contaminations in compressed air



These factors are dangers for producing companies:

1) Intake air: Exposure to water vapour, dirt, oil vapour, micro-organisms
2) Compressor with after cooler: Additional exposure to compressor oil, oil aerosols, oil vapour, water, water aerosols
3) Compressed air storage and distribution: additional exposure caused by rust, pipe contamination, condensate
4) Insufficient compressed air treatment
5) Older or material-mixed pipework systems

› An incorrect design, installation, operation as well as poor maintenance for compressors and treatment components can also result in contamination.

Unclear legal position

Food production is of course already subjected to general quality and safety standards. There are however no nationally or internationally recognised guidelines existing which deal directly with the use of compressed air in the food production process. The BRC Global Standard for Food Safety only actually states:

"Air, other gases and steam used directly in contact with, or as an ingredient in, products shall be monitored to ensure this does not represent a contamination risk. Compressed air used directly in contact with the product shall be filtered".

As opposed to gas, water and electricity, which in most cases are supplied by external suppliers and are subject to strict tolerances and specifications, compressed air is usually generated locally by the user and provided for different areas of application with different quality requirements.

However: Compressed air monitoring is imperative:

According to Ordinance (EC) No. 178/2002, manufacturers are nevertheless obliged to generate a safe product. Producing companies themselves are responsible for monitoring their compressed air quality because compressed air quality has a direct impact on the safety of the end product.

The Hazard Analysis and Critical Control Points concept (HACCP) as well as the Operational Preventive Programme (OPRP) also require compliance with specified limiting values by utilising continuous measuring (24/7).

› The requirements for a safe manufacturing process not only apply for your own production process rather also for every upstream supplier. The auditors now therefore inspect the whole production processes, from suppliers up to the compressor room.

Specific compressed air standards and regulations

Companies and food controllers utilise international standards as guideline values. ISO 8573-1:2010, for example, represents the quality requirements for compressed air and specifies the maximum content of pollutant quantities and particle sizes that may be contained in the respective classes. The following applies for food industries: Hazardous and dangerous sources cannot enter the food via compressed air.

› ISO 22000 › HACCP › OPRP
OPRPs are used to reduce the likelihood that products and/or the processing envoronment will be exposed to hazards, that they will be contaminated, and that hazards will proliferate.

Purity classes from ISO 8573-1:2010

Class	Solid particles, maximum number of particles per m³			Pressure dew point	Oil content (liquid, aerosol, oil vapour)
	0,1 µm < d ≤ 0,5 µm	0,5 µm < d ≤ 1,0 µm	1,0 µm < d ≤ 5,0 µm	°C	mg/m³
0	In accordance with the device operator's or supplier's specification, 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	> 5
6	–	–	–	≤ +10	–
	Maximum particle number in µm/per m³ measured pursuant to ISO 8573-4 Reference conditions 1 bar absolute, 20°C, 0% relative humidity			Maximum pressure dew point measured pursuant to ISO 8573-3	Maximum total oil content measured pursuant to ISO 8573-2 and ISO 8573-5, reference conditions 1 bar absolute, 20°C, 0% relative humidity
	not specified				

It is your responsibility!

Check list

Producing companies in the food industry must guarantee that...

- ... The product must not be contaminated with undesired contaminations.
- ... No undesirable flavouring substances are released into the product with direct contact with the product.
- ... No humidity or moisture is released into the dry product with direct contact with the product.
- ... No micro-organisms, which could negatively affect the product (e.g. shelf life, sterility), can enter the product with direct contact with the not dry (perishable) products.

Where compressed air treatment and processing is essential

Examples from the food industry

MEGGLE

The Meggle dairy company utilises compressed air for manufacturing lactose for the food and pharmaceutical industries. Compressed air comes into direct contact with the lactose powder as a conveying medium. Meggle utilises a heat-regenerating adsorption dryer to dry the compressed air, in which the compression heat from the compressors is used to for desorbing the desiccant.

RHEINFELSQUELLEN

Compressed air is utilised to fill CO^2-free products to create an air cushion in containers or tanks in the production of mineral water at Rheinfelsquellen. „We operate a 24/6 plant and therefore need technology that guarantees 100% process safety. Oil-free compressed air is one of the key elements to ensure this," explains Björn Rinke, head of electrical technology at RheinfelsQuellen in Duisburg-Walsum.

NÖLKE

The poultry processed meat manufacturer Nölke utilises measurement technology for online quality monitoring of compressed air. Compressed air is primarily used as control air for the production systems in processed meat production, but it also comes into contact with the product at a some other points and must therefore satisfy the highest quality requirements. Real-time monitoring of important parameters such as the residual oil content in the compressed air enables Nölke to control its compressed air quality at all times.

Which solutions are suitable for my compressed air system?

BEKO TECHNOLOGIES specialises in comprehensive and reliable treatment, processing and management for compressed air. The complex processes and interrelationships require a deep technical understanding regarding the compressed air production medium. Processes for food industries also require specialist knowledge. Close collaboration with food institutes and control institutions enables us to understand the requirements and challenges of your industry and help you find the most efficient and secure solution for your compressed air system.

- **Compressed air treatment**
  Our specific solutions for compressed air treatment and processing provide you with dry, oil-free and germ-free compressed air of the highest quality. We therefore exceed the high quality requirements from DIN ISO 8573-1, Class 1 oil content and always ensure safety with regard to food safety.

- **Monitoring**
  Quality is the always the result of controlled processes. Measuring technology from **BEKO** TECHNOLOGIES provides you with instruments which deliver the database for monitoring and evaluating important compressed air parameters such as residual vapour content, volume flow rate, pressure, relative humidity and dew point. The measured data enables you to see concealed information: the quality of your compressed air and therefore the efficiency and safety of your production.

Industry-specific compressed air solutions provide you with dry, sterile compressed air of the highest quality and exceed the applicable quality and hygiene requirements.

BEKO TECHNOLOGIES **– WE REPRESENT FOOD SAFETY.**

Do you have any additional questions for optimum treatment for your compressed air?

We have the answers – and suitable solutions for the complete treatment and processing chain. We will be pleased to present our products for the fields of condensate treatment, filtration, drying, measuring and process technology as well as our comprehensive services.

This is **BEKO** TECHNOLOGIES:

- Established in 1982 by Berthold Koch
- Independent, family-owned company
- Head office based in Neuss, Germany
- Operates production plants in Germany, the USA, India and China
- Global sales network
- Committed to the highest quality standards
- Certified according to EN ISO 9001:2008

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