camfil
CLEAN AIR SOLUTIONS

AUDITORS GUIDE

TO AIR QUALITY INSPECTIONS

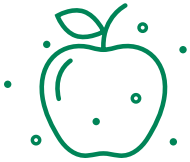
The importance of air quality in food and beverage production

Air is present in all areas of food production facilities and should be considered a vital ingredient within the production process. From office buildings, to your production floor and including controlled environments, good air quality standards are important to ensure optimal operation of your food and beverage production facility.

Why air quality?

There are a number of different reasons why air quality needs to be part of a regimented quality programme within your facility. These include:

Poor air quality can affect the **health of your employees** by exposing the workers to airborne contaminants such as Particulate Matter, Dust, bacteria and viruses. This prolonged exposure can lead to increased absenteeism within the workforce which in turn reduces operational efficiencies.

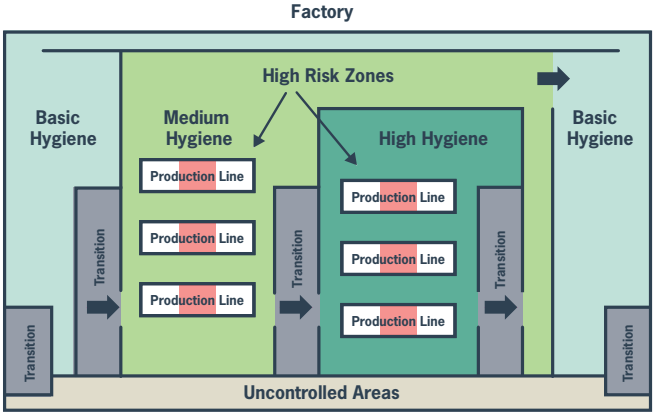


Cross contamination is a big risk to your product and your brand. In areas of poor air quality the risk of product contamination is increased. Cross contamination can lead to product recalls and damage your companies brand reputation.

Poor air quality does not only affect your people and your products but it can also affect **the environment**. From reducing odour emissions to reducing CO_2 emissions, understanding the clean air systems within a food production facility is a key task for all quality and engineering teams.

Zoning air quality requirements in factories

Food and beverage production areas are often already zoned according to the processes that are undertaken within an area. Did you know that these zones all have their own air quality requirements? To help identify the zones in your facility we use the below definitions:



Basic hygiene areas

Are identified as areas where the food that is stored is unlikely to contain pathogenic microorganisms and will not normally support their growth due to food characteristics. These areas include: **Raw ingredient storage areas**.

Medium hygiene areas

Are identified as areas where the food may contain pathogenic microorganisms but will not support their growth due to food characteristics. Areas include: **Raw material prep areas**.

High hygiene areas

Are identified as an area where a Microbiological Reduction Process is followed by ensuring sufficient air changes and high air quality is achieved. These areas include: **Ready meal production areas.**

High risk areas

Are areas where a Microbiological Prevention Process is followed. These areas require sufficent air changes as well as creating a negative/under-pressure environment. These include areas with **finished product for human consumption**.

Uncontrolled areas

Areas that have no food contact. These areas are often people occupied areas such as **offices, meeting rooms and common areas**. Air quality is important to ensure the health and wellbeing of staff.

Air quality regulations and standards

For the use of air filters in commercial or Industrial buildings there are standards based on efficiency, selection and energy consumption that need to be considered. Understanding these standards is a first step to ensuring increased protection without compromising on energy costs.

Efficiency standard: ISO 16890

ISO 16890 is the international standard for filtration efficiency. This standard classifies your filter selection based on its performance against different particulate ranges. ISO 16890 classifies the performance of your air filter into three main classifications ePM1, ePM2.5 and ePM10 filters. The ISO 16890 standard replaced EN779:2012 for European filter classification, while for North America, ASHRAE 52.2 is still the predominant standard.

Typical efficiencies of air filters against PM1 and other fine dust mass concentrations

Filter class	PM1	PM2.5	PM10
M5	<20%	<40%	**≥50%**
M6	<40%	**≥50%**	**≥60%**
F7	**≥50%**	≥70%	≥80%
F8	**≥70%**	≥80%	≥90%
F9	**≥80%**	≥90%	≥95%

PM1 = **P**articulate **M**atter **1** (1 micron and below)

Selection standard: Eurovent 4/23

Eurovent 4/23 was first developed in 2017 with further iterations released in 2018 and 2020. The standard gives clear guidance on the filtration efficiency that should be chosen depending on the commercial and industrial use of the building. When adapting this to the zoning requirements, minimum filtration efficencies are easily identified based upon the process.

Risk/Hygiene level	ODA 1	ODA 2	ODA 3
Low risk/Basic hygiene	$ePM_{2.5}$ = 50%	$ePM_{2.5}$ = 70%	$ePM_{2.5}$ = 80%
High care/High hygiene/ High risk	ePM_{1} = 50%	ePM_{1} = 70%	ePM_{1} = 80%

Outdoor Air (ODA) – The outdoor air quality is determined by WHO guidelines

Energy consumption and your filter

Energy is not consumed by the air filter, the energy is consumed by the fan within the HVAC system. The filter is a cause of pressure drop in the HVAC system. The higher the pressure drop, the harder the fan needs to work in order to maintain air volume. Whilst the filter can account for up to 30% of the total energy consumption in the HVAC system, it is an easily exchangeable maintenance part of a HVAC system so a low energy consuming, long life filter has a great influence on the total cost of ownership.

Energy consumption standard: Eurovent 4/21

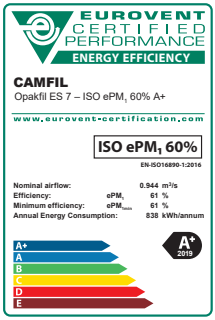
Since the air filter can account for such a large proportion of the total energy costs of the HVAC system, a new energy rating was developed in 2014 with the newest update encompassing the ISO 16890 classifications. In this the air filters are grouped together according to their efficiencies with a Energy rating from A+ to E being determined by the direct effect the filter has on energy.

M_x = 200 g (AC Fine)	AEC in kWh/y for ePM_1 (ePM_1 and $ePM_{1,min} \geq 50\%$)					
	A+	A	B	C	D	E
50 & 55%	800	900	1050	1400	2000	>2000
60 & 65%	850	950	1100	1450	2050	>2050
70 & 75%	950	1100	1250	1550	2150	>2150
80 % 85%	1050	1250	1450	1800	2400	>2400
> 90%	1200	1400	1550	1900	2500	>2500

M_x = 250 g (AC Fine)	AEC in kWh/y for $ePM_{2.5}$ ($ePM_{2.5}$ and $ePM_{2.5,min} \geq 50\%$)					
	A+	A	B	C	D	E
50 & 55%	700	800	950	1300	1900	>1900
60 & 65%	750	850	1000	1350	1950	>1950
70 & 75%	800	900	1050	1400	2000	>2000
80 % 85%	900	1000	1200	1500	2100	>2100
> 90%	1000	1100	1300	1600	2200	>2200

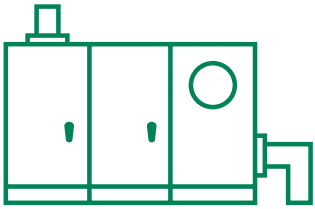
Where to find your energy rating

Every filter that has been tested and certified against the Eurovent 4/21 standard must display the energy rating on the box. The label shows the standard design of all Eurovent tested air filters. On the label you can note 1) The Filtration efficiency 2) the Annual Energy consumption and 3) The rating of the filter. This ensures easy and quick comparison between different filter options.



Air quality inspection guide

When auditing your facilities air quality there are three main areas that need to be focussed upon: Your supply air systems, your exhaust air systems and your building condition and requirements. To help ensure that your facilities meets minimum air quality requirements there are a number of key checks that should be undertaken. This will help identify that the air quality is fit for purpose and protect the people, the products and the environment.



Your **supply air system** is a critical area to inspect. Ensuring that the system achieves recommended filtration levels and air changes is of the utmost importance to protecting your facility from all potential air quality issues. A visual inspection is needed of all HVAC systems within the facility to ensure cleanliness levels are achieved.

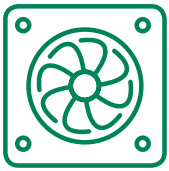
Supply air system checklist

Air filter checks

- ☐ ISO 16890 certified
- ☐ Minimum filtration (Eurovent 4/23)
- ☐ Eurovent 4/21 certified
- ☐ Filter frame condition
- ☐ No filter bypass
- ☐ Microbial growth on the filter

System checks

- ☐ Pressure drop readings
- ☐ Ducts clean
- ☐ Supply/recirculation air ratio
- ☐ Number of air changes
- ☐ Stagnant water build up
- ☐ Fan belt aligned



Food processing facilities will often have **dust extraction system, odour control systems and other exhaust air applications.** Ensuring these systems are fully monitored and functional is a key activity. A report of the dust and/or odours that these systems are removing is needed to ensure compatibility with its function.

Exhaust air system checklists

Dust collection checks	Odour control checks
☐ System operational	☐ System operational
☐ Filters present	☐ Carbon media certification ISO 10121
☐ Pressure drop readings	☐ Carbon media suitability report
☐ Dust analysis report	☐ Odour complaints log

When inspecting **production areas** often the your main tools are going to be your senses. Use your eyes to observe dust build up or mould growth on equipment. Use your nose to detect any uncommon odours that may affect workers. Ensuring that all areas are properly zoned will help understand the system requirements.

Factory air quality assessment

☐ All areas adequately zoned	☐ Dust build up on machinery
☐ Nuisance odours	☐ Particulate monitoring
☐ Microbial growth monitoring	

Camfil – a global leader in air filters and clean air solutions

For more than half a century, Camfil has been helping people breathe cleaner air. As a leading manufacturer of premium clean air solutions, we provide commercial and industrial systems for air filtration and air pollution control that improve worker and equipment productivity, minimize energy use and benefit human health and the environment.

We firmly believe that the best solutions for our customers are the best solutions for our planet, too. That's why every step of the way – from design to delivery and across the product life cycle – we consider the impact of what we do on people and on the world around us. Through a fresh approach to problem-solving, innovative design, precise process control and a strong customer focus we aim to conserve more, use less and find better ways – so we can all breathe easier.

The Camfil Group is headquartered in Stockholm, Sweden and has 33 manufacturing sites, six R&D centres, local sales offices in 30 countries and 4,800 employees and growing. We proudly serve and support customers in a wide variety of industries and in communities across the world. To discover how Camfil can help you to protect people, processes and the environment.

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