FOOD & BEVERAGE

Intro / Application / BRCGS / Standards / ProSafe

Ross Dumigan
F&B Segment Manager CEBI

ISO International Organization for Standardization

BRCGS | In Partnership with camfil

CLEAN AIR SOLUTIONS

ROSS DUMIGAN – F&B SEGMENT MANAGER CEBI

- 15 years with Camfil.
- Based in Cork, Ireland
- Mechanical Engineering / Accounting and Business
- F&B / Pharma / Medical Devices / Microelectronics / Power Generation / Data Centres
- Interests are Food / Rugby / Diving / Surfing / Cycling.

OUR VISION

Making CLEAN AIR a human right.
Just like clean water.

camfil

OUR MISSION

PROTECTING PEOPLE, processes and the environment by defining, developing and delivering filter solutions that combine clean air with energy efficiency, in a sustainable and profitable way.

OUR CORE VALUES — THE SOUL OF OUR COMPANY

RELIABILITY

We are reliable because we know the market and are honest and truthful. Our people, products and processes must always meet or exceed agreed results.

COMMITMENT

We are committed to always striving for the best possible solutions and we stand at the forefront of technological and environmental developments in our fields of expertise.

CUSTOMER SATISFACTION

We put our customers first, identifying customer needs and creating long-lasting customer value.

TEAMWORK

Working together makes us stronger and increases employee satisfaction both locally and globally.

LOCAL PRESENCE

Local understanding and presence on local markets builds customer relations and satisfaction.

ABOUT CAMFIL

2019 Mark Simmons
CEO & President of Camfil AB

HQ in Stockholm, Sweden

55+
Years of
clean air expertise
1963 Gösta Larson founded
Camfil AB in Trosa, Sweden

4500
Employees

8300
Million SEK
net sales

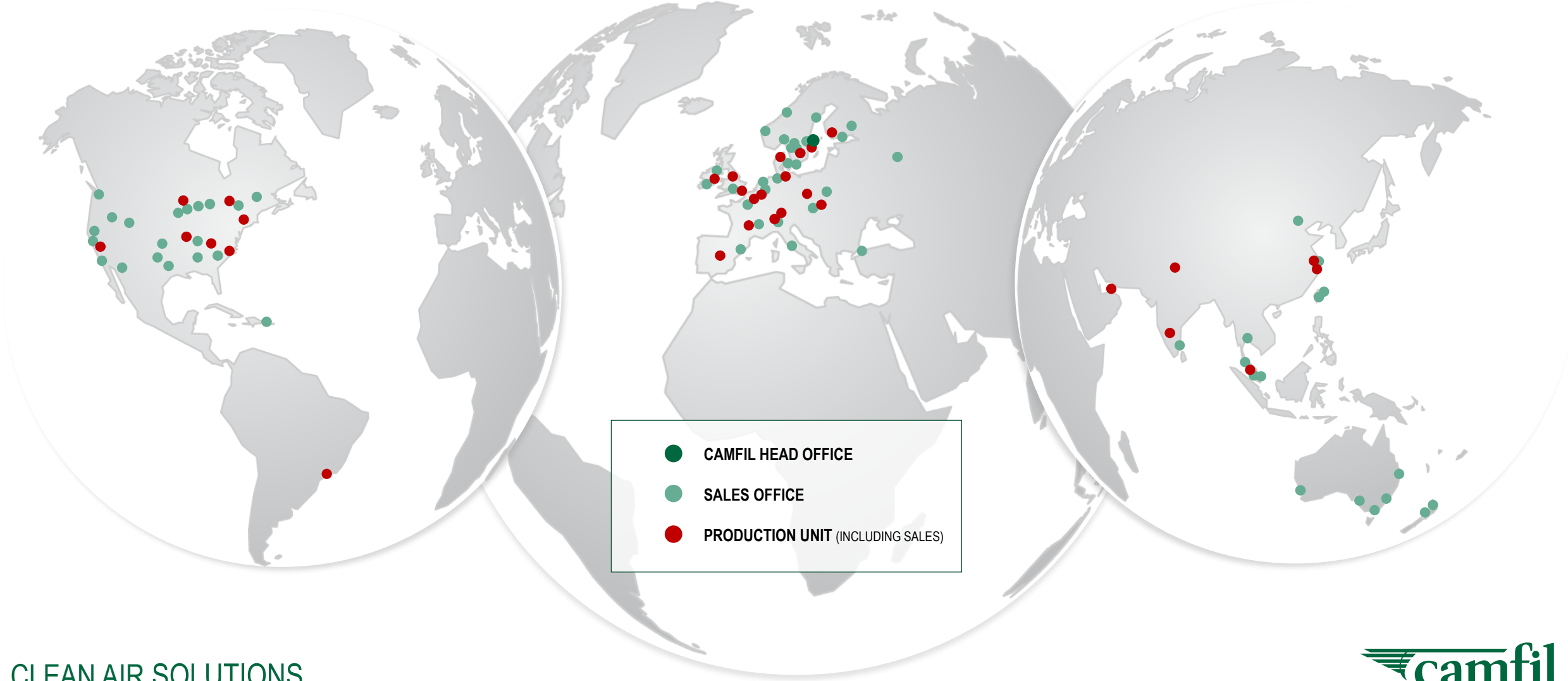
30
Manufacturing
sites

6
R&D centres

30
Countries with
sales offices

camfil

CAMFIL AROUND THE WORLD



CLEAN AIR SOLUTIONS

camfil

BUSINESS AREAS & PRODUCTS

FILTRATION SOLUTIONS (HVAC)

Air Handling Units & Filter Supplies

- Comfort
- Cleanrooms
- Industrial
- Containment

AIR POLLUTION CONTROL

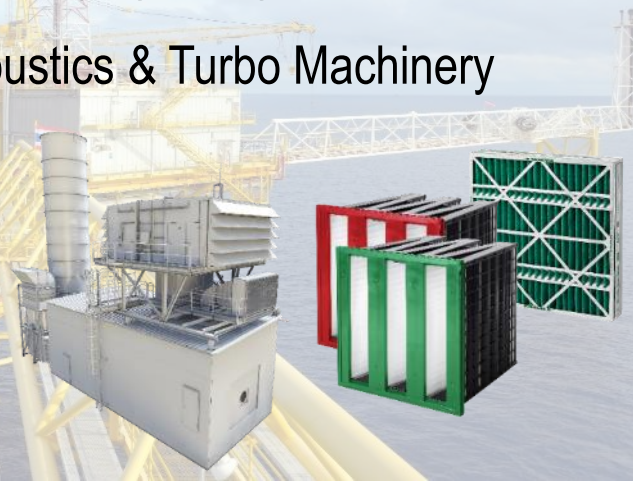
Industrial Dust, Fume & Mist Collection

- Dust
- Fume
- Mist

POWER SYSTEMS

Air Filters for Acoustics & Turbo Machinery

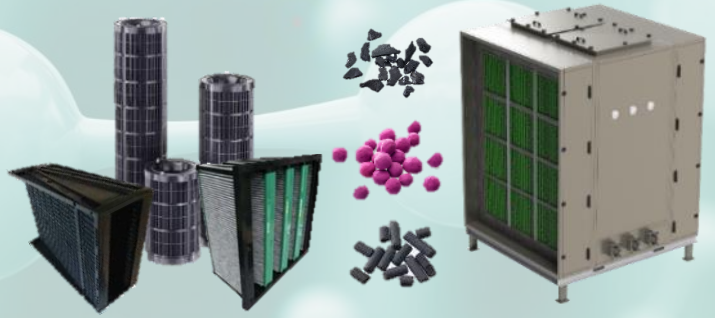
- Power Generation
- Compressors
- Oil & Gas



MOLECULAR CONTAMINATION CONTROL

Air Filters for Harmful Gases & Odours

- Gases
- Odours
- Corrosion control



CAMFIL TECH CENTRE IN SWEDEN STATE-OF-THE-ART RESEARCH FACILITY

"We do what is required of us to have the best understanding of our customers' air quality problems and the optimum solutions to resolve them." (Owner's Directive)

GAS TURBINE + AIR POLLUTION CONTROL TEST RIGS

MOLECULAR + PARTICLE TEST RIGS

IAQ LABORATORY

HEPA LABORATORY

CLASSROOMS

SCANNING ELECTRON MICROSCOPE (SEM)

QUALITY FIRST

Camfil started with high-quality products for the nuclear market and we want to continue this heritage in all our activities. We want everyone in Camfil to be proud of what we design, develop and deliver to all our customers worldwide.

camfil

WHAT'S ON THE BOX IS IN THE BOX

OWNER'S DIRECTIVE

At Camfil we are honest, trustworthy and deliver on our promises.

CLEAN AIR SOLUTIONS

camfil

SUSTAINABILITY

OWNER'S DIRECTIVE

Camfil has been focused on sustainability since 1963. As sustainability becomes increasingly important and requested by customers, we need to ensure that we keep this focus.

Sustainability should not be something we do – **IT SHOULD BE WHO WE ARE.**

SUSTAINABILITY — A PART OF OUR DNA

- Designing environmental aspects into our company's product line is a Camfil priority. In return, we are able to make workplaces greener as well.
- By maintaining a constant dialogue with our customers, filter media suppliers and evolving our product designs, we are able to reduce the air-flow resistance of our filters, directly improving the energy efficiency of ventilation systems that use our products in air handling units and other filtration systems.
- We can work with customers to determine life cycle cost and total cost of ownership for any products going into facilities.

CAMFIL & UNITED NATIONS GOALS

Camfil aligns its strategy with the **UN SUSTAINABLE DEVELOPMENT GOALS**. We identified four goals that are the most relevant to our business and enable us to provide the most meaningful global contribution.

GOOD HEALTH AND WELL-BEING

High indoor air quality that promotes good health and well-being

DECENT WORK AND ECONOMIC GROWTH

Satisfactory working conditions for 4,500 employees at 30 manufacturing plants

SUSTAINABLE CITIES AND COMMUNITIES

The most energy-efficient clean air solutions on the market

RESPONSIBLE CONSUMPTION AND PRODUCTION

Production plants' environmental impact is continuously being reduced

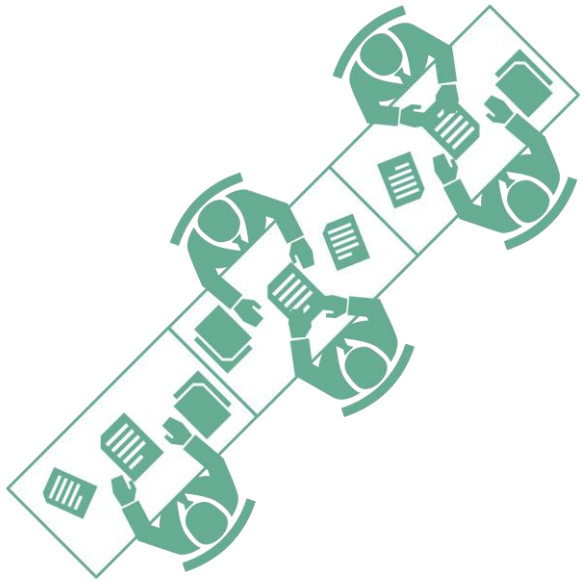
THE AIR WE BREATHE

Humans eat **1 kg** food/day

Humans drink **2 kg** fluids/day

Humans breathe **15 kg** air/day

We spend up to **90%** of our life indoors. This means that indoor air quality (IAQ) can substantially influence our health.

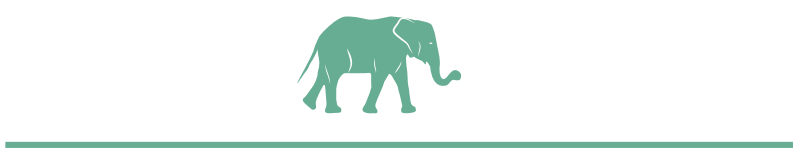


The indoor environment can be up to **50 times** more polluted than outdoor air.

LET'S COMPARE DIFFERENT SIZED PARTICLES

The blue whale, elephant and man are a good analogy for 10µm, 2.5µm and 1µm sized particles in terms of their relative size and relative mass and the number in our environment.

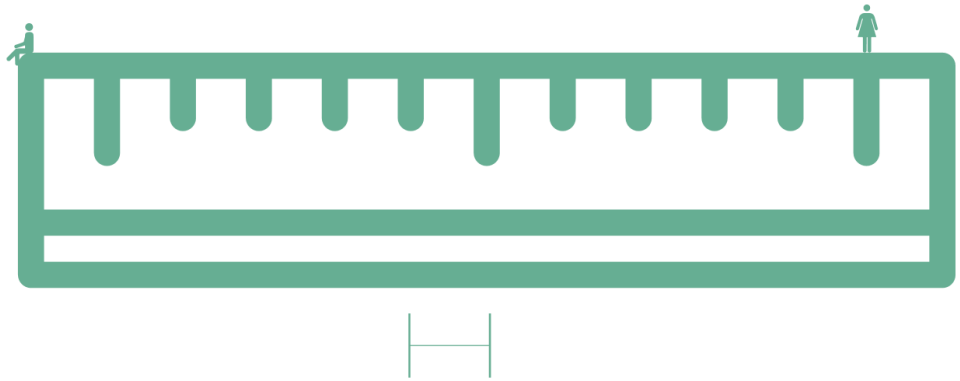
PM1 <1µm particle | Human | 80 KG | more than 7 billion living



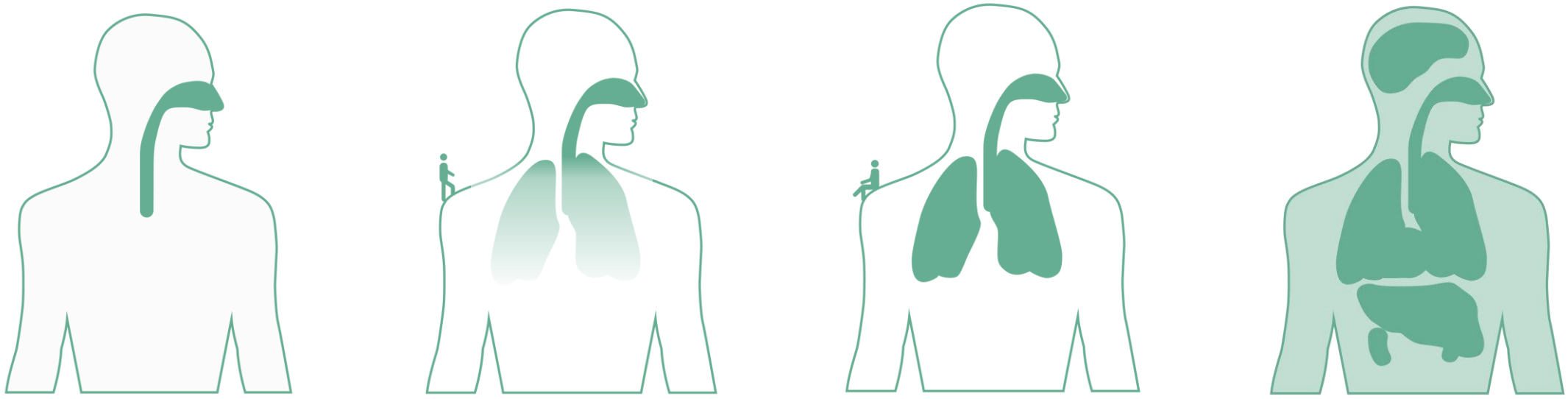
PM 2.5 <2,5 µm particle | Elephant | 6Ton| less than 1 million living

PM10 <10 µm particle | Blue Whale | 200 Ton| less than 25,000 living

PM1 is smaller than 1/1000th of a millimetre



PENETRATION OF PARTICLES AND GASES INTO THE BODY



PM10 Size <10µm
Coarse particles.
Upper respiratory tract

PM2.5 Size <2.5µm
Fine particles.
Lower respiratory tract

PM1 Size <1µm
Inhaleable particles
Alveoli

Size <0.1µm
Ultrafine particles and gas
Bloodstream / whole body

PM1 — PEOPLE MATTER 1ST

We need to place air quality at the top of the environmental and human health agenda.

We need to understand the effect of particulate matter on our health, finding solutions to protect people inside our buildings.

OUR PROMISE TO OUR CUSTOMERS

Your trusted leader in commercial and industrial clean air solutions. Our mission is to protect people, processes and the environment from harmful particles and gases by defining, developing and delivering solutions that combine clean air with energy efficiency in a sustainable way.

CLEAN AIR MADE FOR IMPROVING LIFE

camfil

AGENDA

- IAQ Definitions
- Applications
- Food Production Area’s
- New BRCGS Air Quality Standard – Why?
- Air Quality Standards “ A Brief History”
- Compliance
- ISO 16890
- EN16798-3:2017
- Eurovent 4-23 & RS4/C
- Molecular Filtration Guidance
- Risk Mitigation
- Maintenance & Condition Monitoring
- ProSafe Products
- AirCair Services
- Questions

I A Q definition

Indoor air quality refers to the quality of the air inside buildings as represented by concentrations of pollutants and thermal conditions that affect the health, comfort and performance of occupants.

How air enters a building through HVAC

1. Air is coming from the outdoor air untreated
2. Air being filtrated through a classified filter in one or several filter steps
3. Air passing through a heat exchanger
4. Air supplied to the room
5. Air Exhaust from the rooms
6. Exhaust air being filtrated through a classified filter in one or several filter steps
7. Air passing through a heat exchanger
8. Filtrated and heat exchanged air return to the outdoor air.

HOW DOES AIR QUALITY IMPACT ON PRODUCTION?

- Product Contamination
- Employee Health
- Odour emissions effecting general public
- Product Shelf Life
- Labour Costs
- Production Cost
- Energy Costs

WHAT ARE WE SEEING IN THE F&B MARKET

- Limited Knowledge
- Poor Understanding
- Commercially driven – Cheap
- Lack of accountability – Outsourcing to FM / MRO Companies
- Product call backs – Brand Damage, Reduction of Consumer Confidence
- Companies are receiving fines
- Questionable companies without standards supplying sites.
- Centralising of data!
- Consolidating of suppliers!
- Agreements are being put in place!

APPLICATIONS

- Dairy
- Beverage
- Ready To Eat or R.T.E.

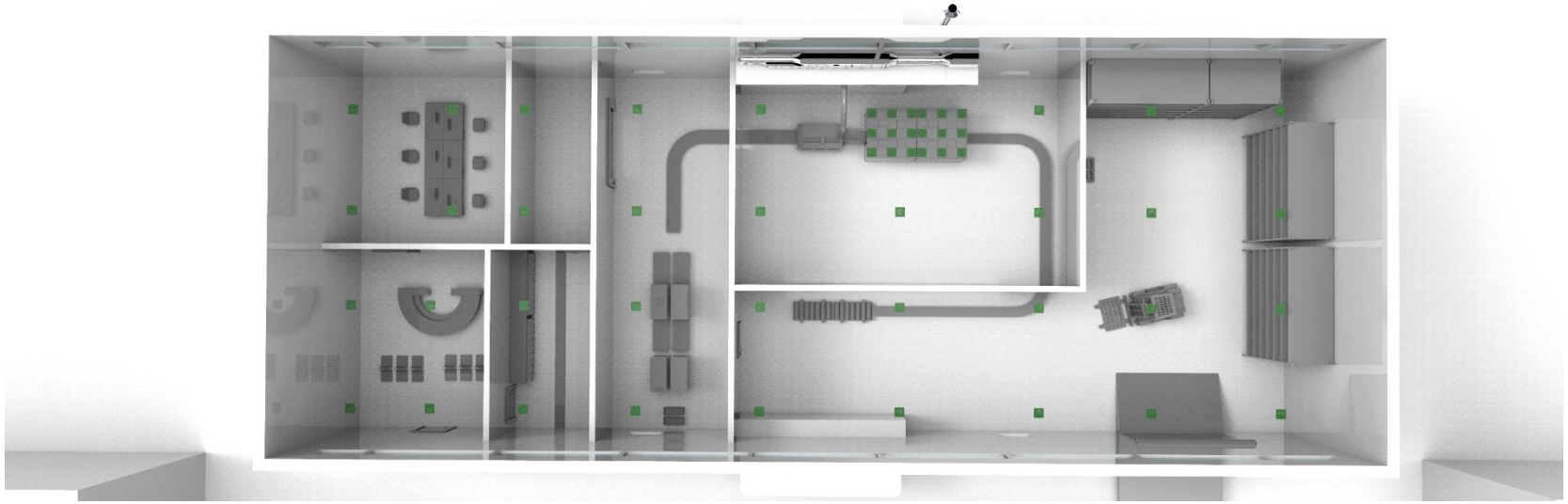
SPRAY DRYER APPLICATION

https://www.youtube.com/watch?v=G4kf60Nrymk&feature=share

ASEPTIC FILLING

https://youtu.be/GLwbLKqQg2I

Ready Meals



PRODUCTION AIR QUALITY SUPPLY

PRODUCTION AIR QUALITY EXTRACT

LOW CARE AREAS – BASIC HYGIENE

- Food that is unlikely to contain pathogenic microorganisms and will not normally support their growth due to food characteristics.
- Fruit & Vegetable / Grains / Cereals / Bakery / Alcohol Production / Storage areas.
- Pre-Filters / CamCleaner / Molecular Filters

MEDIUM CARE AREAS – MEDIUM HYGIENE

- Food that may contain pathogenic microorganisms but will not support their growth due to food characteristics.
- Raw Material Prep / Processed / Packaged /
- Juice Production , Canned goods, Milk products, peanut Butter / Dried Goods Filling / Tipping Stations / Meat Packaging etc..
- Pre Filters / Fine Filters / Molecular / CamCleaner

HIGH CARE AREAS

- An area where Microbiological REDUCTION Process is followed by ensuring sufficient air changes.
- Sandwich / Salads / Ready Meals
- Pre Filters / Fine Filters / Molecular / Hepa Filters / Terminal Housings / CamCleaner

HIGH RISK AREAS – HIGH HYGIENE

- An area where Microbiological PREVENTION Process is followed. Sufficient air changes & Under Positive Pressure.
- Finished product for human consumption.
- Aseptic Filling / Cooked Meals or Meats / Tasting Areas / Washing Areas / Ice Cream
- Pre Filters / Fine Filters / Molecular / Hepa or Ulpa Filters / Terminal Housings

F&B Plant Development Industry Bodies

STANDARDS AGENCIES

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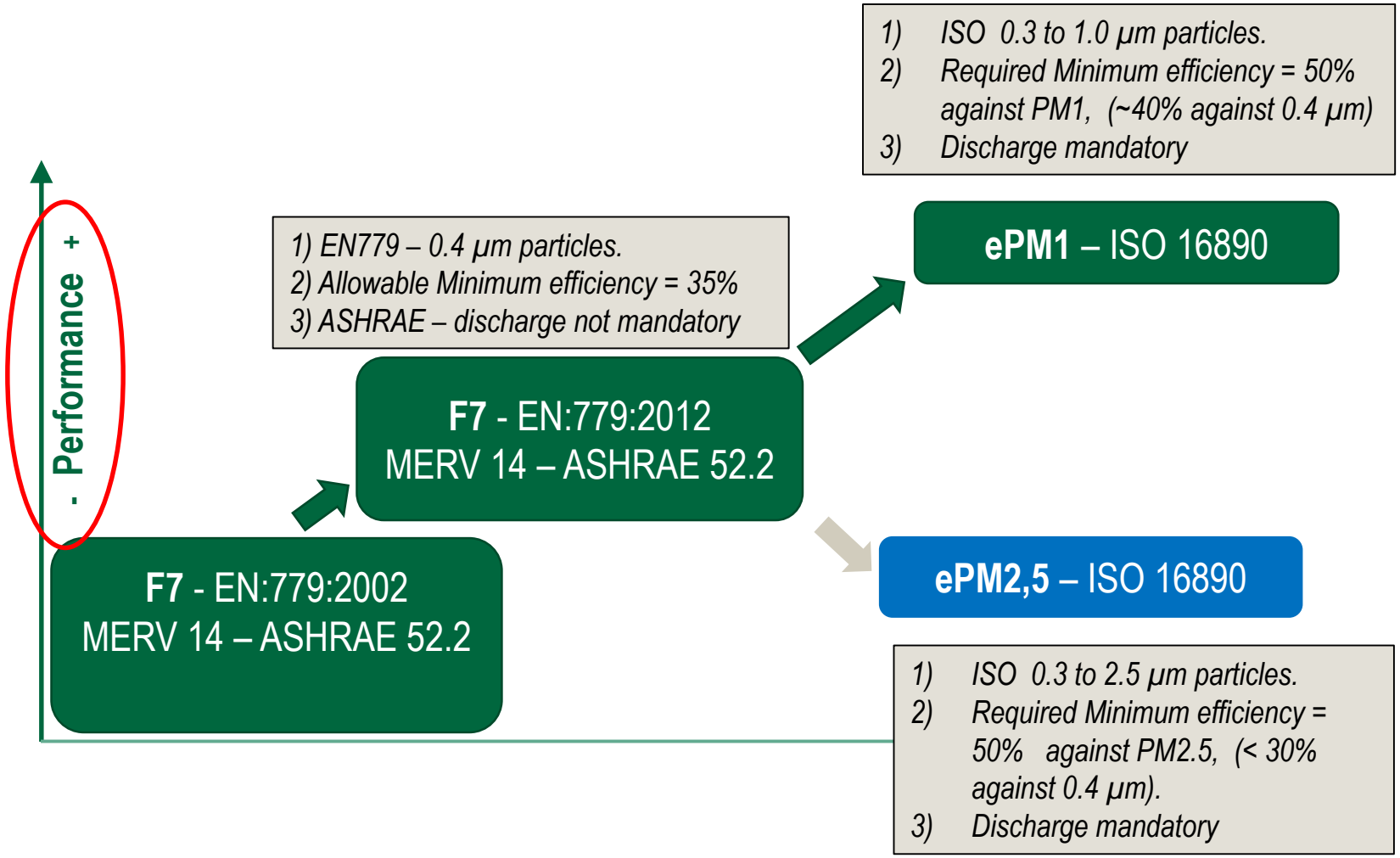
PM1 VS PM2.5

ISO 16890 – Impact of Classification on Air Quality



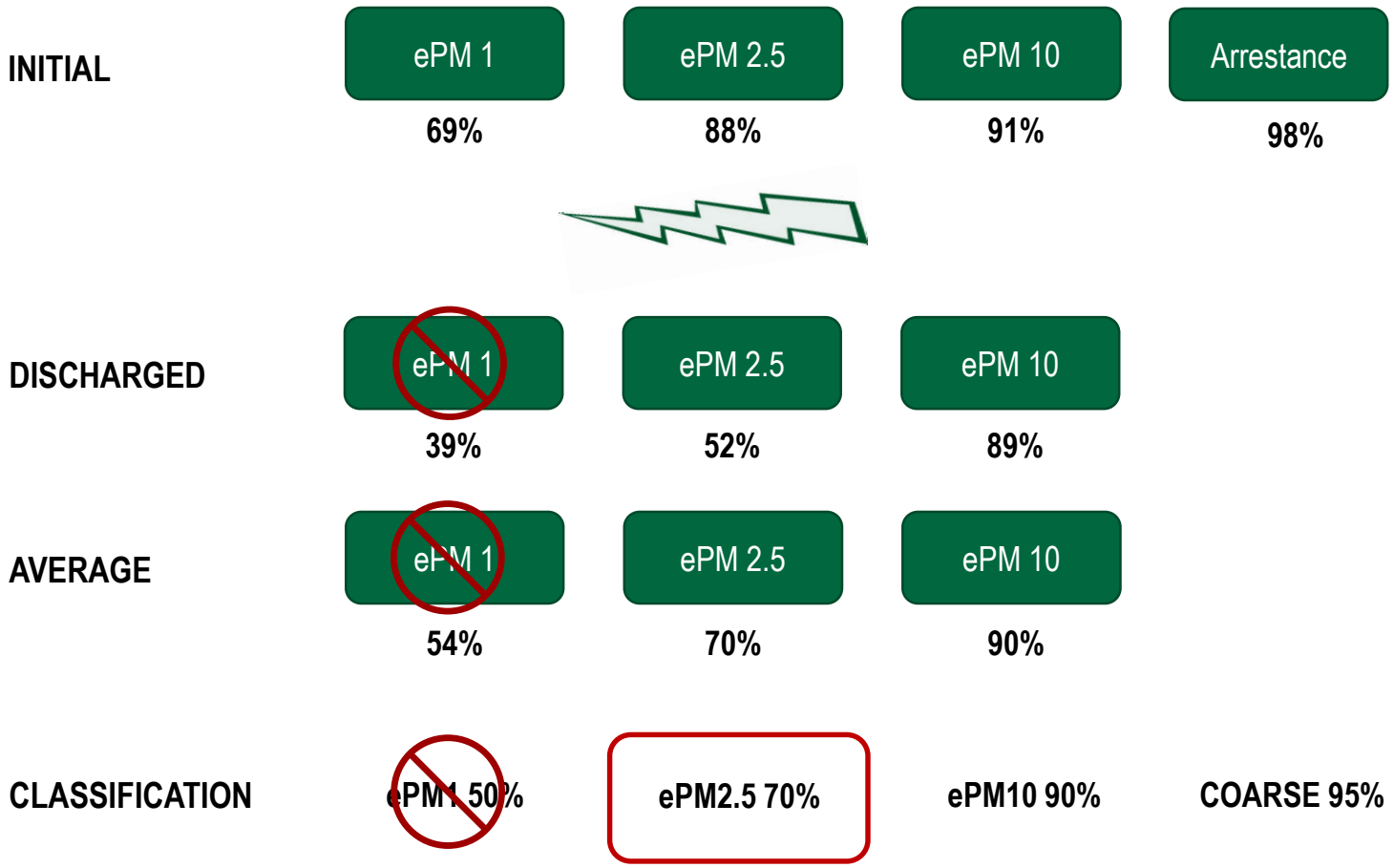
EXAMPLE: FILTER 1

Fine fibre filter media without electrostatic charge

INITIAL	ePM 1	ePM 2.5	ePM 10	Arrestance
	65%	74%	93%	99%
DISCHARGED	ePM 1	ePM 2.5	ePM 10	
	64%	74%	93%	
AVERAGE	ePM 1	ePM 2.5	ePM 10	
	64%	74%	93%	
CLASSIFICATION	ePM1 60%	ePM2.5 70%	ePM10 90%	COARSE 95%

EXAMPLE: FILTER 2

Coarse fibre filter media with electrostatic charge


INITIAL
ePM 1
ePM 2.5
ePM 10
Arrestance
69%
88%
91%
98%
DISCHARGED
ePM 1
ePM 2.5
ePM 10
39%
52%
89%
AVERAGE
ePM 1
ePM 2.5
ePM 10
54%
70%
90%
CLASSIFICATION
ePM1 50%
ePM2.5 70%
ePM10 90%
COARSE 95%

NEW BRC AIR QUALITY STANDARD – WHY?

- Compliance
- ISO 16890:2016
- EN16798 – 3:2017
- Easy Filter Selection
- Standardization
- Transparency

Why develop a new global test standard?

What are the customer benefits?

Recognition

–

Air filters positively influence air quality and human health

More intuitive

–

Filter efficiency and classification aligned with real world air pollution

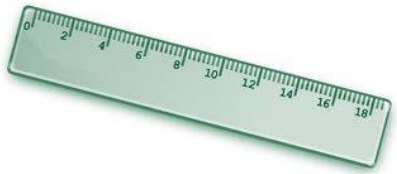
Global applicability

–

Eliminate confusion

Why develop a new global test standard?

What are the benefit for the industry:



Level playing field

–

Fair product comparison.
Drive product development.
Drive innovation and customer value.
Eliminate some low performing products.

Global standard

–

One test for all providers
Removes an obstacle to global trade

Simplicity

-

Easier to explain product value in terms of function and application

A Quality Standards a Brief History

Filtration Standards for General Air Filter

~~CEN779:2012~~

ASHRAE 52.2

International Organization for Standardization

2017 – New ISO 16890 Standard
(Focus on Particulate Matter PM1, PM2.5 & PM10)

Filtration Standards for HEPA & ULPA Filter

EN1822:2009

Energy / Environment Standards

~~Eurovent 4/21 (Energy Rating)~~

Eurovent RS4/C/001-2019 (Energy Rating)

Indoor Air Quality

In Partnership with BRGS

COMPLIANCE

- **ISO 16890:2016** Air filters for general ventilation – Part 1: Technical specifications, requirements and classification system based upon particulate matter efficiency (ePM)

  This is the new standard for the testing of air filters. From 30 June 2018 this replaced BS EN 779:2012 and provides a much better test with a clearer classification system. The test has been developed and improved over the previous test method to ensure that reported efficiencies represent the real-life performance much more accurately than the previous test method.

- **EN 16798-3:2017** Energy performance of buildings. Ventilation for buildings. For non-residential buildings. Performance requirements for ventilation and room-conditioning systems

  This standard gives much-needed guidance regarding the performance of ventilation systems and the requirements for ensuring the required air quality is achieved. It also provides a clear link to the outdoor air quality (ODA) and its impact on indoor air quality, with guidance on the air filtration specification required based on the ODA.

EN16798

2.2.1 OUTDOOR AIR QUALITY

EN 16798-3:2017 splits outdoor air quality into three categories: ODA1, ODA2 and ODA3. These are based on the World Health Organization (WHO) annual mean limits for particle sizes of 2.5 µm and 10.0 µm.

Current WHO limits for air quality are used as the basis for establishing the three ODA categories and are as follows:

- Annual mean for $PM_{2.5}$ <10 $\mu g.m^{-3}$
- Annual mean for PM_{10} <20 $\mu g.m^{-3}$

From these values the three ODA air quality categories are as follows:

- **ODA1** Applies where the WHO (2005) guidelines and any national air quality standards or regulations for outdoor air are fulfilled (i.e. $PM_{2.5}$ <10 $\mu g.m^{-3}$ and PM_{10} < 20 $\mu g.m^{-3}$)
- **ODA2** Applies where pollutant concentrations exceed the WHO guidelines or any national air quality standards or regulations for outdoor air by a factor of up to 1.5 (i.e. $PM_{2.5}$ ≤15 $\mu g.m^{-3}$ and PM_{10} ≤ 30 $\mu g.m^{-3}$)
- **ODA3** Applies where pollutant concentrations exceed the WHO guidelines or any national air quality standards or regulations for outdoor air by a factor greater than 1.5 (i.e. $PM_{2.5}$ >15 $\mu g.m^{-3}$ and PM_{10} >30 $\mu g.m^{-3}$)

EN16798

How to establish ODA

Governments and environmental authorities around the world monitor air quality; the data for this can normally be found on a national or regional government website. For example, in the UK it is available on the Department for the Environment, Food and Rural Affairs (Defra) website at https://uk-air.defra.gov.uk/data/gis-mapping. Using this website you can view historical data for air quality monitoring for the particle sizes $PM_{2.5}$ and PM_{10}.

- For data type, select 'Roadside'.
- Select either 'PM2.5 annual mean (without sea salt)' or 'PM10 annual mean (without sea salt)'.
- Select the most recent year (2015 at the date of publication).
- Enter your postcode at the bottom left and zoom until the colour coding appears, detailing the particulate levels.

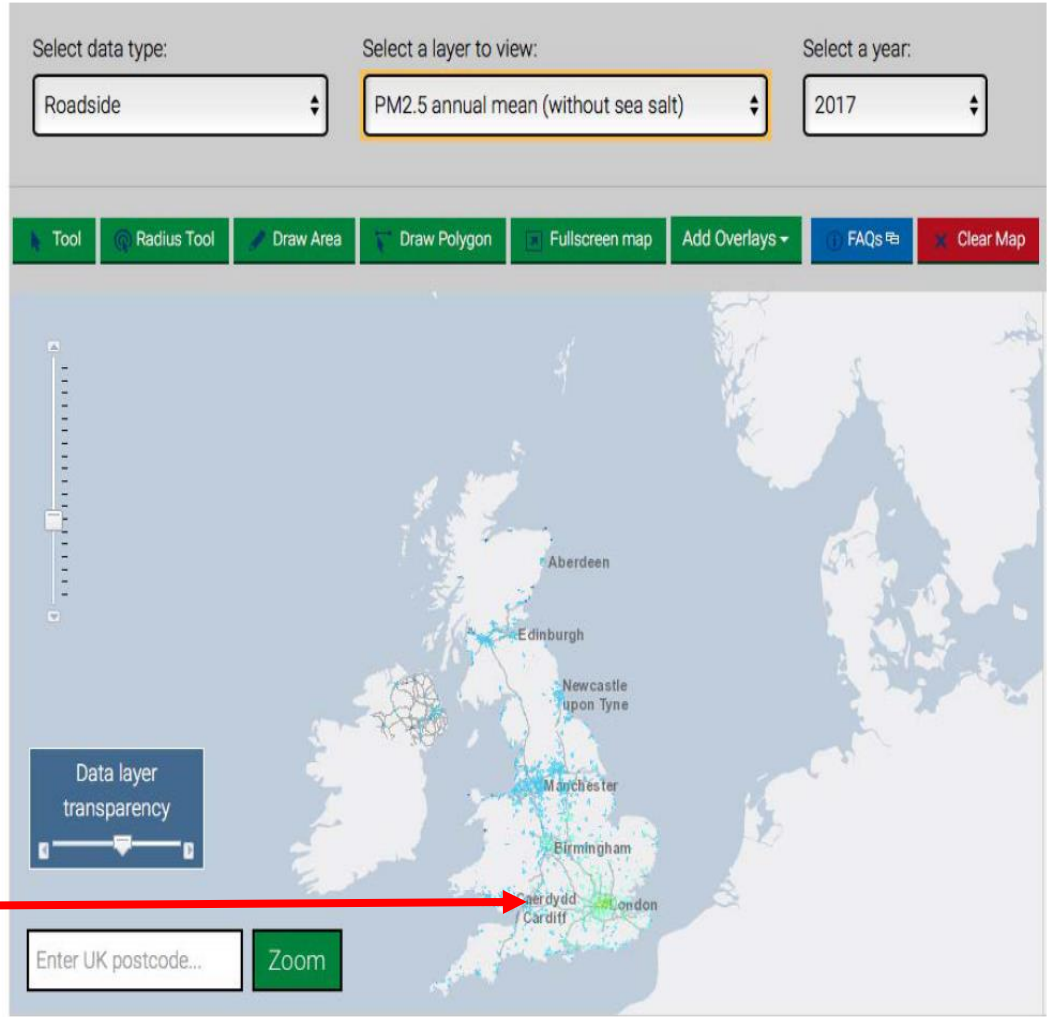
The definitions for the ODA categories set out earlier are as follows:

- ODA1 $PM_{2.5}$ annual mean <10 $\mu g.m^{-3}$
- ODA2 $PM_{2.5}$ annual mean ≤15 $\mu g.m^{-3}$
- ODA3 $PM_{2.5}$ annual mean >15 $\mu g.m^{-3}$

$PM_{2.5}$ excluding sea salt roadside concentration

Annual mean ($\mu g\ m^{-3}$)

- < 5
- 5 - 10
- 10 - 12.5
- 12.5 - 15
- 15 - 20
- 20 - 25
- 25 - 30
- > 30



EN16798-3:2017 & EUROVENT 4-21

EN 16798-3:2017 details five supply air categories (i.e. five categories defining the quality of air needed for any particular application): SUP1 to SUP5. These are defined as follows:

- **SUP1** Applications with high hygiene demands such as hospitals and the pharmaceuticals and electronics industries.

  SUP1 refers to supply air with concentrations of particulate matter which fulfil the limit values stipulated by WHO (2005) guidelines multiplied by a factor of 0.25 (i.e. annual mean for $PM_{2.5}$ is ≤2.5 µg.m^{-3} and for PM_{10} is ≤5 µg.m^{-3}).
- **SUP2** Applications with medium hygiene demands such as food and beverage production.

  SUP2 refers to supply air with concentrations of particulate matter which fulfil the limit values stipulated by WHO (2005) guidelines multiplied by a factor of 0.5 (i.e. annual mean for $PM_{2.5}$ is ≤5 µg.m^{-3} and for PM_{10} is ≤10 µg.m^{-3}).
- **SUP3** Applications with basic hygiene demands such as low-risk food and beverage production.

  SUP3 refers to supply air with concentrations of particulate matter which fulfil the limit values stipulated by WHO (2005) guidelines multiplied by a factor of 0.75 (i.e. annual mean for $PM_{2.5}$ is ≤7.5 µg.m^{-3} and for PM_{10} is ≤15 µg.m^{-3}).
- **SUP4** Applications without hygiene demands such as general production areas (e.g. automotive).

  SUP4 refers to supply air with concentrations of particulate matter which fulfil the limit values stipulated by WHO (2005) guidelines (i.e. annual mean for $PM_{2.5}$ is ≤10 µg.m^{-3} and for PM_{10} is ≤20 µg.m^{-3}).
- **SUP5** Production areas of heavy industry such as steel mills, smelters and welding plants.

  SUP5 refers to supply air with concentrations of particulate matter which fulfil the limit values stipulated by WHO (2005) guidelines multiplied by a factor of 1.5 (i.e. annual mean for $PM_{2.5}$ is ≤15 µg.m^{-3} and PM_{10} is ≤30 µg.m^{-3}).

The final step is to use Table 1 to compare ODA and SUP values to identify the appropriate filter.

	SUPPLY AIR				
	SUP1	SUP2	SUP3	SUP4	SUP5
	$PM_{2.5}$ ≤2.5 µg.m^{-3} PM_{10} ≤5 µg.m^{-3}	$PM_{2.5}$ ≤5 µg.m^{-3} PM_{10} ≤10 µg.m^{-3}	$PM_{2.5}$ ≤7.5 µg.m^{-3} PM_{10} ≤15 µg.m^{-3}	$PM_{2.5}$ ≤10 µg.m^{-3} PM_{10} ≤20 µg.m^{-3}	$PM_{2.5}$ ≤15 µg.m^{-3} PM_{10} ≤30 µg.m^{-3}
OUTDOOR AIR					
CAT	$PM_{2.5}$	PM_{10}	ePM_1*	ePM_1*	$ePM_{2.5}$*	ePM_{10}*	ePM_{10}*
ODA 1	<10 µg.m^{-3}	<20 µg.m^{-3}	70%	50%	50%	50%	50%
ODA 2	<15 µg.m^{-3}	<30 µg.m^{-3}	80%	70%	70%	80%	50%
ODA 3	<15 µg.m^{-3}	<30 µg.m^{-3}	90%	80%	80%	90%	80%

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%

EUROVENT 4/23-2019

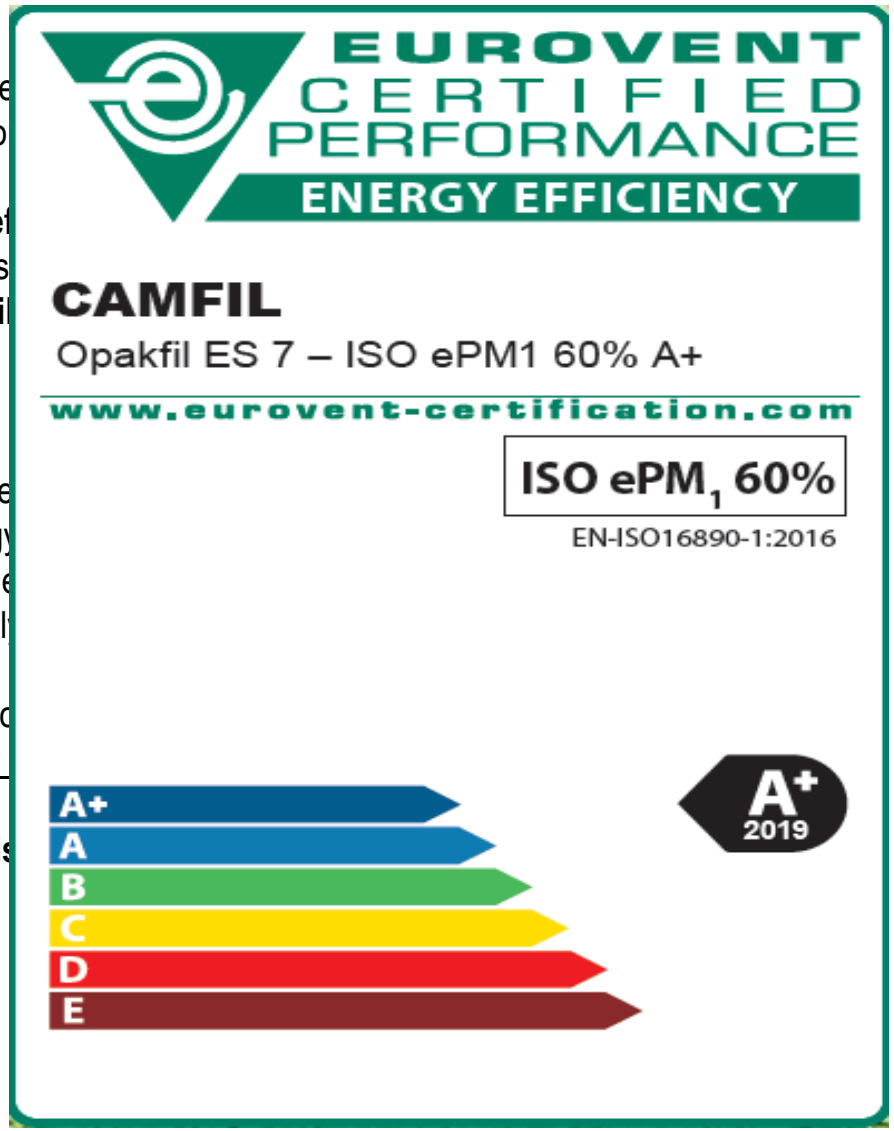
New Energy Rating is base
Implementation planned fo

The demands on energy ef
Max. 1% of all listed filters
That means most „A+“ fi
„B“, etc.

Fully based on ISO 16890
3 tables with energy classe
Higher demands on Energy
Some filters will change the
Most filters will have sligthl

Stricter rules for Certificatio
ISO 16890 test reports for_

The new Energy Rating is



DISTRIBUTION OF THE CLASSES FOR ePM1

	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

DISTRIBUTION OF THE CLASSES FOR ePM2.5

	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%	850	1000	1200	1500	2100	>2100
>90%	1000	1110	1300	1600	2200	>2200

DISTRIBUTION OF THE CLASSES FOR ePM10

	A+	A	B	C	D	E
50&55%	450	550	650	750	1100	>1100
60&65%	500	600	700	850	1200	>1200
70&75%	600	700	800	900	1300	>1300
80&85%	700	800	900	1000	1400	>1400
>90%	800	900	1050	1400	1500	>1500

BRGS | In Partnership with camfil

MOLECULAR FILTRATION

Certain contaminants are not present in the air as particles and can only be captured by a physical barrier. Pollutants such as NOx and SOx that are present as gaseous molecules, particularly in urban environments, may require carbon filtration to achieve the required air quality standard.

Table 3 details the cases when carbon/molecular filtration is likely to be required or deemed necessary to ensure suitable air quality.

OUTDOOR AIR QUALITY	SUPPLY AIR QUALITY				
	SUP 1	SUP 2	SUP 3	SUP 4	SUP 5
ODA 1	Recommended				
ODA 2	Required	Recommended			
ODA 3	Required	Required	Recommended		

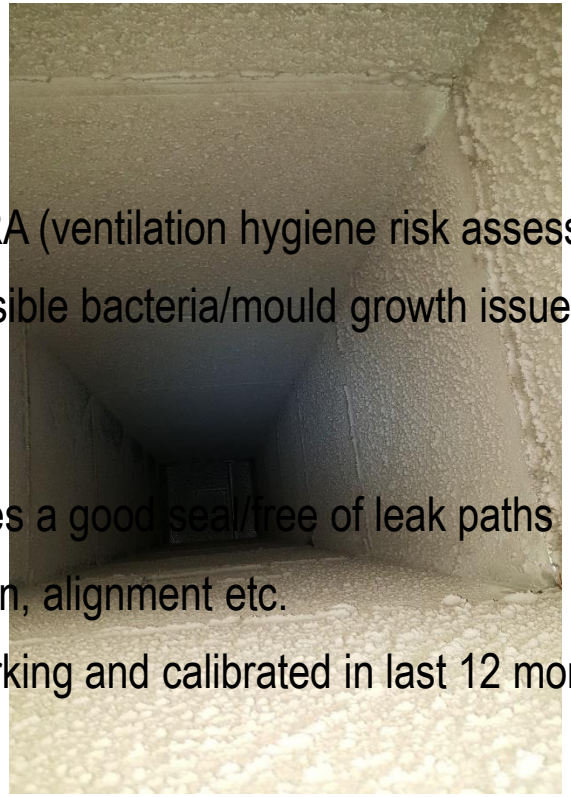
Carbon/molecular filtration can be installed as a third-stage dedicated carbon filter or as a second stage that provides a combined specification for both ePM (as in Table 2) and molecular filter capability. It is recommended that any carbon filters used are tested to ISO 10121-2:2013, thus ensuring that their efficiency has been independently verified.

RISK MITIGATION - CONSIDERATIONS

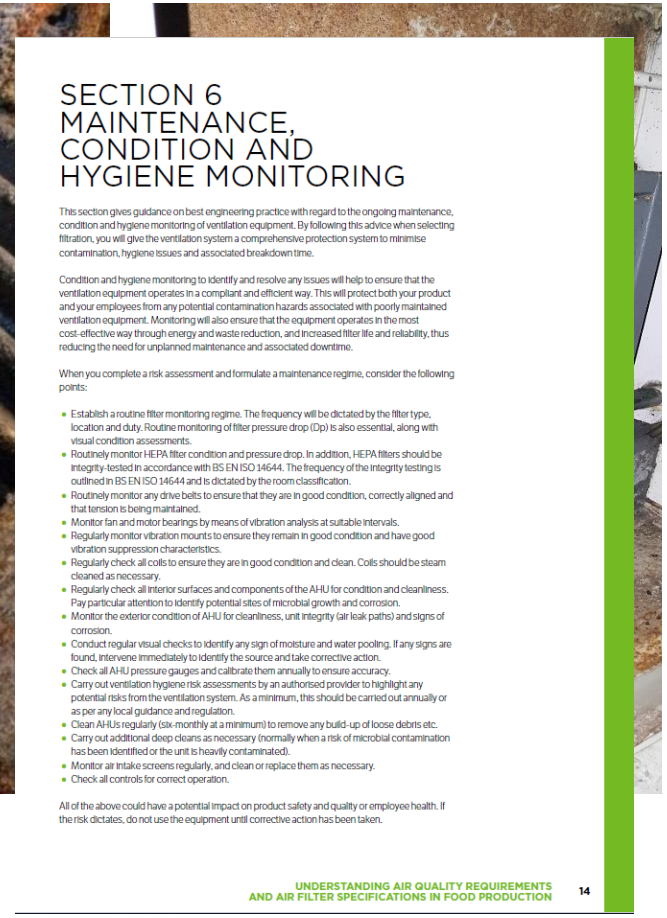
Most manufacturers offer a range of products of varying specifications, some of which are tailored for particular industry segments, including food and beverage. Therefore, wherever possible, you should confirm the following when selecting a filtration product:

- Has the filter been tested to the latest international standard, ISO 16890:2016? The supplier should be able to confirm this with an official independent test certificate. This is the only way to ensure that the filtration used actually provides the correct level of protection and is of the required specification.
- Does the product have specific certification or independent testing that confirms its suitability and safety for use within food and beverage facilities? Examples include:
  - Food contact materials – Regulation (EC) 1935/2004 (or similar; this confirms its suitability for food contact)
  - VDI 6022: hygienic standards for ventilation and air conditioning systems (this gives guidelines on confirming hygienic design)
  - ISO 846:1997 – Plastics – Evaluation of the action of microorganisms (this confirms materials to be microbially inert).
- Is the supplier technically competent and able to provide support when needed? Air quality and filtration are complex subjects, and a supplier who can demonstrate a high level of technical support and guidance is invaluable.
- Do the filters carry labels from the manufacturer (not necessarily the supplier) that can be used to verify compliance once they have been fitted? All filters should carry such labelling.

MAINTENANCE & CONDITION MONITORING



- Motor & Fan Condition
- AHU Cleanliness/Hygiene – VHRA (ventilation hygiene risk assessm
- Glass traps fitted to ensure possible bacteria/mould growth issues monitored.
- Coil Condition/Cleanliness
- Filter Frame Condition – provides a good seal/free of leak paths
- Pulley, belt and bearing condition, alignment etc.
- Pressure gauges – are they working and calibrated in last 12 mont



SECTION 6 MAINTENANCE, CONDITION AND HYGIENE MONITORING

This section gives guidance on best engineering practice with regard to the ongoing maintenance, condition and hygiene monitoring of ventilation equipment. By following this advice when selecting filtration, you will give the ventilation system a comprehensive protection system to minimise contamination, hygiene issues and associated breakdown time.

Condition and hygiene monitoring to identify and resolve any issues will help to ensure that the ventilation equipment operates in a compliant and efficient way. This will protect both your product and your employees from any potential contamination hazards associated with poorly maintained ventilation equipment. Monitoring will also ensure that the equipment operates in the most cost-effective way through energy and waste reduction, and increased filter life and reliability, thus reducing the need for unplanned maintenance and associated downtime.

When you complete a risk assessment and formulate a maintenance regime, consider the following points:

- Establish a routine filter monitoring regime. The frequency will be dictated by the filter type, location and duty. Routine monitoring of filter pressure drop (Dp) is also essential, along with visual condition assessments.
- Routinely monitor HEPA filter condition and pressure drop. In addition, HEPA filters should be integrity-tested in accordance with BS EN ISO 14644. The frequency of the integrity testing is outlined in BS EN ISO 14644 and is dictated by the room classification.
- Routinely monitor any drive belts to ensure that they are in good condition, correctly aligned and that tension is being maintained.
- Monitor fan and motor bearings by means of vibration analysis at suitable intervals.
- Regularly monitor vibration mounts to ensure they remain in good condition and have good vibration suppression characteristics.
- Regularly check all coils to ensure they are in good condition and clean. Coils should be steam cleaned as necessary.
- Regularly check all interior surfaces and components of the AHU for condition and cleanliness. Pay particular attention to identify potential sites of microbial growth and corrosion.
- Monitor the exterior condition of AHU for cleanliness, unit integrity (air leak paths) and signs of corrosion.
- Conduct regular visual checks to identify any sign of moisture and water pooling. If any signs are found, intervene immediately to identify the source and take corrective action.
- Check all AHU pressure gauges and calibrate them annually to ensure accuracy.
- Carry out ventilation hygiene risk assessments by an authorised provider to highlight any potential risks from the ventilation system. As a minimum, this should be carried out annually or as per any local guidance and regulation.
- Clean AHUs regularly (six-monthly at a minimum) to remove any build-up of loose debris etc.
- Carry out additional deep cleans as necessary (normally when a risk of microbial contamination has been identified or the unit is heavily contaminated).
- Monitor air intake screens regularly, and clean or replace them as necessary.
- Check all controls for correct operation.

All of the above could have a potential impact on product safety and quality or employee health. If the risk dictates, do not use the equipment until corrective action has been taken.

CERTIFICATION BODIES

CLEAN AIR SOLUTIONS

Register

BUREAU VERITAS

camfil

THE CAMFIL GROUP

ProSafe Range

Clean air solutions

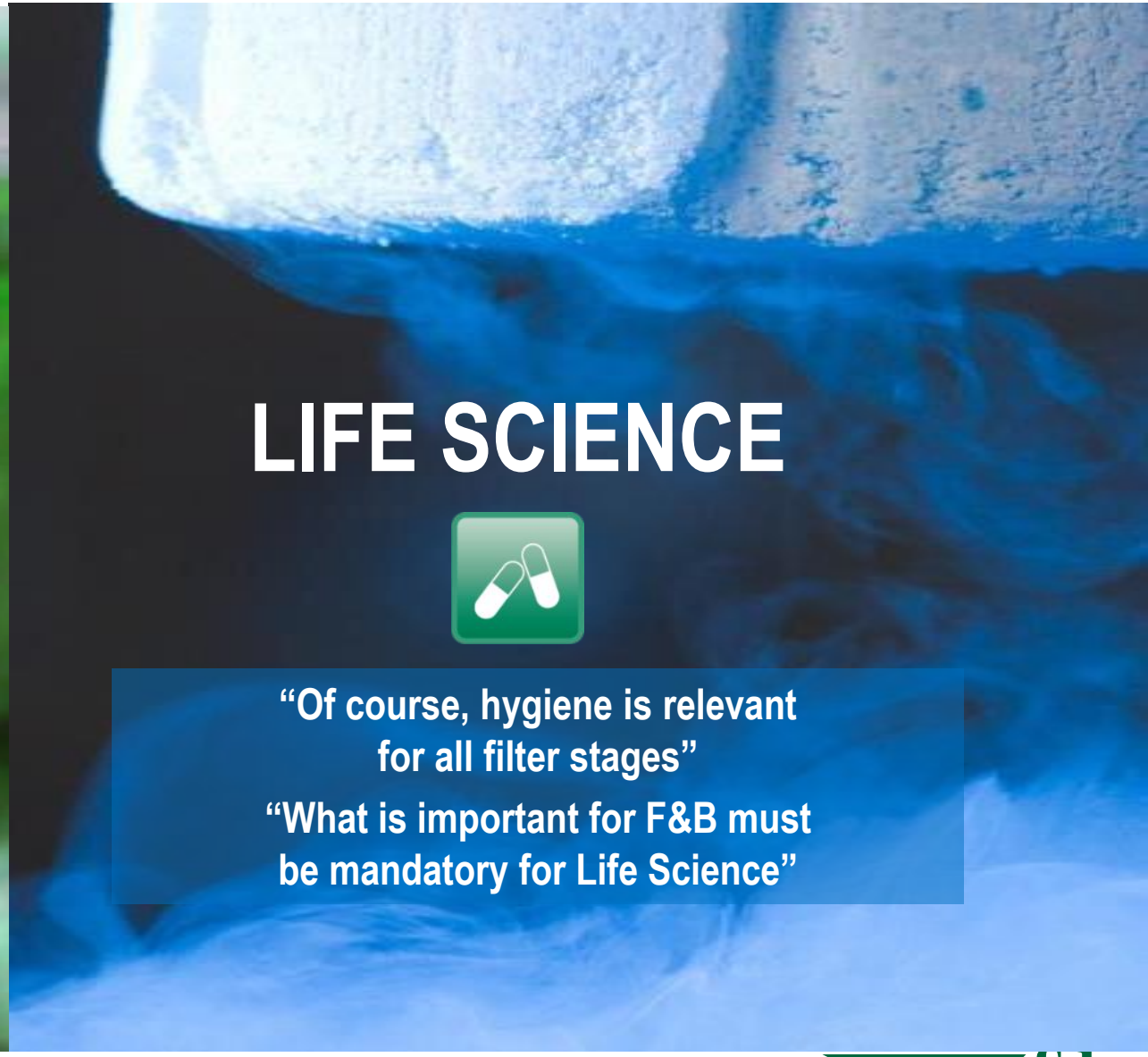
camfil

Sensitive products

FOOD & BEVERAGE

"Air is a food ingredient"

General market change towards quality (organics, "Bio", fair-trade, no harmful chemicals,…)



LIFE SCIENCE

"Of course, hygiene is relevant for all filter stages"

"What is important for F&B must be mandatory for Life Science"

THE COMPLETE PROSAFE FAMILY!

PRO SAFE

Air filters for sensitive processes

COMPLETE RANGE OF PROCESS SAFETY

now available for all stages from intake air to the product (G4 to H14)

Retrospective view

What does ProSafe mean?

ProSafe = **Pro**cess **Safe**ty

- Particle protection
- Avoiding of harmful substances
- Hygiene in air conditioning
- Biological resistence
- Chemical resistence
- Food-safe
- Simplification of audits

Food & Beverage

Pharma

ProSafe = **Pro**cess **Safe**ty

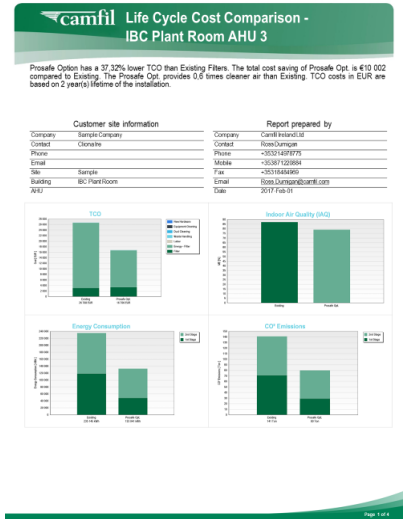
- Particle protection
- Avoiding of harmful substances
- Hygiene in air conditioning
- Biological Resistance
- Chemical Resistance
- Food-safe
  „air is part of ingridients“
- Simplification of audits

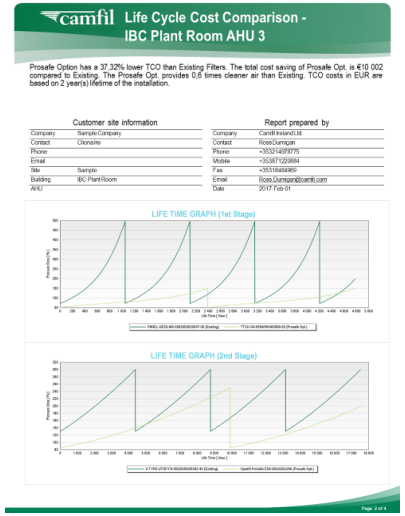
ProSafe = **Customer Benefits**

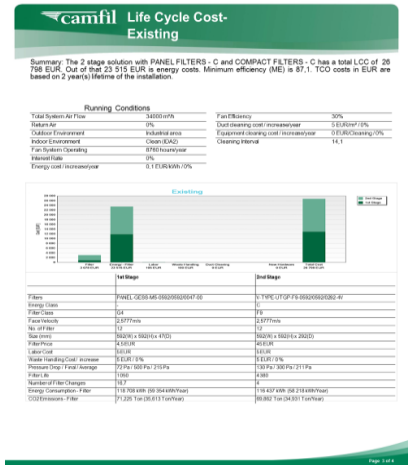
• Air Filter with reliable performance	→ Low Dp / Low Energy Consumption / Longer Life / Less Waste etc…….
• Free of bisphenol A, Phthalate and formaldehyde	→ In reference to the Infant Milk Powder Contamination in China.
• VDI 6022 concurrent	→ Hygienic Air Conditioning & IAQ Guarantee
• ISO 846 Certified	→ Antimicrobial Inert which means Micro organisms cannot grow on our products
• Tested with all common Cleansing agent and disinfectant	→ The components of ProSafe products will not be affected by harsh chemicals used for cleaning in F&B or LS
• EC 1935/2004 concurrent	→ Products are certified for food Contact
• Online Certificates / Documentation	→ All product material is available to the customer online by scanning the QR Code

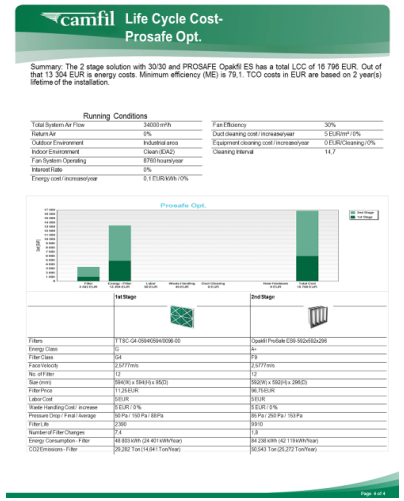
Life Cycle Cost Benefits

ProSafe Filters are the most energy efficient filters on the market. ProSafe not only reduces your overall running costs without compromising on IAQ while also ensuring Full Protection of your people / product & processes.







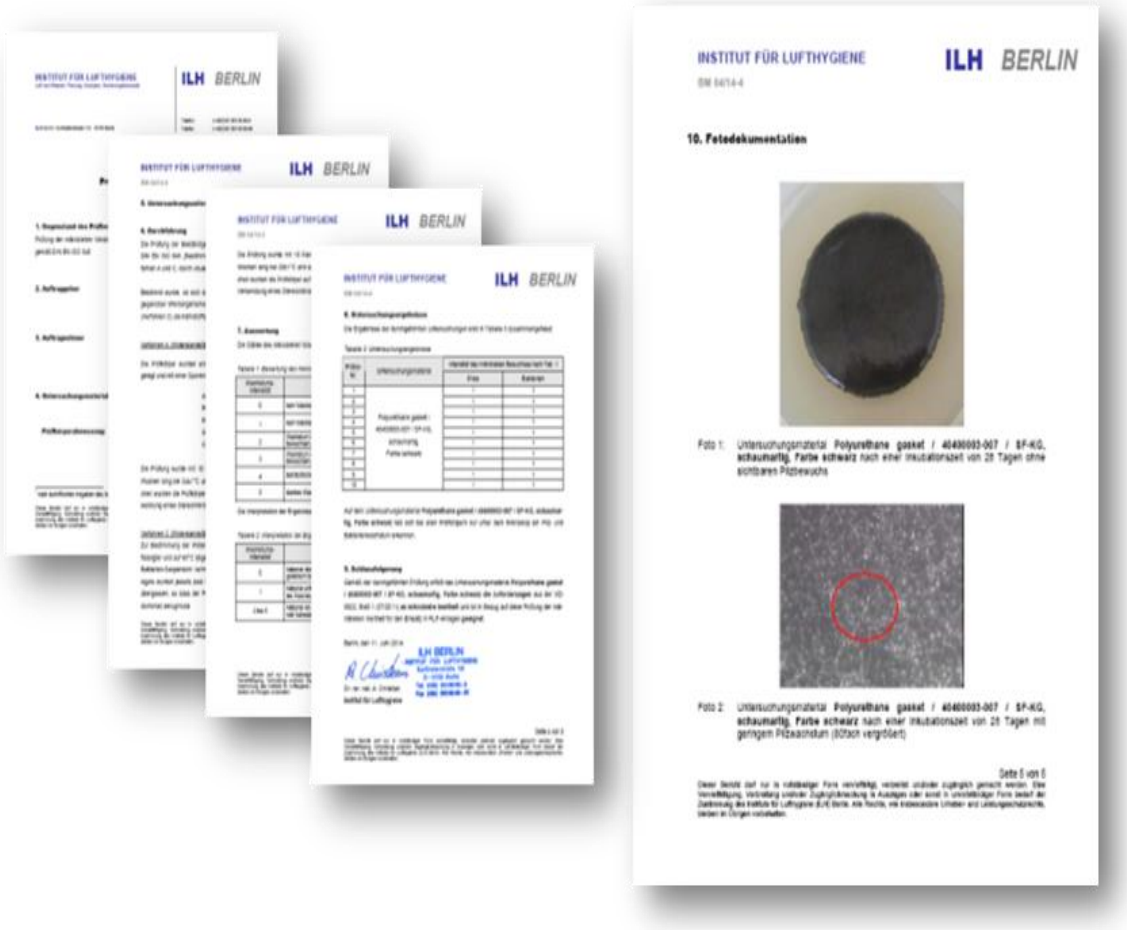


camfil

ISO 846 test

Samples of each component are sent for independent testing to ensure:

- No Fungal Growth
- No Bacteria Growth
- Fully Microbial Inert



camfil

EU Regulation 1935/2004

- “any material or article intended to come into contact **directly** or **indirectly** with food” (3)
- “must be sufficiently inert to preclude substances from being transferred to food in quantities large enough to endanger human health […]” (3)
- “Member States should lay down rules on sanctions applicable to infringements of the provisions of this Regulation […]” (26)

EU Regulation 1935/2004

Closer look at the components:

- Filter media (Glas)
    - test of migration of lead and cadmium
- Filter frame (aluminium)
    - Yet no indiviual regulation in EU
    - Tested acc. to french law (limits for alloys)
- Potting (PU)
- Gasket (PU)
- Plastic frames

„*Commission Regulation* ***10/2011*** *for* ***plastic materials***“

- **Overall. migration in:**
    - Acetic acid 3%
    - Ethanol (10%)
    - Olive oil
- **Specific. migration of**
    - Several. phthalates
    - 7 heavy metals
    - Aromatic Amines

L 338/4 EN Official Journal of the European Union 13.11.2004

REGULATION (EC) No 1935/2004 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL

of 27 October 2004

on materials and articles intended to come into contact with food and repealing Directives 80/590/EEC and 89/109/EEC

THE EUROPEAN PARLIAMENT AND THE COUNCIL OF THE EUROPEAN UNION,

Having regard to the Treaty establishing the European Community, and in particular Article 95 thereof,

Having regard to the proposal from the Commission,

Having regard to the opinion of the European Economic and Social Committee (1),

Acting in accordance with the procedure laid down in Article 251 of the Treaty (2),

Whereas:

(1) Council Directive 89/109/EEC of 21 December 1988 on the approximation of the laws of the Member States relating to materials and articles intended to come into contact with foodstuffs (3) established general principles for eliminating the differences between the laws of the Member States as regards those materials and articles and provided for the adoption of implementing directives concerning specific groups of materials and articles (specific directives). This approach was successful and should be continued.

(2) The specific directives adopted under Directive 89/109/EEC in general contain provisions which leave little room for the exercise of discretion by the Mem-

substances from being transferred to food in quantities large enough to endanger human health or to bring about an unacceptable change in the composition of the food or a deterioration in its organoleptic properties.

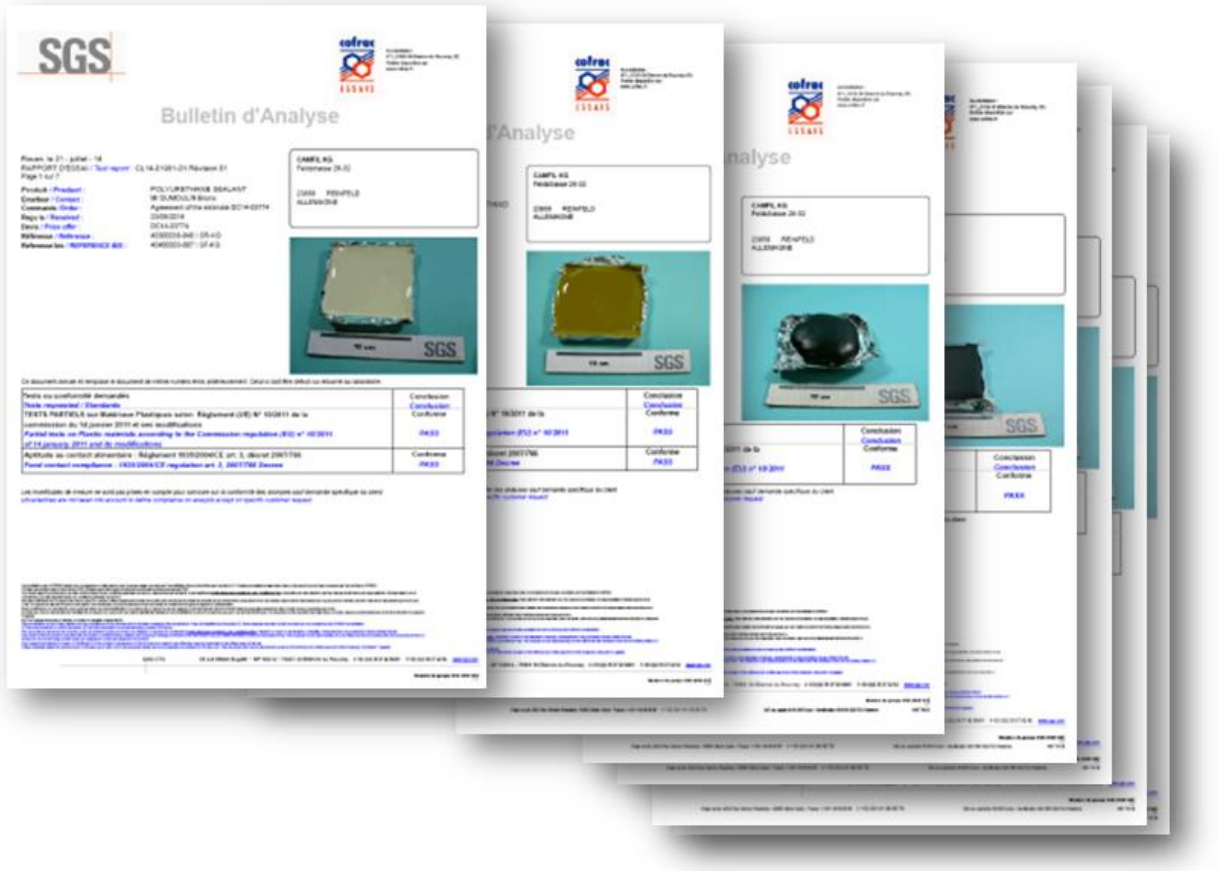
(4) New types of materials and articles designed to actively maintain or improve the condition of the food (active food contact materials and articles) are not inert by their design, unlike traditional materials and articles intended to come into contact with food. Other types of new materials and articles are designed to monitor the condition of the food (intelligent food contact materials and articles). Both these types of materials and articles may be brought into contact with food. It is therefore necessary, for reasons of clarity and legal certainty, for active and intelligent food contact materials and articles to be included in the scope of this Regulation and the main requirements for their use to be established. Further requirements should be stated in specific measures, to include positive lists of authorised substances and/or materials and articles, which should be adopted as soon as possible.

(5) Active food contact materials and articles are designed to deliberately incorporate 'active' components intended to be released into the food or to absorb substances from the food. They should be distinguished from materials and articles which are traditionally used to release their natural ingredients into specific types of food during the process of their manufacture, such as wooden barrels.

Test EC 1935:2004

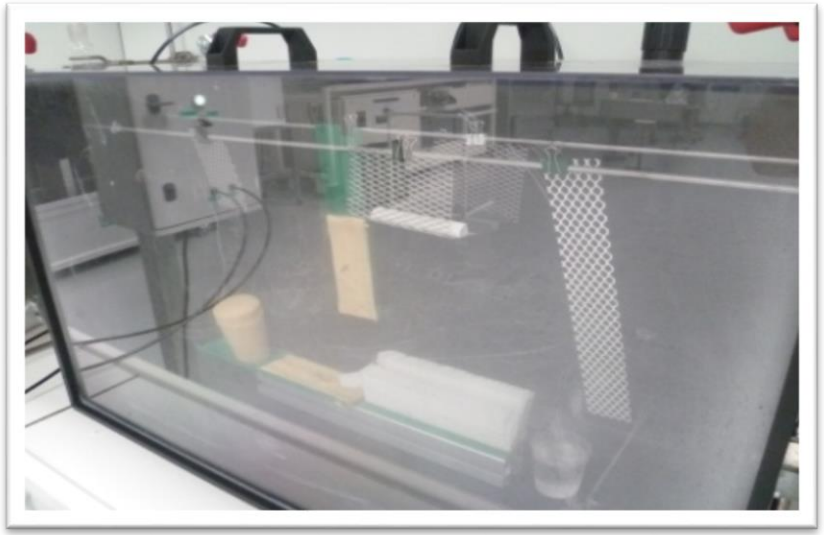
Many probes of each material sent to an independant institute to do overall migration test.

Food Contact test for overall migration, heavy metals, phthalates and PAA migration.



Test chemical resistance

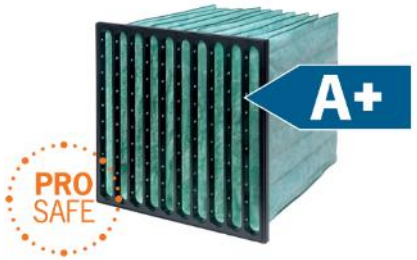
- Peracetic acid (bactericidal 0.001%)
- Hydrogen peroxide (bactericidal from 1%)
- Acetic acid (Bactericidal: from 3%)
- Ethanol (bactericidal action peak between 60% and 70%)
- Isopropanol (peak bactericidal action between 60% and 70%)
- Acetone (bactericidal action peak between 60% and 70%)
- Bleach (commercial solution at 2.6% - 0.072% Bactericide, fungicide 0.18%)
- Ammonium salt (50-100 mg / L)



camfil

Comfort Filters

the family is growing…

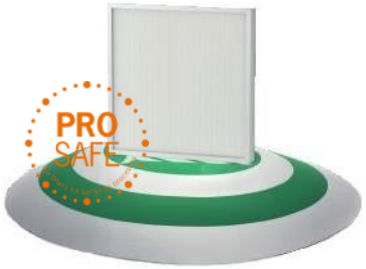


Clean Process Filter

Absolute V ProSafe
(Only in virgin ABS plastic
with PU gasket
610x610 & 305x610)

Opakair ProSafe
(F7 and F9)

Megalam
mostly ProSafe approved
(Exceptions like Neoprene gasket)



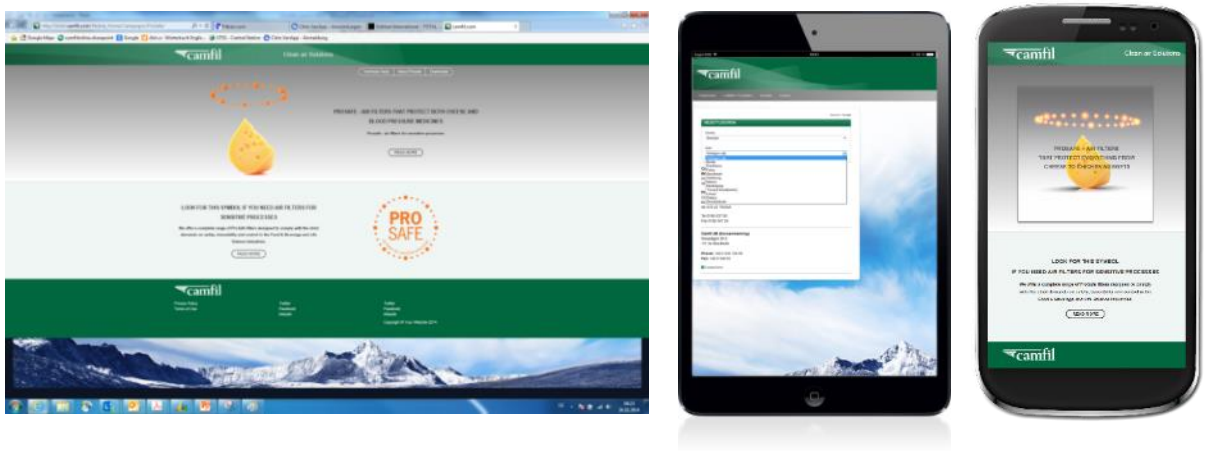
Megalam ES ProSafe
Latest multi-layer membrane
composite media
First membrane 100% compatible
with Life-Science and F&B

How to know it’s ProSafe

Look for the ProSafe label with QR-Code leading to:

www.camfil.com/prosafe

Dedicated and responsive-design website



PRO SAFE

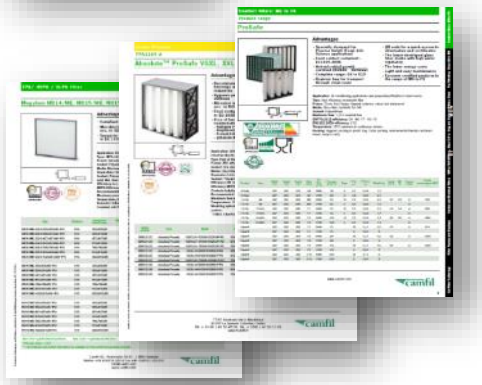
ISO 846
EC 1935:2004
VDI 6022

Information material online

- New Brochure

- Certificates

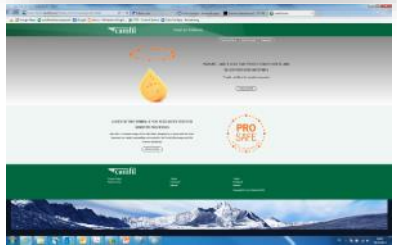
- All data sheets



- AirMail with case studies

- ProSafe Article

- ProSafe website



- Prosafe film

Youtube, LinkedIn, Yammer, Facebook, Website,….

camfil

Market Acceptance

Market Acceptance

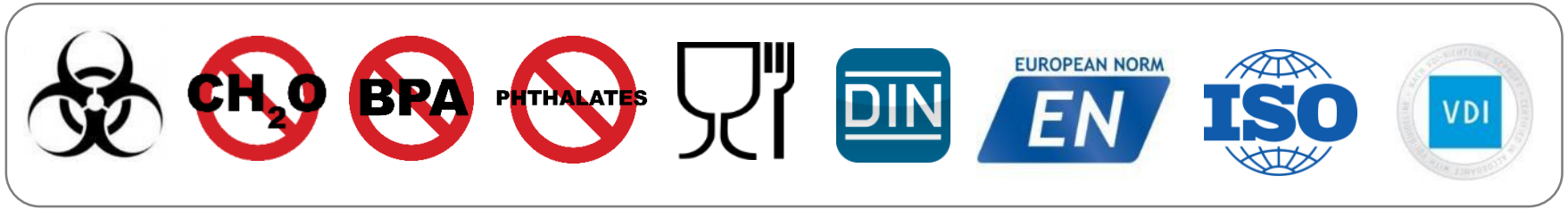
Nestlé

FrieslandCampina

glanbia

Prosafe F&B benefits

- Quality and Compliance are paramount :
- Prosafe Eliminates Risks:
- Exclusive Camfil Prosafe Protection:
- 24H / 365 D / 52 W Access to all Documentation:
- Quality Certified and Full Traceability :



Microbial inert
Tested, certified to
DIN EN ISO 846

Hygienic
Tested, certified to
VDI 6022

Food contact
Tested, certified to
EC 1935:2004

PRO SAFE
Air filters for sensitive processes

Free of harmful chemical components
Tested for halogen, formaldehyde, pthalates, bisphenols

Decon-agent resistant
Tested resistance against all common decon and cleaning agents

QR code access to download above certificates

F&B Plant ProSafe Benefits & References

- Increasing Production Output
- Fully Certified Products – Ease of Auditing
- Full Traceability – Ease of Auditing
- Energy & CO^2 Reduction – Improving Sustainability
- F&B Plant Managers we are here to help
- Education on Hvac Standards at your site?
- Added Value references…KERRY / DAIRYGOLD / LAKELAND / Glanbia / Ferrero / Coca Cola / Nestle / Danone etc…

CLEAN AIR SOLUTIONS

camfil

AirCair™

Fully compliant filtration management contract with a difference…….

- Guaranteed air quality, HVAC hygiene and compliance for food production facilities.

- For a fixed monthly cost, we will guarantee to provide the best possible air quality and ensure your filtration and HVAC equipment are maintained in line with **BRC GLOBAL STANDARD FOOD SAFETY ISSUE 8 - UNDERSTANDING AIR QUALITY REQUIREMENTS AND AIR FILTER SPECIFICATIONS IN FOOD PRODUCTION** and EHEDG Doc. 47 Guidelines.

AirCair™

Fully compliant filtration management contract with a difference……

- All filters supplied will be tested as per ISO16890 and EN1822:2009 and will be certified by Eurovent. Ensuring all filters are tested as per the most current standards and offering the most cost effective, energy efficient solution

PRO SAFE
Air filters for sensitive processes

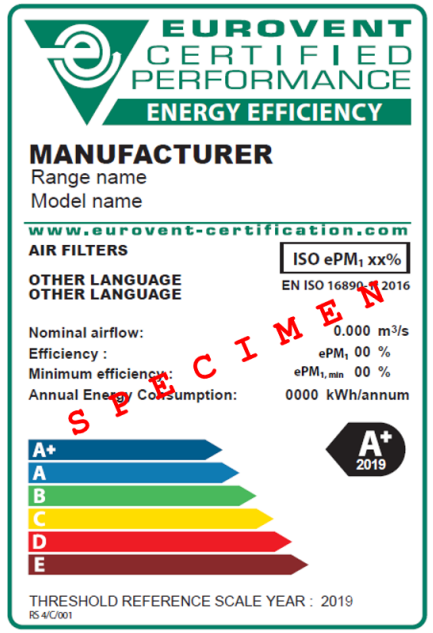
- Wherever suitable, Camfil Prosafe filters will be supplied. Specifically designed for Process Safety, with food contact certificates for the materials used (according EC1935-2004) and anti-microbial growth certificates (according ISO846 and VDI6022)

TESTED
EN 779:2012
ACCORDING TO

AirCair™

Low **E**nergy **A**ir **F**iltration **a**nd **L**ife **C**ycle **C**osting

- Camfil will ensure that the most energy efficient products are used, all having been independently tested by Eurovent to rating standard RS4/C/001-2019 providing unbiased confirmation of the filters energy rating.



- We will carry out Life Cycle Costing using Camfil's unique software tool. Using site and application specific data to accurately identify the most cost effective, energy efficient solution for each application. Thus reducing site energy usage, maximising filter service life and reducing downtime associated with maintenance.

Reducing direct and associated costs of AHU air filtration whilst providing a reliable quality air maintenance and monitoring solution

AirCair™

A filtration management contract with a difference…….

- **Compliant Service -** Complete peace of mind. Ensuring that the air handling equipment hygiene and air quality within the production areas are maintained to the highest standards to meet the requirements of both internal and external audits.

- Camfil will provide all relevant documentation, certification and reports to satisfy both internal and external audits.

- Tailored service to ensure that all relevant testing is carried out for Basic, Medium and High hygiene areas as per BRC/Retailer audit standards and EHEDG Doc. 47

Area “RISK” Classifications

Food production plants split into 3 classifications depending on criticality:

High Risk

Facility where ready-to-eat **cooked** products are manufactured and segregation from low risk production is required to prevent pathogen transfer.

High Care

Facility where ready-to-eat products are manufactured such as salads and sandwiches. No cooking is normally undertaken in these facilities, hence a reduced risk of pathogen transfer from uncooked products.

Low Risk

Uncooked food processing such as meat packaging.

Cleanroom as per ISO 14644 – typically for aseptic filling and must be maintained as per the ISO14644 standard and in line with the relevant cleanroom classification.

Air Filter Selection For Food & Beverage

In Accordance with ISO16890:2016, BS EN16798:2017; Eurovent 4/23 and the **BRC GLOBAL STANDARD FOOD SAFETY ISSUE 8 - UNDERSTANDING AIR QUALITY REQUIREMENTS AND AIR FILTER SPECIFICATIONS IN FOOD PRODUCTION**

	ODA1	ODA2	ODA3
Low Risk	$ePM_{2.5}$ = 50%	$ePM_{2.5}$ = 70%	$ePM_{2.5}$ = 80%
High Care/High Risk	ePM_1 = 50%	ePM_1 = 70%	ePM_1 = 80%

The ISO16890:2016 filter efficiency shown in the above table is the minimum final stage filter efficiency based on the outdoor air quality (ODA) for the location of your production facility. ***Please contact Camfil for guidance on establishing the ODA for your location.***

The above table details the final filtration efficiency that should be used. To ensure that these filters are protected to provide maximum service life and a cost effective solution, they should be protected by a suitable pre-filter. The minimum recommended efficiency for this pre-filter is ISO Coarse 65%.

AirCair™ Service Options

DESCRIPTION
1. Filter Supply and fit as per site requirments
2. Waste Disposal
3. Condition Monitoring Visits & Report:
• Filter Pressure Drop
• Visual Inspection Of Filters Not Being Changed
• Drive Belt Condition Inspection/Assessment
• Fan and Motor Bearing Condition Assessment
• Vibration Mount Condition Assessemnt
• Coil Condition Assessment
• Interior Condition/Corrosion Issues
• Exterior Condition/Corrosion Issues
• General AHU Cleanliness
4. Supply & Extract Air Flow volumes/Air Change Rate[1]
5. Room Pressure Differentials[2]
6. Temperature Monitoring/Verification
7. Microbiological Monitoring[3]
8. Humidity Monitoring/Verification
9. HEPA Filter Validation/DOP Testing[2]
10. Particle Counting[2]
11. Pressure Gauge Calibration
12. Ventilation Hygiene Risk Assessement[3]
13. Ductwork Cleaning

1. Carried out in accordance with BSRIA Commissioning Air Systems BG 49/2015
2. Carried out in accordance with ISO 14644
3. Carried out in accordance with BESA TR19 App B

BRCGS | In Partnership with

Service options shown in the table opposite are offered to ensure compliance with industry audit requirements including the **BRC GLOBAL STANDARD FOOD SAFETY ISSUE 8 - UNDERSTANDING AIR QUALITY REQUIREMENTS AND AIR FILTER SPECIFICATIONS IN FOOD PRODUCTION**

AirCair™

Summary - what is included:

In Partnership with BRCGS

- ✓ **Supply and fit of ProSafe™ energy efficient** filter technology specifically designed for the food & beverage industry.
- ✓ 6 monthly visits to carry out scheduled maintenance and monitoring.
- ✓ **Fixed monthly cost** to allow easy budgeting and planning, minimising unexpected and unplanned cost.
- ✓ Service complies with **BRC GLOBAL STANDARD FOOD SAFETY ISSUE 8 - UNDERSTANDING AIR QUALITY REQUIREMENTS AND AIR FILTER SPECIFICATIONS IN FOOD PRODUCTION**
- ✓ Service provided as per **EHEDG Guidelines** on Air Handling Systems in the Food Industry.
- ✓ **Condition reporting** to cover all aspects of work carried out and condition report highlighting any additional remedial work.
- ✓ 12 monthly **validation report** to confirm results of particle counting, DOP testing and pressure gauge calibration.

HVAC FILTER COMPLIANCE CHECKLIST

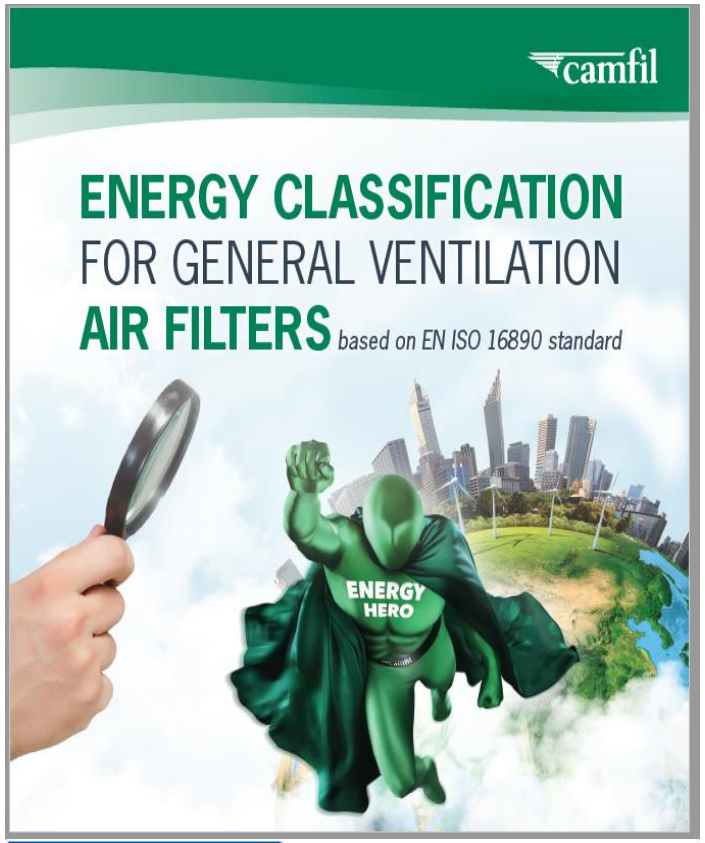
- CERTIFIED TO ISO 16890
- CERTIFIED TO EUROVENT RS4/C/001-2019
- CERTIFIED ISO 846
- CERTIFIED EC1935:2004
- CERTIFIED VDI 6022
- FREE FROM HARMFUL COMPONENTS
- FULL PRODUCT TRACABILITY

CLEAN AIR SOLUTIONS

In Partnership with BRC GLOBAL STANDARDS

camfil camfil

Questions and answers



ISO International Organization for Standardization

In Partnership with BRC GLOBAL STANDARDS

THANK YOU FOR YOUR ATTENTION

Ross Dumigan @ ross.dumigan@camfil.com