camfil

FOOD & BEVERAGE INDUSTRY

Clean air solutions

FOOD SAFETY COMPLIANCE IS OUR CONCERN

Efficient filter systems instead of “bacteria spreaders“. Growing market requirements and increasingly stringent legislation are placing even greater emphasis on hygiene in the food industry. Similarly, the air quality in the production process has never been more important than it is today. Only efficient filters and air recirculation systems can reduce the levels of microorganisms in the air.

For more than 50 years, Camfil has been supplying filter systems for indoor climate control in all types of applications. On the basis of our high standards of research, development and quality assurance, we design and sell pioneering air filters and clean room solutions, in particular for the food industry.

CAMFIL COMPLIES WITH THE FOLLOWING INDUSTRY PRODUCT STANDARDS:

- Fighting against microbiological contamination
- Compliance with **VDI 6022** and **ISO 846**: inert raw materials against microbial growth
- Food certification for components that come into contact with the product
- Compliance with Regulation **(EC) No 1935/2004** for all products related to the food industry
- Products which meet **HACCP risk requirements** (hazard analysis and critical control points)
- Filter, labelling, identification and traceability
- Guaranteed filtration efficiency level in accordance with **EN 779:2012 guaranteed filtration efficiency**

camfil

HUMAN HEALTH

MICROSCOPIC CAUSES...
Outdoor air carries 200 to 1,500 bacteria per m^3. So an air handling unit with a capacity of 10,000 m^3/h will supply between 2 to 15 millions bacteria each hour!

- fungal spores: 1 to 10 µm
- bacteria: 0.2 to 10 µm
- viruses: 1/100 to 1/1000 of micron
- visible range: Hair 100 µm and pollen 10 µm

...CATASTROPHIC EFFECT

- production loss
- withdrawals from sale, return and destruction
- production breakdowns, plant closures
- extra expenditure on controls and remedial actions
- drop in sales
- brand image damage
- loss of consumer confidence

FOOD HYGIENE AND SAFETY
Protecting human health is a major concern for governments of the European Community (Directive 89/397/EEC of 14 June 1989).

Such measures may include product withdrawal and destruction, or even closure of all or part of the offending company for an appropriate period. In order to ensure product safety, those in charge of plants are required to:

- identify every aspects of their business that impact food safety;
- ensure that appropriate safety procedures are implemented, followed and updated, on the basis of ADPCM/HACCP principles.

How can we prevent air handling units from becoming a “nest of microbes”?

AIR FILTRATION SOLUTIONS DESIGNED FOR THE FOOD PROCESSING INDUSTRY

In both design and construction, Camfil integrates specific characteristics for the food processing industry:

Limiting microbiological contamination

- cleanability
- decontaminability
- moisture control

Resistance to corrosion

- use of stainless-steel materials, plastics, polyester resin...
- consistent solution with HACCP (Hazard Analysis Critical Control Point) risk level
- traceability, identification and labelling of filters
- guaranteed efficiency in accordance with current standards

Rapid development of processes and production

- modularity, flexibility and progressive nature of filtration solutions
- easy and safe to use

Quick and efficient maintenance

- accessibility
- simple installation of filters
- easy to handle

Access for *in-situ* testing
Access for *in-situ* testing is taylor-made on request. Our range of products, dedicated to the Food Industry, are developed in accordance to these requirements.

Food safety compliance certificates
For some components close to the process, Camfil is able to provide food contact certification documents where applicable.

SUSTAINABILITY
ENERGY SAVINGS

For over 50 years, the Camfil group have been developing air filtration solutions to help our customers' improve indoor air quality for the lowest possible energy cost. By doing so our customers can protect people, processes and the environment from air pollution, while reducing their carbon footprint, in a profitable way.

According to the USEPA Agency, sustainable buildings shall reduce the overall impact of the built environment on human health and the natural environment by:

- Efficiently using energy, water, and other resources
- Protecting occupant health and improving employee productivity
- Reducing waste, pollution and environmental degradation

Energy efficiency becomes a tool to achieve global financial performance involving business controlers and finance departments, whereas it was delegated to maintenance departments so far.

Sustainable air filtration solutions, can provide concrete answers to new requirements from authorities regarding climate change mitigation and energy efficiency policies implementation, without compromising indoor air quality.

It is all about finding the right balance between energy conservation and people health or environment protection. Without a global approach, people health and environment protection will be trade off.

Today priority is given to energy efficiency and indoor air quality is overlooked, most of the time considered as an additional feature for good comfort of buildings occupants. However, scientific evidences has shown the direct impact of indoor air pollution on peoples health. Optimizing ventilation and air filtration in buildings lead to unsuspected cost savings and enhanced productivity.

Scan to learn more or go to:
www.camfil.com/About-Camfil/Sustainability

Camfil was the first air filter manufacturer to produce and publish a sustainability report. This was the year 2009.

ENERGY IMPACT

THE COST OF VENTILATION
It is well known that building ventilation costs are significant. The "typical" energy cost of filters as a percentage of the total system is approximately 30%.

A bad filter construction could add 50 Pascal (0.2" wg) compared to a "good" construction, even when the same filter class is used.

LCC – LIFE CYCLE COST
From a long-term perspective, it is evident that the energy consumption is the major overall cost in operating a filter.

Camfil has developed software to determine precise LCC costs for a particular filter, in any given system, with its unique conditions and requirements. Our Camfil Sales Team will help you optimise your system.

Email:
request_tco_analysis@camfil.com

70% OF THE COST IS ENERGY!
Calculations reveal that energy normally accounts for **70% of the total life cycle cost** of the system. The energy consumption is directly proportional to the average pressure drop over the filter.

- ***Q:*** *Air flow, m^3/s (cfm)*
- ***ΔP:*** *Average filter pressure loss, Pa (in WG)*
- ***T:*** *Operation time, hr*
- ***η:*** *Fan efficiency, %*
- ***Pc:*** *Cost of Power, $/kWh*
- ***Co:*** *Constant, 1000 in SI units, 8515 in IP units*

$$Energy\ (E) = [(Q \cdot \Delta P \cdot T)/(\eta \cdot Co)] \cdot Pc$$

TOTAL COST OF OWNERSHIP

It is important to focus on the right factors when choosing a filter. Using the initial resistance to airflow can be a bad indicator of the **Total Cost of Ownership (TCO)** for a filter selection. The way the filter loads in real life applications is vital to determining the true cost.

Many believe that adding pre-filters will extend the life of the final filter and save the user money. In cases where the configuration of the air handling unit does not allow for single stage filtration, prefilters may be required, but the presence of prefilters could increase the TCO if not carefully chosen.

The **Camfil LCC Green Software** program can calculate the total cost of ownership for filters in actual usage and will be used by our local representative to calculate the total cost for specific systems, upon request. This is an excellent tool for evaluating the performance of air filters under various conditions such as evaluating the effect of running at a higher or lower airflow rate.

The data utilized by the LCC Green Software is generated using multiple methods, including the CamField Labs. However, one of the premises of comparing total cost of ownership calculations is the calculations have to be run on equivalent particle removal efficiency filtration systems.

Thus, if one filter drops in efficiency to a level below the minimum specified by the customer or application the comparison of the TCO is not the same as we are not comparing 'apples to apples' with filter efficiency.

SUMMARY EXAMPLE OF COMPARING VARIOUS STAGES AND TYPES OF FILTERS BASED ON TCO

Filter(s)	Filter Price ($/filter)	Changes per year	Average Δp For 1 year (inches of w. g.)	Energy Cost ($/Filter/yr)	Labor & Waste ($/filter/yr)	Total TCO ($/filter/yr)	Total TCO for AHU ($/AHU/yr)
Camfil, Hi-Flo ES	$80	1	0.60	$246	$7	$333	$6,658
Competitor Pleat	$3.50	5	1.24	$508	$20	$582	$11,645
Competitor Pocket	$30	1	1.24	$508	$7	$582	$11,645
Competitor, 4V	$80	1	0.90	$371	$7	$458	$9,157

- **Total TCO =** [(Filter Price · Changes) + (Energy Cost) + (Labor & Waste)] · Number of Filters
- **Labor & Waste =** [Labor & waste cost * Changes]
- **Energy Cost =** [(Resistance * Airflow * Time) / (Fan Eff)] * Cost of Energy

- Air Handle Unit size – (20) 24x24 filters
- Fan operation – 8,760 hrs/yr
- Fan Efficiency – 55%
- Filter Air flow rate – 2,000 cfm per 24x24 filter
- Pre-filter labor rate (including waste cost) – $4/filter
- Final Filter labor rate (including waste cost) – $7/filter
- Cost of Energy – $0.11 per kWh

AIR FILTRATION
INTERNATIONAL STANDARDS

HVAC AIR FILTER STANDARDS

The filtration industry is inundated with multiple filtration standards to classify, identify, and evaluate various performance characteristics of an air filter.

In the USA, the organization known as ASHRAE (American Society of Heating, Refrigerating, and Air-Conditioning Engineers) was founded in 1894 and is currently an international organization of 50,000 persons. ASHRAE has published a laboratory filtration performance standard for testing air filters since 1968 and all have been accredited by the American National Standards Institute (ANSI) to define minimum values or acceptable performance.

In Europe, the history of the filtration standards mimics the ASHRAE standard path. The European Committee for Standardization (CEN) formalized their filtration standard in 1993 with the publication of EN 779:1993. This document was very similar to ASHRAE 52.1-1992 and with only minor differences, used the same equipment and test method of the ASHRAE standard. In 2002 CEN followed the ASHRAE lead by revising EN-779 into a particle removal efficiency standard similar to ASHRAE 52.2. However, this new document EN-779:2002 had some striking differences, both good and bad. In 2002 CEN released the version of the European EN-779 standard.

As with the 1999 revision to the ASHRAE document, this new procedure converted from Dust Spot efficiency to a particle removal test method. The actual test method and equipment used is different between the two standards in a number of ways with the most important variations listed below:

Particle size range measured – Since 99% of all the particulate found in atmospheric air is below 1.0 micron it is important to know the filtration performance below that point. ASHRAE went with a higher upper limit to be able to provide particle removal efficiency for lower end pre-filters.

The EN 779 standard was revised in 2012. EN779:2012 now classifies fine air filters according to their lowest filtration efficiency, referred to as "Minimum Efficiency" (ME). The introduction of the new criteria for F7 to F9 filter classes secures the air cleaning ability of air filters over time, regardless of the type of filtration media that the filters are made of. This will have a beneficial impact on indoor air quality.

To support the selection of energy-efficient air filters, EUROVENT, the trade association for the European HVAC industry, has developed guidelines, Eurovent 4/11 Document,to classify air filters according to their performance and energy consumption during the usage phase.

As a result, air filters offering the same air cleaning performance can be compared on the basis of their annual energy consumption. This tool now allows the selection of efficient filters according to EN 779 while keeping energy consumption as low as possible.

AIR FILTERS TESTING STANDARDS COMPARISON

ASHRAE Standard 52.2-2012				ASHRAE 52.1-1992		EN 779 2012				
Minimum Efficiency Reporting Value	Composite Average Particle Size Efficiency, % in Size Range, microns			Average Arrestance	Average Dust Spot Efficiency	Class	Group	Average Efficiency at 0.4 micron[1]	Average Arrestance of synthetic dust	Minimum Efficiency at 0.4 micron[1]
	Range 1	Range 2	Range 3							
MERV	0.30 - 1.0	1.0 - 3.0	3.0 - 10.0	%	%			%	%	%
1	n/a	n/a	E_3 < 20	A_{avg} ≥ 65	< 20	G1	Coarse	-	50≤ A < 65	-
2	n/a	n/a	E_3 < 20	A_{avg} ≥ 65	< 20	G2		-	65 ≤ A < 80	-
3	n/a	n/a	E_3 < 20	A_{avg} ≥ 70	< 20					
4	n/a	n/a	E_3 < 20	A_{avg} ≥ 75	< 20					
5	n/a	n/a	E_3 ≥ 20	80	20	G3		-	80≤ A < 90	-
6	n/a	n/a	E_3 ≥ 35	85	20-25					
7	n/a	n/a	E_3 ≥ 50	90	25-30	G4		-	90≤ A	-
8	n/a	n/a	E_3 ≥ 70	92	30-35					
9	n/a	n/a	E_3 ≥ 85	95	40-45	M5	Medium	40< E ≤60	-	-
10	n/a	E_2 ≥ 50	E_3 ≥ 85	96	50-55					
11	n/a	E_2 ≥ 65	E_3 ≥ 85	97	60-65	M6		60< E ≤80	-	-
12	n/a	E_2 ≥ 80	E_3 ≥ 90	98	70-75					
13	n/a	E_2 ≥ 90	E_3 ≥ 90	98	80-85	F7	Fine	80< E ≤90	-	35
14	E_1 ≥ 75	E_2 ≥ 90	E_3 ≥ 90	99	90-95	F8		90< E ≤95	-	55
15	E_1 ≥ 85	E_2 ≥ 90	E_3 ≥ 90	99	95	F9		95≤ E	-	70
16	E_1 ≥ 95	E_2 ≥ 95	E_3 ≥ 95	100	99	NA	NA		-	-

Notes:
The final MERV value is the highest MERV where the filter data meets all requirements of that MERV.
The characteristics of atmospheric dust vary widely in comparison with those of synthetic dust used in the tests. Because of this the test results do not provide a basis for predicting either operational performance or life. Loss of media charge or shedding of particles or fibers can also adversely affect efficiency.
[1]Minimum efficiency is the lowest efficiency among the initial efficiencies, discharged efficiency and the lowest efficiency throughout the test procedure.

ISO 29463 CLASSIFICATIONS

Filter Class (Group)	Particle Size for Testing	Global Values		Local/Leak Values		
		Collection Efficiency (%)	Penetration (%)	Collection Efficiency (%)	Penetration (%)	Multiple of Global Efficiency (%)
ISO 15 E	MPPS	≥95	≤5	-	-	-
ISO 20 E	MPPS	≥99	≤1	-	-	-
ISO 25 E	MPPS	≥99.5	≤0.5	-	-	-
ISO 30 E	MPPS	≥99.9	≤0.1	-	-	-
ISO 35 H	MPPS	≥99.95	≤0.05	≥99.75	≤0.25	5
ISO 40 H	MPPS	≥99.99	≤0.01	≥99.95	≤0.05	5
ISO 45 H	MPPS	≥99.995	≤0.005	≥99.975	≤0.025	5
ISO 50 U	MPPS	≥99.999	≤0.001	≥99.995	≤0.005	5
ISO 55 U	MPPS	≥99.9995	≤0.0005	≥99.9975	≤0.0025	5
ISO 60 U	MPPS	≥99.9999	≤0.0001	≥99.9995	≤0.0005	5
ISO 65 U	MPPS	≥99.99995	≤0.00005	≥99.99975	≤0.00025	5
ISO 70 U	MPPS	≥99.99999	≤0.00001	≥99.9999	≤0.0001	10
ISO 75 U	MPPS	≥≤99.999995	≤0.000005	≥99.9999	≤0.0001	20

EN1822 CLASSIFICATION

Filter Class	Particle Size for Testing	Global Values		Local Leak Values		
		Collection Efficiency (%)	Penetration (%)	Collection Efficiency (%)	Penetration (%)	Multiple of Global Efficiency (%)
E10		≥ 85	≤ 15			
E11		≥ 95	≤ 5			
E12		≥ 99.5	≤ 0.5			
H13	MPPS[a]	≥ 99.95	≤ 0.05	≥ 99.75	≤ 0.25	5
H14	MPPS[a]	≥ 99.995	≤ 0.005	≥ 99.975	≤ 0.025	5
U15	MPPS[a]	≥ 99.9995	≤ 0.0005	≥ 99.9975	≤ 0.0025	5
U16	MPPS[a]	≥ 99.99995	≤ 0.00005	≥ 99.99975	≤ 0.00025	5
U17	MPPS[a]	≥ 99.999995	≤ 0.000005	≥ 99.9999	≤ 0.0001	20

[a] MPPS - Most Penetrating Particle Size

IEST-RP-CC001

Filter Type	Particle Size for Testing	Global Values		Local Leak Values		
		Collection Efficiency (%)	Penetration (%)	Collection Efficiency (%)	Penetration (%)	Multiple of Global Efficiency (%)
A	0.3[a]	≥ 99.97	≤ 0.03			
B	0.3[a]	≥ 99.97	≤ 0.03	Two-Flow Leak Test		
E	0.3[a]	≥ 99.97	≤ 0.03	Two-Flow Leak Test		
H	0.1-0.2 or 0.2-0.3[b]	≥ 99.97	≤ 0.03			
I	0.1-0.2 or 0.2-0.3[b]	≥ 99.97	≤ 0.03	Two-Flow Leak Test		
C	0.3[a]	≥ 99.99	≤ 0.01	≥ 99.99	≤ 0.01	1
J	0.1-0.2 or 0.2-0.3[b]	≥ 99.99	≤ 0.01	≥ 99.99	≤ 0.01	1
K	0.1-0.2 or 0.2-0.3[b]	≥ 99.995	≤ 0.005	≥ 99.992	≤ 0.008	1.6
D	0.3[a]	≥ 99.999	≤ 0.001	≥ 99.99	≤ 0.005	5
F	0.1-0.2 or 0.2-0.3[b]	≥ 99.9995	≤ 0.0005	≥ 99.995	≤ 0.0025	5
G	0.1-0.2	≥ 99.9999	≤ 0.0001	≥ 99.999	≤ 0.001	10

[a] Mass median diameter particles (or with a count median diameter typically smaller than 0.2 µm as noted above).
[b] Use the particle size range that yields the lowest efficiency.

ISO 29463-1:2011 establishes a classfcation of filters based on their performance, as determined in accordance with ISO 29463-3, ISO 29463-4 and ISO 29463-5. It also provides an overview of the test procedures, and specifies general requirements for assessing and marking the filters, as well as for documenting the test results. It is intended for use in conjunction with ISO 29463 2, ISO 29463 3, ISO 29463-4 and ISO 29463-5.

EN-1822

This European standard is based on particle counting methods that actually cover most needs for different applications. EN 1822:2009 differs from its previous edition (EN 1822:1998) by including the following:

- An alternative method for leakage testing of Group H filters with shapes other than panels
- An alternative test method for using a solid, instead of a liquid, test aerosol
- A method for testing and classifying of filters made out of membrane-type media
- A method for testing and classifying filters made out of synthetic fiber media
- The main difference is related to the classification for the filter classes H10 - H12, which has now been changed to E10 - E12.

IEST –RP-CC-001.5

This Recommended Practice (RP), IEST-RP-CC001.5, covers basic provisions for HEPA (high efficiency particulate air) and ULPA (ultra-low penetration air) filter units as a basis for agreement between customers and suppliers.

HEPA filters and ULPA filters that meet the requirements of this RP are suitable for use in clean air devices and cleanrooms that fall within the scope of ISO 14644 and for use in supply air and contaminated exhaust systems that require extremely high filter efficiency (99.97% or higher) for sub micro-meter (µm) particles.

This RP describes 11 levels of filter performance and six grades of filter construction. The customer's purchase order should specify the level of performance and grade of construction required. The customer should also specify the filter efficiency required if it is not covered by the performance levels specified in this RP.

HEPA/ULPA
APPLICATIONS

Hepa filters are used in a wide variety of applications, different components are utilized in the filters construction as well as the test methods employed to optimize the filters life while still delivering the desired filter efficiency.

HEPA FILTERS
Camfil's Megalam & Absolute brands are specified daily and chosen by our customers worldwide for the most critical applications, these filters are used to protect the process from contamination, they often must be resistant to a wide range of cleaning and decon agents as well as the test aerosol used periodically during the filters working life.

HEPA filters used on the exhaust air are used to protect the people and our environment from any harmful or dangerous compound or virus being generated in the classified space.

FILTER CONSTRUCTION
There are 5 main components of materials utilized in a HEPA filter.

Frame:
Produced in aluminum, electro galvanized, MDF, stainless and steel and plastic as standard.

Media:
Glass fiber as standard for 99% of applications, membrane media historically supplied to the Microelectronics industry has potential but unproven applications in Life Science today.

Sealant:
Specific sealants for HEPA filters are used according to temperature requirements.

Gaskets:
This can be a liquid such as Gel which can be delivered in Silicone & Polyurethane, Neoprene, poron & one piece PU gaskets also apply.

Media separator:
Hot melt, aluminum & glass thread are 3 common methods delivered by Camfil globally depending on the application.

TEST METHODS
Being the world's largest supplier of HEPA filters with production plants in all corners of the globe, we need to manufacture specific grades of filters to meet local, regional and international standards. We manufacture in-house all major scanning and pleating machines to ensure consistency of product quality and construction throughout the world.

We primarily manufacture filters in accordance with EN-1822 part 5, IEST CC 034 & ISO 29463.

Applications that require shake table testing, high airflow, burst pressure tests, High temperature tempering are often used subject to demand.

Scan to learn more or go to: www.camfil.com/Filter-technology/Filter-testing/HEPAULPA-Testing

HEPA FILTER / ULPA FILTER

TEMPERATURE 70 C°

ABSOLUTE
HIGH AIR FLOW > 2500 M^3/HR (1500 CFM)
FILTER CLASS E10 - H14

- **ABSOLUTE C SERIES**
- **ABSOLUTE D SERIES**
- **ABSOLUTE V SERIES**

STANDARD CLEAN ROOM APPLICATION
- 0,45 M/S (90 FPM)
FILTER CLASS H13 - U17

- **MEGALAM**
  - **MEGALAM MD / MX / MG**
  - **SILENT HOOD/ SLIMLINE**
  - **MEGALAM GREEN**

250 PA
FILTER CLASS
E10 - H14

- **CLOSEPLEAT**
  - **CLOSEPLEAT STEEL FRAME**

TEMPERATURE 110 C°
- **ABSOLUTE**

TEMPERATURE 230-250 C°
- **SOFILAIR HT /FRSI**

TEMPERATURE 350 C°
- **TERMIKFIL**

TEMPERATURE 350 C°
- **F SERIES / FRK**

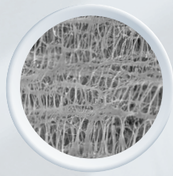
PLEATING
Proprietary pleating technology allows us to produce and optimize pleat height to maximize performance.

GASKET
Installations mainly utilize a Gel or PU endless gasket system as seen below.

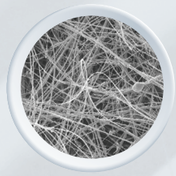
PU endless Gasket

Gel

MEDIA



Other



Glass fibre

PROSAFE RANGE:
TAKING CARE OF YOUR PROCESS SAFETY

We offer a complete range of ProSafe filters designed to comply with the strict demands on safety, traceability and control in the Food & Beverage and Life Science industries.

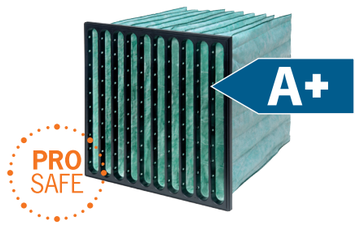
BENEFITS WITH ALL PROSAFE FILTERS:

- Specially designed for process safety (Food & Beverage and Life Science applications)
- All HEPA classified ProSafe filters are thoroughly tested before they leave the factory to eliminate potential leakage
- The quality of the raw material (or filter media as we call it) is the highest. It is tested and developed according to very precise specifications
- Approved for food product contact according to EC 1935:2004
- Prevents microbial contamination according to ISO 846
- Sturdy, moisture- and corrosion-resistant for a hygienic HVAC system according to VDI6022
- Tested resistance to chemicals used for cleaning and decontamination processes in clean rooms
- Free of harmful chemical components such as Formaldehyde, Phthalates and Bisphenol-A
- All ProSafe filters are packed individually in an hygienic bag

** A+ in F7 according to Eurovent RS 4/C/001-2015*

*** A+ in F7/F8/F9 according to Eurovent RS 4/C/001-2015*

HI-FLO PROSAFE *
This is a pocket filter with high efficiency used for air-conditioning applications and preparatory filtration in clean rooms. Optimised pocket design for the best energy-efficient air distribution.



OPAKFIL PROSAFE ES **
Specially produced to fulfil the strict safety requirements for preparatory filtration of air for clean rooms in the most energy efficient way.

HI-CAP PROSAFE
This bag filter is designed to remove the largest particles. Used for preparatory filtration of air in clean rooms. It has rigid self-supporting pockets.

ABSOLUTE V PROSAFE
Absolute is a HEPA compact filter with high reliability. Now it also meets the requirements of ProSafe and can be used in the extremely demanding environments of the Food & Beverage and Life Science industries.

MEGALAM PROSAFE
The original Megalam MD/MX/MG air filters with Gel or PU gasket are superior products that give you the highest possible level of protection. Megalam is the final, safe barrier protecting your sensitive processes from harmful particles.

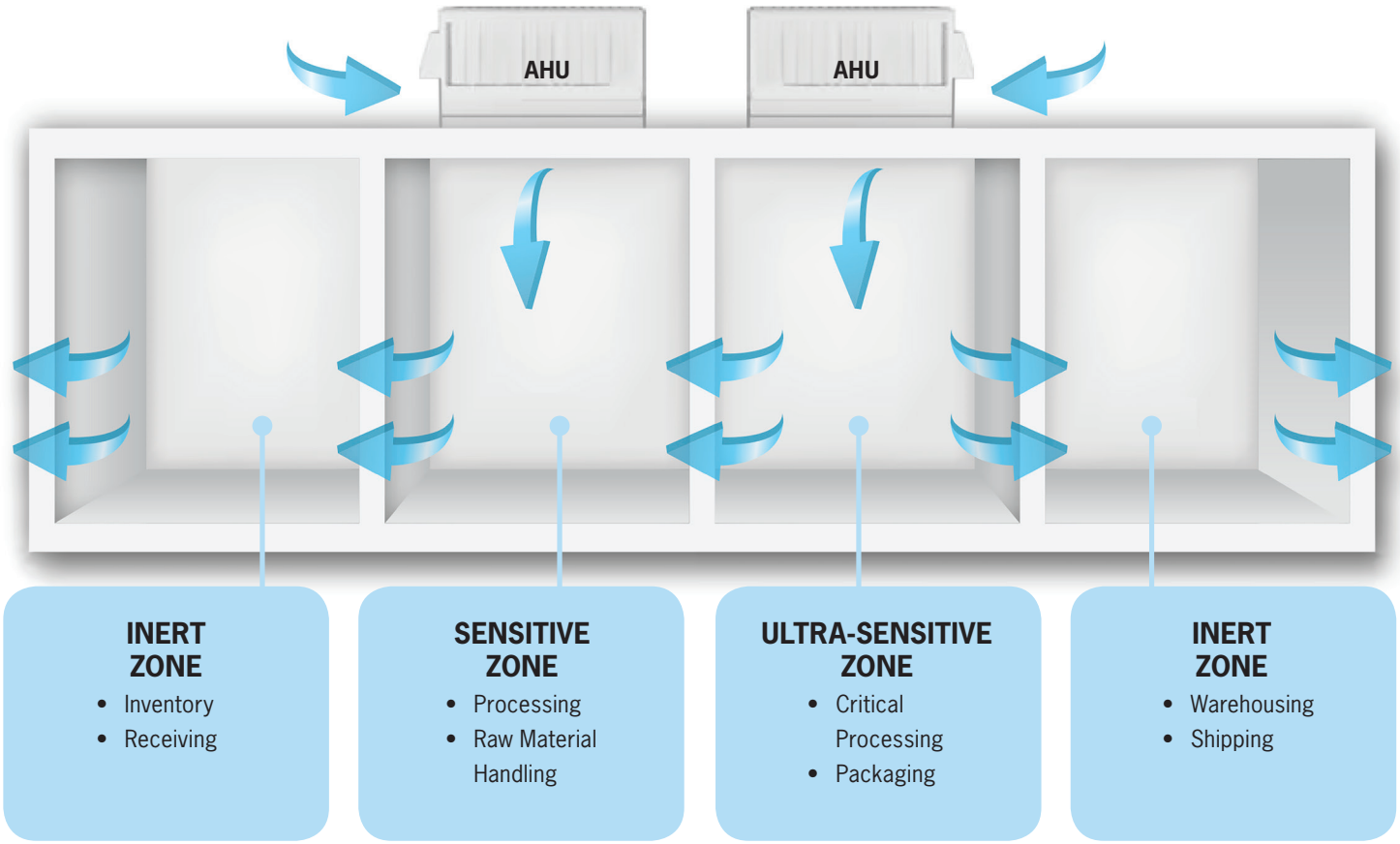
It is a panel filter that is typically applied in terminal housings, clean room ceilings or LAF benches. Its components have provided the base for the development of Camfil's ProSafe range. And these components have also has been the basis for the high quality standardisation of the whole Camfil filter range.

M-PLEAT & ECOPLEAT PROSAFE
Protect your complete installation thanks to ProSafe pleated panels from M5 to F9, from intake air to return air.

AIR CLEANER CC 6000 PROSAFE
For you in the Food & Beverage- and Life Science industry, air is one of the most important ingredients. That's why effective recirculation by Camfil air Cleaners that reduce the levels of microorganisms in the air are vital. In addition, legislation and market demands are becoming increasingly tougher on hygiene in the food & beverage and life science industry.

- Approved for food product contact according to EC 1935:2004
- Prevents microbial contamination according to ISO 846
- Sturdy, moisture- and corrosion resistant for a hygienic HVAC system according to VDI6022
- Tested resistance to chemicals used for cleaning and decontamination processes in clean rooms
- Free of harmful chemical components such as Formaldehyde, Phtalates and Bisphenol-A
- Flexible solution
- Plug and play installation
- IP54 protection

THE NECESSITY OF POSITIVE PRESSURE



POSITIVE PRESSURE
A critical component of any food safety program is controlling the flow of air throughout the plant.

Directing air from high pressure zones in the sensitive areas of processing and packaging towards less sensitive areas such as shipping and receiving, creates a "wall of air" and is an important strategy in preventing contaminants from infiltrating.

To accomplish this targeted airflow, the plant engineer requires access to a large and consistent supply of clean, filtered air.

Using filters with a low resistance to air-flow while maintaining rated efficiency for their entire service life, allows engineers the flexibility to design individual solutions based upon their plant's layout.

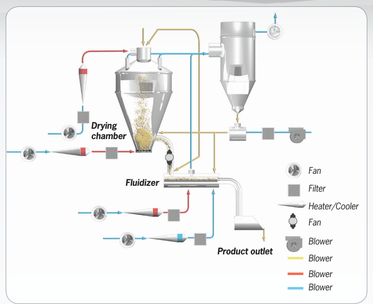

YOU CAN
COUNT ON
CAMFIL
PRODUCTS...
...AND OUR
APPLICATION
KNOW HOW!

BABY MILK
SPRAY DRY AND COOLING

As milk powder needs to be cooled down, contamination risk appears. Especially with *Enterobacter sakazakii* which is extremely harmful for babies.

Camfil Filter Solution: air is cleaned and will remain clean for the entire life of the filter. Each filtration step is protecting the next one in order to maximize process operating time.

With the specific Food Safety Compliant range, Camfil brings also proves of safety and reliability to Industrial Customers. Because monitoring and controlling process is so important and must be demonstrated.



30/30 or M-Pleat (M5/MERV 8)

Opakfil ProSafe (F8) Durafil ES (MERV 14)

Absolute VG XL/XXL (H13)

YOGHURT FILLING PROCESS

OUTSIDE AIR

Filtration is like a chain:

Each part protects the next and the weakest will decrease the Total Cost of Ownership for the entire process.

So even from the Air Handling Unit, it is important to ensure appropriate stable filtration. Whole Customer Process Total cost of Ownership including energy costs, maintenance costs will be the lowest possible.

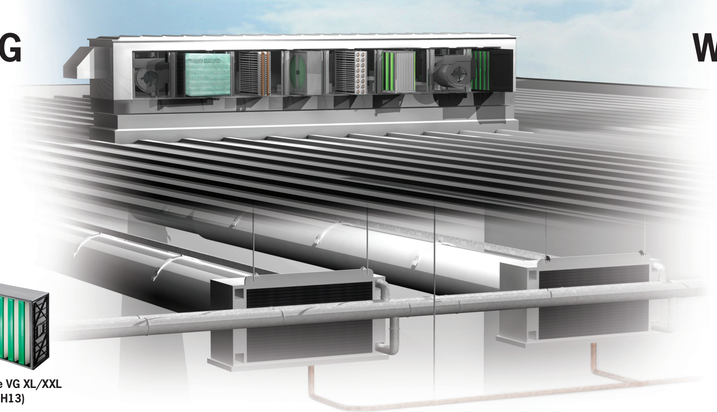
This is why Camfil provides from G4 pre-filtration to Rigid Bag filters and High Air Flow HEPA filters a complete Food & Beverage solution Range.

Process as a box in a box:

Let's ensure a safe filtration cascade. Even if textile duct works are used: good filtration will ensure better cleanliness over time.

FILLING LINE

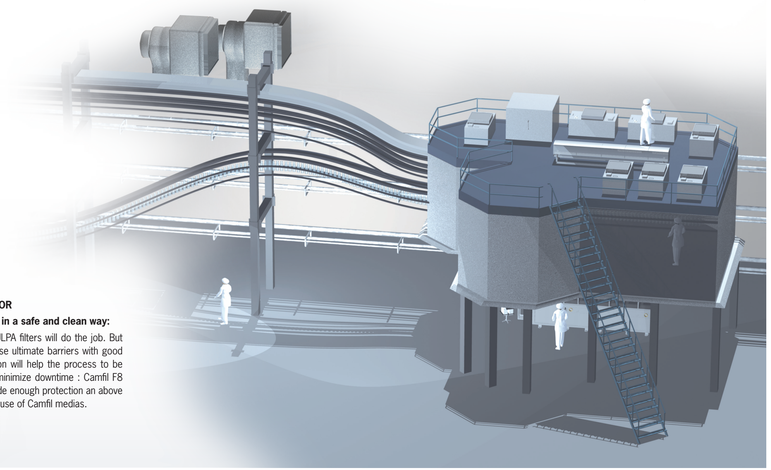
As a very sensitive product, yoghourt must be filled below a clean air protection, HEPA/ULPA filter efficiency can only ensure the required cleanliness.



Absolute VG XL/XXL (H13)

Opakfil ProSafe (F8) Durafil ES (MERV 14)

M-Pleat (M5/MERV 8)



M-Pleat (M5/MERV 8)

Opakfil ProSafe (F8) Durafil ES (MERV 14)

Absolute VG XL/XXL (H13)

AIR CONVEYOR

Transporting in a safe and clean way:

surely HEPA/ULPA filters will do the job. But protecting these ultimate barriers with good reliable filtration will help the process to be safer and to minimize downtime : Camfil F8 filter will provide enough protection an above all stable because of Camfil medias.

WATER FILLING PROCESS

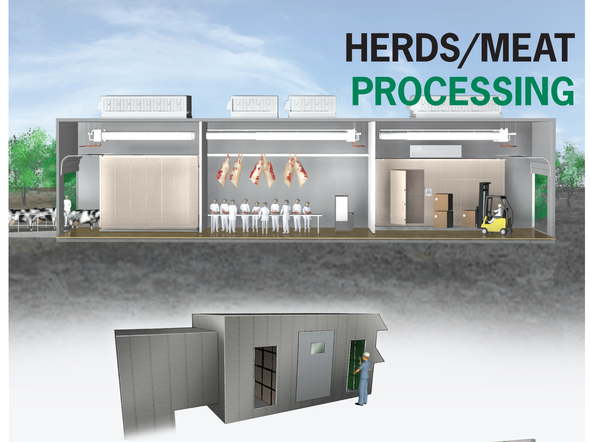
FILLING LINE

For high moisture and water filling, Camfil has developed unique media for HEPA filtration: guarantying efficiency and filter lifetime even in high moisture conditions: Megalam MD 15 ME. But as a normal HEPA: protecting this filter with a good fine filter will increase process availability.

Ecopleat (F5 or MERV8 and F9 or MERV15)

Megalam ME (H14 or U15)

HERDS/MEAT PROCESSING



HERDS:

Air filters used in facilities that process herd animals have unique challenges to overcome. In some cases, tens of thousands of animals are processed each day in these plants which can employ 1500 people or more. There is no waste; the entire animal is utilized through numerous processing steps.

Each step in the process requires filters with specific performance traits due to the conditions they face. The intake air passing though the prefilters for example often contains very high moisture content and elevated dirt loads. Further down the processing line in the more sensitive zones, the higher efficiency filters must contend with wide temperature swings and high airflow requirements to maintain positive pressure. Despite these difficult conditions, the filters must continuously provide clean air suitable to safely process the food all of us enjoy.

This is why Camfil has a wide range of products capable of delivering the level of protection required by quality control managers but with an operating cost appealing to those in financial management.

The 30/30, M-Pleat Green and Camflo XLT are engineered to handle the difficult conditions in the prefilter stages while remaining in service for a long period of time. As air quality requirements increase in the more sensitive zones, the Hi-Flo ES and Opakfil, along with the ProSafe versions of these products, deliver the efficiency needed to protect food prior to packaging. The ProSafe Hi-Flo and ProSafe Opakfil filters are specifically designed for food plants that require certification and traceability on food contact products.

In the most critical processing operations such as slicing and mincing, food is exposed to aerial bio contamination. HEPA filters, Absolute Range for AHU or Megalam Range for terminal filtration, are then strongly recommended due to their ability to capture bacteria.

While some bacteria may be sub-micron in size, they are typically larger than Most Penetrating Particle Size (MPPS) which is used when certifying these filters. The benefit of HEPA filtration is not solely limited to customer health as the shelf life of the food can be extended as well.

30/30 or M-Pleat (M5/MERV 8)

Hi-Flo ProSafe (F8 or MERV14)

Opakfil ProSafe (F8) Durafil ES (MERV 14)

INERT ZONE

INERT ZONE

Zone in which the risk of bio-contamination of the product is average or low to negligible according to standard ISO/DIS 14698-1.

Examples of applications

- Low temperature areas for reception/storage of raw materials.
- Areas for packing, boxing and storing pre-packaged products.

Air quality

"Ventilation or air conditioning systems must not be a source of food contamination" (French Decree of 9 May 1995, Art. 3).

Recommended filtration

Only fine filtration, with F7 efficiency as a minimum, according to European standard EN 779:2012, provides sufficient protection*.

PRE-FILTRATION

EcoPleat Green

Available in all sizes with a depth of 48 or 96 mm. Ultra-compact solution, efficiency M6 or F7 (MERV 13): ideal for replacing a much less efficient G4 filter. 100% incinerable

M-Pleat Green

Pre-filter with a high level of mechanical and humidity resistance.

30/30

The 30/30® has a very low pressure drop throughout its lifetime and is consequently a very low-energy filter. For guaranteed G4 performance, 30/30® is the right choice.

Cam-Flo XLT

Cam-Flo has a filter material of newly-developed plastic fibre media. Low initial pressure loss, flat development. Newly-developed seam technique for better air distribution. Conical pockets and self-supporting bags. High mechanical strength and dust holding capacity

FILTRATION

Opakfil ProSafe/ Durafil ES

Very large filtering surface area.
Highly energy efficient.
Efficiency: M6, F7, F8, F9.
Easy to install thanks to its 10 handles.

Cam GT

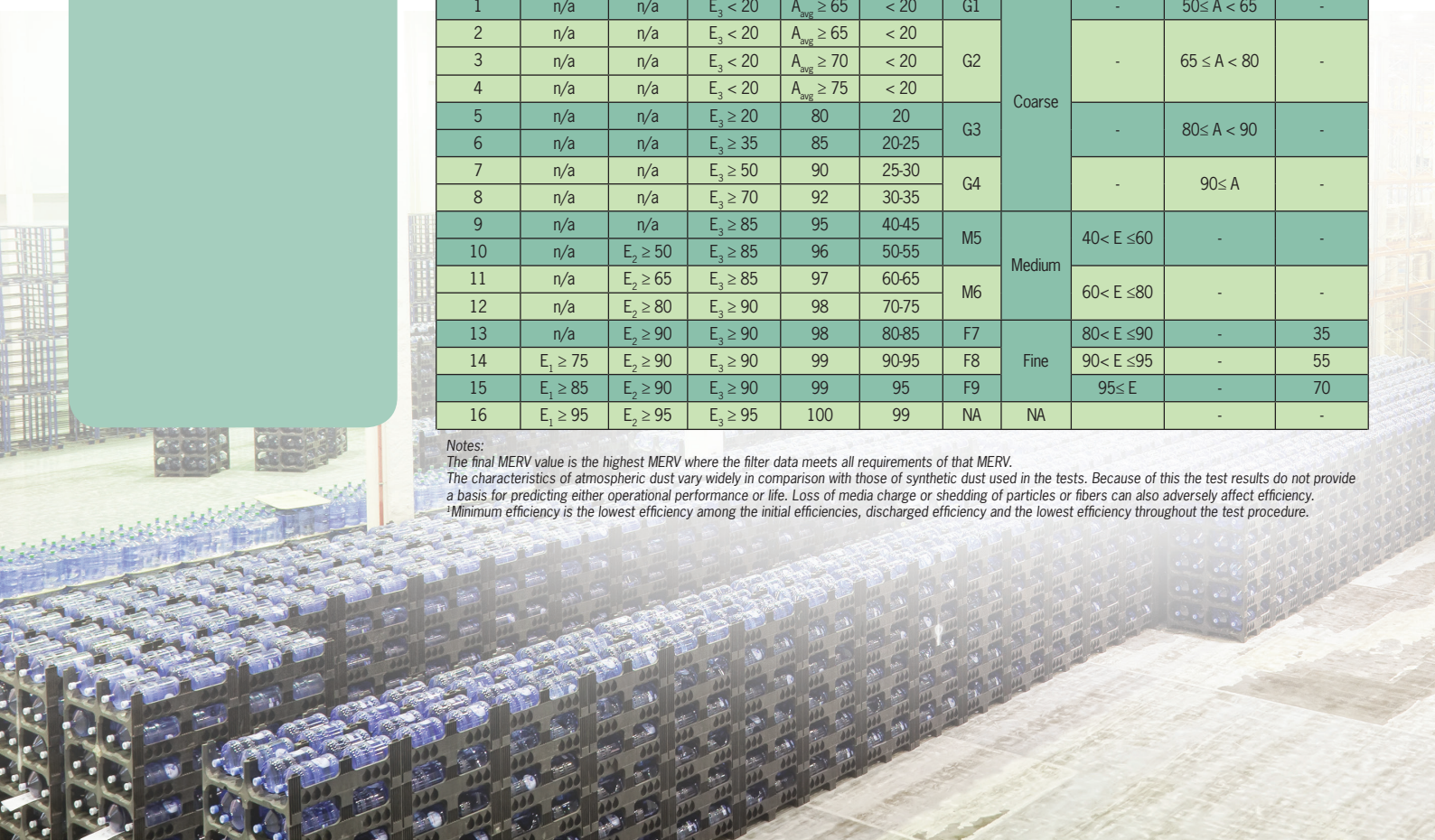
Designed for very humid environments.
Available from F7 to E10

All of these solutions are corrosion resistant

AIR FILTERS TESTING STANDARDS COMPARISON

ASHRAE Standard 52.2-2012				ASHRAE 52.1-1992		EN 779 2012				
Minimum Efficiency Reporting Value	Composite Average Particle Size Efficiency, % in Size Range, microns			Average Arrestance	Average Dust Spot Efficiency	Class	Group	Average Efficiency at 0.4 micron[1]	Average Arrestance of synthetic dust	Minimum Efficiency at 0.4 micron[1]
	Range 1	Range 2	Range 3							
MERV	0.30 - 1.0	1.0 - 3.0	3.0 - 10.0	%	%			%	%	%
1	n/a	n/a	$E_3 < 20$	$A_{avg} \geq 65$	< 20	G1	Coarse	-	50≤ A < 65	-
2	n/a	n/a	$E_3 < 20$	$A_{avg} \geq 65$	< 20	G2		-	65 ≤ A < 80	-
3	n/a	n/a	$E_3 < 20$	$A_{avg} \geq 70$	< 20					
4	n/a	n/a	$E_3 < 20$	$A_{avg} \geq 75$	< 20					
5	n/a	n/a	$E_3 \geq 20$	80	20	G3		-	80≤ A < 90	-
6	n/a	n/a	$E_3 \geq 35$	85	20-25					
7	n/a	n/a	$E_3 \geq 50$	90	25-30	G4		-	90≤ A	-
8	n/a	n/a	$E_3 \geq 70$	92	30-35					
9	n/a	n/a	$E_3 \geq 85$	95	40-45	M5	Medium	40< E ≤60	-	-
10	n/a	$E_2 \geq 50$	$E_3 \geq 85$	96	50-55					
11	n/a	$E_2 \geq 65$	$E_3 \geq 85$	97	60-65	M6		60< E ≤80	-	-
12	n/a	$E_2 \geq 80$	$E_3 \geq 90$	98	70-75					
13	n/a	$E_2 \geq 90$	$E_3 \geq 90$	98	80-85	F7	Fine	80< E ≤90	-	35
14	$E_1 \geq 75$	$E_2 \geq 90$	$E_3 \geq 90$	99	90-95	F8		90< E ≤95	-	55
15	$E_1 \geq 85$	$E_2 \geq 90$	$E_3 \geq 90$	99	95	F9		95≤ E	-	70
16	$E_1 \geq 95$	$E_2 \geq 95$	$E_3 \geq 95$	100	99	NA	NA		-	-

Notes:
The final MERV value is the highest MERV where the filter data meets all requirements of that MERV.
The characteristics of atmospheric dust vary widely in comparison with those of synthetic dust used in the tests. Because of this the test results do not provide a basis for predicting either operational performance or life. Loss of media charge or shedding of particles or fibers can also adversely affect efficiency.
[1]Minimum efficiency is the lowest efficiency among the initial efficiencies, discharged efficiency and the lowest efficiency throughout the test procedure.



SENSITIVE ZONE

CAMFIL STAINLESS STEEL HOUSINGS

- Problem-free installation for HEPA filters
- Very flexible installation
- Modular system ready to be connected
- Easy maintenance
- Access by inspection door
- Instant locking of the filters without tools
- Camfil clamping mechanism without tools

If well protected, a HEPA terminal filter can see its service life significantly increased.

OPAKFIL PROSAFE EPA

- Resistant to corrosion.
- Up to 4000 m³/h treated according to EN 1822:2009.
- Efficiency E10.
- Easy to install thanks to its 10 handles.

ABSOLUTE VG XL

- Very high efficiency with a high flow in complete safety
- Efficiency certified according to EN 1822:2009/IEST-RP-001.5
- Check on leaving production
- Complete traceability
- Individual serial number
- Economical
- Up to 4000 m³/h
- Low pressure drop
- Suitable for food-processing operating conditions
- Halogen free

Moisture resistant filters are also available, such as the Cam-GT box.

SENSITIVE ZONE

Zone in which the risk of biocontamination of the product is high to average according to standard EN/DIS 14698-1.

Examples of applications

- Cutting, dicing and processing rooms
- Pre-packaging rooms, maturing areas, sensitive chambers: personal, equipments and materials, etc.

Recommended final filtration

Efficiency E10 (EN 1822) for the average level of risk to H13 (EN 1822) for the high level of risk.

Stainless steel duct housing located as close as possible to the point of use.

Standard EN 1822:2009							
MPPS overall values					MPPS local values		
Filter	Filter class	Minimum efficiency (%)	Maximum penetration (%)	Minimum P.C	Minimum efficiency (%)	Maximum penetration (%)	Minimum P.C.
E P A (E)	E10	85	15	6.7	-	-	-
	E11	95	5	20	-	-	-
	E12	99.5	0.5	200	-	-	-
HEPA (H)	H13	99.95	0.05	2 000	99.75	0.25	400
	H14	99.995	0.005	20 000	99.975	0.025	4 000
ULPA (U)	U15	99.9995	0.0005	200 000	99.9975	0.0025	40 000
	U16	99.99995	0.00005	2 000 000	99.99975	0.00025	400 000
	U17	99.999995	0.000005	20 000 000	99.9999	0.0001	1 000 000

EPA: *Efficiency Particulate Air (filter)*
ULPA: *Ultra Low Penetration Air (filter)*

HEPA: *High Efficiency Particulate Air (filter)*
MPPS: *Most Penetrating Particle Size*

Standard EN 1822:2009 guarantees the integrity of the filters: *Industrial test certificate from H13 / Checks carried out with MPPS particles / Search for local leaks in addition to the overall efficiency of the filter / Explicit and standardised test conditions.*

ULTRA SENSITIVE ZONE

ULTRA SENSITIVE ZONE

Zone in which the risk of biocontamination of the product is very high according to standard ISO/DIS 14698-1.

Examples of applications

- Cutting, boning, trimming. Slicing, fine slicing areas. Dicing areas.
- Areas of leaving refrigeration prior to pre-packaging.
- Assembly/pre-packaging areas.
- Fermenting agent preparation areas.

Air quality
Very high level of microbiological cleanness. Local protection: class 100 / M3.5 (C.E. E) or ISO 5 (EN 14644-1) with laminar flow room: ISO 6 / ISO 7 (EN 14644-1)

Recommended filtration
High risk control. Efficiency H14/U15 according to standard EN 1822.

On machine and equipment:
Silent Hood ducted filter, Megalam laminar flow panels in Sofdistri diffuser housing.
Laminar flow: Megalam laminar flow panel housings installed on CamGrid structure.

Room:
Silent Hood filter block, Megalam laminar flow panels in Sofdistri diffuser housing or fitted on CamGrid structure.

MEGALAM MEMBRANE

Camfil has developed advanced membrane filtration products. It is now possible to manufacture HEPA/ULPA filters from a material which has numerous advantages for your installation:

- Low pressure drop (up to half that of a conventional filter with glass fibre media of the same efficiency).
- Excellent mechanical resistance of the membrane for easier handling.
- Resistance to corrosion and splashes of liquids.

MEGALAM GREEN

A complete range of fully incinerable HEPA/ULPA laminar flow panels.

- **Full guarantee of performance at "critical points"**
- **Compliant** with European standard EN 1822, each filter is checked individually before packing
- **Leak test** by MPPS scanning
- MPPS overall **efficiency test**
- **Individually packed** in a plastic bag in a clean room
- **Complete** traceability

SOFDISTRI

The Sofdistri is a terminal filter diffuser housing for air supply or extraction. Easy to install: quick clamping. Ceiling or wall installation.

Sealing guaranteed

Perfectly flat and rigid gasket seat: guarantee of a maximum leak rate of less than 10-4 (0.01%), corresponding to terminal filtration with a minimum efficiency of HEPA H13.

Very high manufacturing standards

Designed to allow pressure drop measurements and recurrent integrity tests of the terminal filters.

The direct access to the terminal filters permits precise filter integrity testing and absence of leaks at the module.

Turbulent air diffusion

Choice of 5 standard types of diffusion grilles (overlapping or flush perforated grille, 4 directions, helical) to optimise air mixing.

CLEARING THE DUST
IN FOOD PROCESSING PLANTS

The Farr Gold Series® cartridge dust and fume collector combines enhanced performance with ease of service while cleaning the work environment of irritating dust and fumes.

FARR GOLD SERIES® DUST COLLECTOR FOR FOOD PROCESSING

Dust control in food processing facilities is vital for many reasons. Dust-laden floors pose safety hazards to workers, making them prone to slips and falls. Some food ingredients are allergens, threatening the health of workers: Ongoing exposure to ambient dust particles from these ingredients can cause serious health problems, particularly to individuals suffering from allergies or asthma.

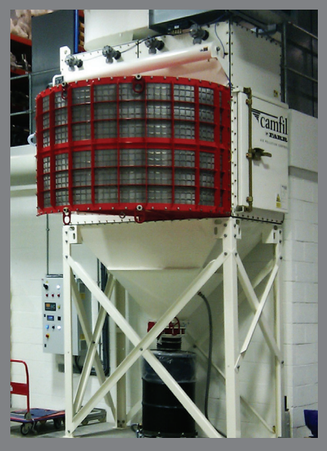
Also, many food dusts – including sugar, flours, cornstarch and other starches – are highly combustible, elevating the risk of a combustible dust explosion. In addition to these safety issues, a dusty workplace can also compromise productivity and product quality.

The Farr Gold Series® is used in a wide range of food processing including cereal ingredients, spices, feed and grain, raw agricultural products, egg shell and general dust.

FARR GOLD SERIES® FEATURES

- Modular design for optimum flexibility
- Each module accommodates airflows up to 8,500 m³/h
- "Built like a safe" modules are constructed of 4.5 mm thick carbon steel
- Door, hopper, inlet and panels are all 3 mm thick
- Powder painted for unsurpassed corrosion resistance
- Component configurations are virtually unlimited
- Vertically-mounted cartridges allow efficient pulse cleaning of dust, reduce fire and explosion risks
- Collector can be expertly fitted with explosion vents or other explosion prevention technologies to meet ATEX or NFPA requirements

Scan to learn more or go to www.camfilapc.com/europe-food



Farr Gold Series units in various configurations available for custom applications.

Farr Gold Series offers modular design for optimum flexibility – delivered fast!

FARR GOLD SERIES® FOR SPICE MIXING IN ISO 6 CLASSIFIED PRODUCTION CELLS

PRODUCT INFORMATION

Product:	**Farr Gold Series® dust collector**
Size:	**18 x GS4**
Air Volume:	**1.500 - 4.000 m³/hr**
Application:	**Spice Mixing**
Customer:	**Huijbregts Group / L&F Machinebouw BV, Helmond, The Netherlands**
Installation date:	**December 2009**

COMPANY PROFILE

The Huijbregts Group provides powder ingredients stock management for leading food industries around Europe. The Huijbregts Group executes its processes according to the highest quality standards and strictest food safety legislation.

CHALLENGE

The Huijbregts group was looking for a reliable, sustainable, easy maintenance and low "life cycle cost" dust collection system for their newly built production site in Helmond NL.

Kuijpers Installaties BV were tasked with finding the right supplier for the dust collection equipment and the HVAC setup to achieve the ISO 6 environmental demands for allergen free production in the production cells.

SOLUTION

A dust sample was analyzed at the Camfil Air Pollution Coltrol (APC) test facility in Jonesboro (AR, USA), who advised on the most suitable media type and air to cloth ratio.

After careful evaluation of a number of suppliers, Kuijpers decided that the Camfill APC Farr Gold Series® dust collector offered the best solution, meeting in full the requirements of the project managers at The Huijbregts Group.

To avoid complicated duct work and to achieve the best flexibility and reliability, Huijbregts decided to install 18 separate dust collection units.

14 of these are installed on individual production cells, with the remaining 4 units being used for material and bulk handling on the top floor of the factory.

The exhaust volume from each production cell varies between 1,500 m³/hr and 4,000 m³/hr and is controlled by a variable frequency drive and pressure sensors in the ducting on each system. The Farr Gold Series dust collectors are supplied complete with DuraPleat Gold Cone cartridges, top-mounted fan sets, silencers and secondary security filters.

The dust collectors are reinforced to withstand a pressure of 0.45 bar, so that if required they can be retro-fitted with a flame quench device, for safe indoor explosion venting.

The contact person at Huijbregts Group said: "We chose dust collectors from Camfil APC because Camfil APC is recognized as a quality dust collector manufacturer and their standard dust collectors has all the elements we need. All the other dust collectors needed expensive modifications before meeting our requests."

Farr Gold Series® dust collectors located at Huijbregts Group, in Helmond, The Netherlands.

Scan to see more or go to www.camfilapc.com/case-studies

The **Durapleat Cold Cone** cartridges fitted to the units are a washable, heavy-duty spunbond polyester, providing high efficiency filtration, with a low pressure loss and excellent cleaning characteristics for a long life.

ENGINEERING TOOLS

CREO SOFTWARE

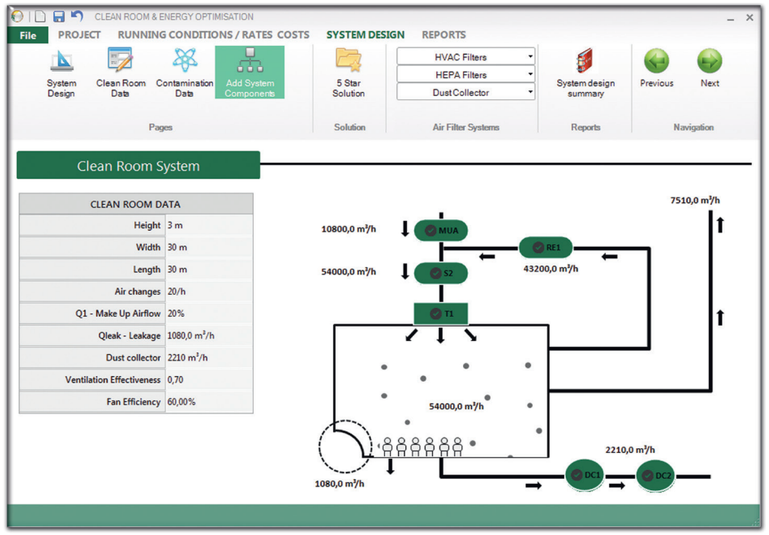
The **Clean Room and Energy Optimization** software enables the user to create a customized clean room application. The software allows the user to calculate the Life Cycle Cost and cleanliness class for different Clean room designs.

Different Cleanroom configurations can be analyzed ranging from ventilating to uni-directional (Laminar flow) installations.

Selection options include:

- Particle size of interest, 0.1, 0.3 or 0.5 micron
- Particles generated from the process and activity from people in the room
- Dimensions of the room
- No. of air changes/airflow
- Ventilation effectiveness
- Amount of recirculated air from 0 – 100%
- Pre and terminal filter efficiencies

Wide ranges of reports are available, including Cleanroom classifications as well as specifications for selected products. Additional information such as CO_2-emissions and efficiency of the filter system is also available.



LCC SOFTWARE

The **LCC (Life Cycle Cost)** software is a tool we have used successfully for many years in the Life Science industry. The volatile oil and energy markets and the ever increasing cost of supplying clean air are critical for this industry.

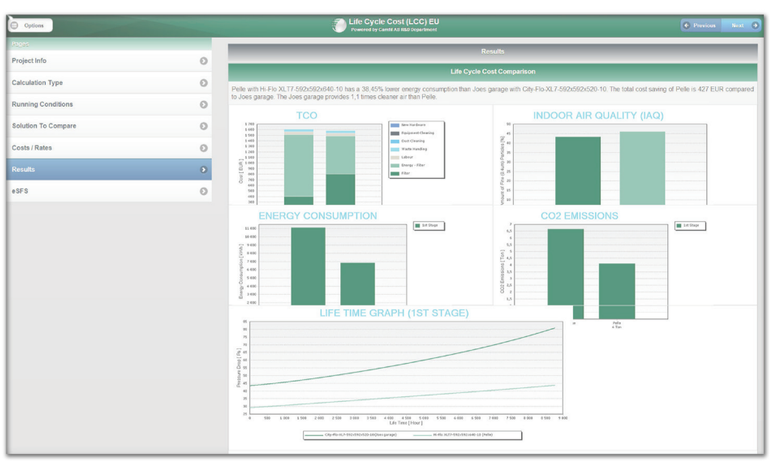
The LCC software allows us to simulate different combinations of filter types with the desired efficiency to maximize lifetime, reduce energy costs and number of filter changes which can save the Pharmaceutical manufacturer valuable resources. An additional benefit is the positive effect reduced motor power and disposal has on the environment.

After filter survey's are carried out at the manufacturing facility, we can input the existing filter set up in the air handling units and optimize the selection of the lowest LCC filter combination for the facility in question.

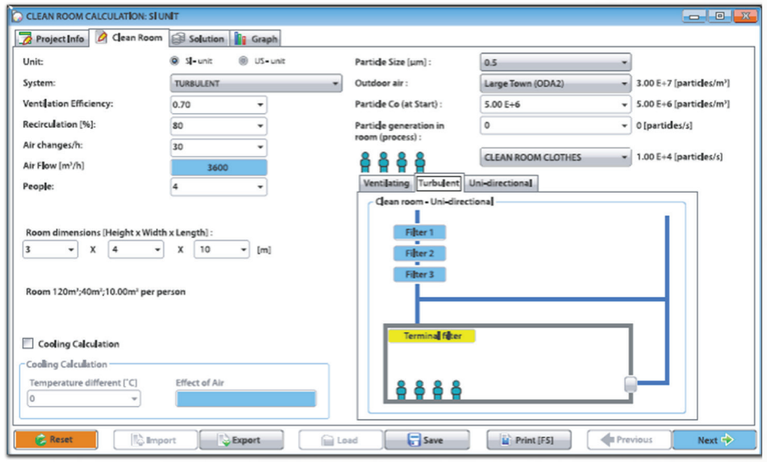
Parameters the software includes:

Type of filters in use:

- Outside air condition (environmental condition in the plants location)
- Airflow
- Number of filters in the air-handling units
- Current change out conditions (we can select filters being changed on time or pressure drop)
- Current energy cost
- Installation cost
- Disposal and cleaning costs



CLEAN SOFTWARE

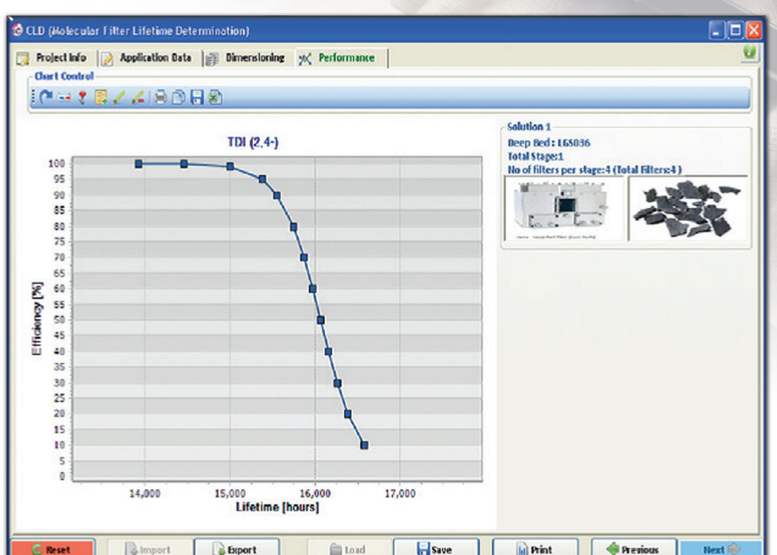


Before we developed **CREO**, the original cleanroom design software **CLEAN** was developed in the early 1990's and is still a useful software utilized today.

The software is perfect for a simple quick overview to calculate the desired cleanroom class and recovery time.

CARBON SOFTWARE

Camfil has developed a powerful sofware called **CLD (Carbon Lifetime Determination)** to simulate the efficiency and lifetime of molecular filtration solutions under application real conditions. The software provides the opportunity to input data relating to the application, e.g flow rate, contaminant gas(es), gas concentration(s), temperature and relative humidity. The performance of different molecular filtration products and adsorbent medias can then be compared. The output from the software is a an efficiency/lifetime chart, together with relevant data such as the application details, product selection, pressure loss and contact time.



The software has been developed using data from 3 sources:

1) Physical and chemical characteristics of the contaminant molecule, adsorption theory and adsorption isotherms.

2) The results from thousands of test reports generated in the Camfil molecular filtration test rigs. In these rigs, different products have been evaluated against a range of gases at different temperature and relative humidity values.

3) The results of on-site measurements and the observation of filter performance in the real world.

For optimal data, it is essential that the Camfil molecular filtration test rigs and CLD software can take account of the gas, gas concentration, temperature and relative humidity since these parameters directly influence the performance of a molecular filtration solution.

TAKE CARE OF YOUR SMALLEST PROBLEMS BEFORE THEY BECOME BIG ONES

CAMCLEANER
CamCleaner is a range of patented air purifiers with the most efficient HEPA filters on the market. They are designed to work as a supplement to your existing ventilation system costs, more efficient production and a healthier work environment with less dust and fewer harmful particles.

MOST CUSTOMERS BUY A CAMCLEANER SINCE IT:

- Solves a problem (dust)
- Increases efficiency (less production failure)
- Reduce cost (cleaning)
- Less sick leave

CAMCLEANER FACTS

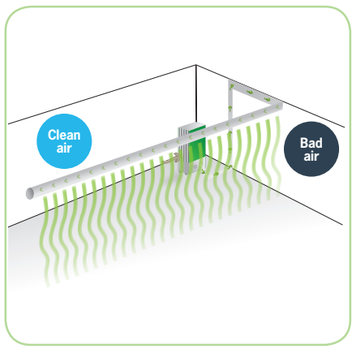
- IAQ (indoor air quality) particle and dust concentration have been reduced with 50% after CamCleaner installation
- Energy consumption has been reduced by 17%. This means that CamCleaner has lowered the energy consumption with 161 000 kW.
- 30% reduction in cleaning and maintenance cost.
- Cleaner products, less downtime.
- Healthier employees.
- Even temperature distribution in high ceilinged rooms.
- Elimination of most air impurities, e.g. Spores, fungus, combustion particles from process contamination.

CLEANING ZONES ACHIEVE MORE EFFECTIVE AIR PURIFICATION
In large premises, you often have different air quality requirements depending on the type of operations taking place in different parts of the building.

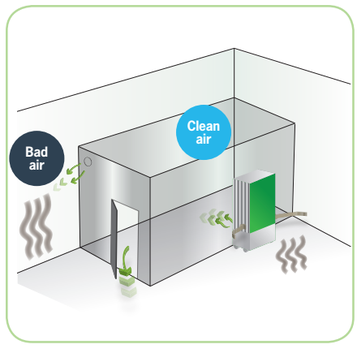
Despite being based on the same ventilation system, CamCleaner can control how clean the air is in various zones, even if there are no walls dividing up the premises.

This is possible because CamCleaner can transport air over a long range and deliver the air into particularly sensitive parts of the premises. The CamCleaner units optimize the air flow in order to meet the demands of your business.

Scan to learn more or go to:
www.camfil.com/Products/air-puri-fier



CLEANING ZONE IN OPEN PREMISES
In this example, the air is purified in the CamCleaner unit's HEPA filter. Then it passes through the duct along the ceiling, where air is discharged from the holes along the wall. The purified air creates a sort of curtain that divides the room into two zones; one with higher quality air and one with lower quality air.



OVERPRESSURE
Exactly as in the example above, overpressure is created when the air is purified and enters the compatment. By doing this, a thoroughly controlled indoor environment is achieved in the space in question. This is useful in processes such as those involving installation, food, electronic installation, and other sensitive production units.

camfil

CAMCARB CG

The compact molecular filtration solutions for small exhaust air streams

(Flow rates: 1,000 m^3h^{-1} to 10,000 m^3h^{-1})

CAMCARB CG filters are filled with high quality activated carbon or CamPure media and are used to remove molecular contaminants from supply air, recirculation air and exhaust air ventilation systems.

CAMCARB CG filters eliminate customer problems with different categories of airborne molecules, including; odours, irritants, toxic gases and corrosives (acidic gases).

The molecular filtration media is deployed in an annular pattern with uninterrupted 360 degree geometry along the entire length of the filter.

This arrangement ensures even air distribution over the entire filter area and maximizes filter lifetime. Filters mount onto a dedicated baseplate using integrated bayonet fastenings without the need for specialized tools.

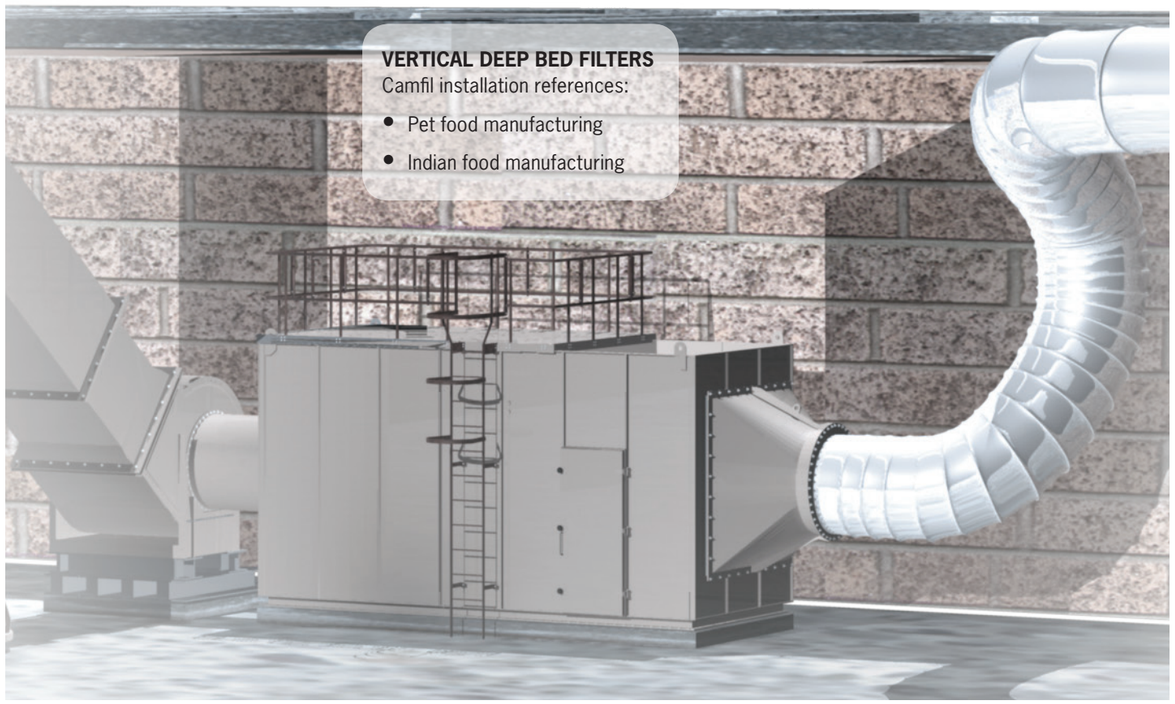
Scan to learn more or go to:
www.camfil.com/Products/gas-filter-products-carbon-chemical/Loose-fill-filters/CamCarb-Green-en

VERTICAL DEEP BED FILTERS

The molecular filtration solution for large exhaust air streams

(Flow rates: 10,000 m^3h^{-1} to 100,000 m^3h^{-1})

Scan to learn more or go to:
www.camfil.com/Global/Documents/Products/VDB/VDB%20product%20sheet.pdf



VERTICAL DEEP BED FILTERS
Camfil installation references:

- Pet food manufacturing
- Indian food manufacturing

EXPERTISE AND SERVICE

Camfil can assist customers in determing air quality in their facilities by analyzing samples taken on-site and submitted to one of our international laboratories.

We can test these samples against existing regulations or we can follow internal guidelines established by by our customers and based upon their unique circumstances.

While these guidelines and regulations are designed primarily to protect the food produced, Camfil is aware of the importance of protecting the investment in expensive air handling equipment as well.

We send our own teams on-site for delivery and installation. We take this step to ensure our filters are installed correctly and performing as expected. The challenge we are committed to is delivering the highest indoor air quality at the lowest total cost of ownership.

SERVICES OFFERED
Camfil Filter Management (CFM)

- Guarantees the correct implementation and standardization of the filters
- Optimizes the overall operational cost of filtration in all customers facilities
- Assists in all activities related to filtration

SERVICES INCLUDES

- Optimizing filter service life
- Scheduling filter changes
- Inventory management
- On-time delivery options
- Installation
- Disposal of used filters
- Energy cost analysis using Life Cycle Cost modeling software

WORK - INSTALLATION

- A single contact from design to installation of the equipment.
- Guaranteed results on installation commissioning.
  – Filter wall modifications
  – Filter change operations
  – Repairing, cleaning and disinfecting your textile ducts

MANAGING FILTER WASTE
We can assist you for the management of your used filters.

CHECKING YOUR EPA , HEPA AND ULPA FILTRATION SYSTEMS

Checking your EPA, HEPA and ULPA filtration systems. This is the guarantee that they will protect products, operators and the environment.

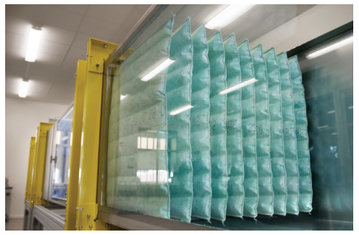
- Laminar flow hoods
- Microbiological Safety Stations
- Closed hoods
- Blowing ceilings
- Filter checking in Air Handling Units

CAMFIL SCHOOL
Camfil offers training courses: “Practice of air filtration” at Camfil School.

- For a pragmatic approach of air filtration

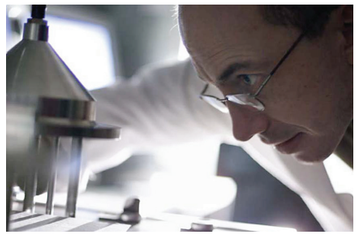
RESEARCH FOR THE FOOD & BEVERAGE INDUSTRY

1. Molecular Lab
- Development of molecular filters
- Climate controlled test rigs for carbon media and full-size molecular filters
- Gas chromatography



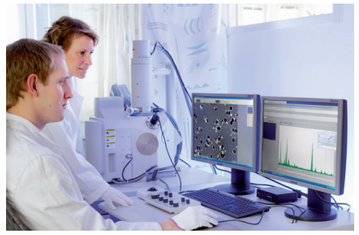
2. GT/APC Lab
- Development of filter solutions for dust collection and gas turbines
- High-Speed filter rig for gas turbines
- Climate simulation

3. Process Development Workshop
- Development of process equipment for manufacturing filters
- Fully equipped machine shop
- 3D printer for prototyping



4. Particle Lab 1
- Development of comfort and HEPA filters
- Aerosol research
- Test rig for full-scale filters and smaller filters
- Nano particle measurements using an electrostatic classifier with CPC
- Filter media testing and development

5. Particle Lab 2
- Classification of filters according to EN 779:2012 and ASHRAE 52.2
- Energy classification of filters
- Classification rig and IPA discharge rig
- Remote-controled mobile laboratories for testing air filters in the field



6. IAQ Lab
- Quantitative and qualitative air quality analysis
- Media and fibre development
- Air quality research
- Scanning Electron Microscope, SEM

CAMFIL – a global leader in air filters and clean air solutions.

Camfil is a global leader in the air filtration industry with more than half a century of experience in developing and manufacturing sustainable clean air solutions that protect people, processes and the environment against harmful airborne particles, gases and emissions. These solutions are used globally to benefit human health, increase performance and reduce energy consumption in a wide range of air filtration applications.

Our 26 manufacturing plants, six R&D sites, local sales offices and 3,800 employees provide service and support to our customers around the world. Camfil is headquartered in Stockholm, Sweden. Group sales total more than SEK 6 billion per year.

www.camfil.com/Industries/Food–Beverage

For further information please contact your nearest Camfil office.