Clean air solutions for turbo machinery
Our organization specializes in the field of Air Filtration Solutions. We are focused on research and development, state-of-the-art manufacturing, and marketing of air filtration products and services on a global basis. The Camfil group of companies is the world’s largest designer and manufacturer of air filters for many applications with 24 manufacturing facilities around the globe. We offer the strength and expertise of the group. As well as the advantage of local presence.

For the past forty years, we have supplied filtration solutions and services to a large number of gas turbine installations around the world.

Camfil takes great pride in the fact that our products and systems offer superior engine protection while minimizing degradation due to fouling and erosion. Our products offer high efficiency, extended service life, low pressure drop and high quality thus providing our customers with the lowest possible operating and maintenance costs.

Our efforts have thus been focused on the ability to offer our clients an extensive range of products and services which cater to a broad range of requirements, whether based on technical or commercial criteria.

Strength factors
An international leader in the field of air filtration, Camfil offers its customers the security of long-term partnership, backed by the documented capability to analyze needs and supply total air filtration solutions.

Our product range will meet your
demands, from solutions to common filtration problems to highly specialized filtration techniques for applications that are extremely sensitive to air pollution. We provide the best possible clean air solutions, customized and optimized for cost and performance.

Raising air filtration to a new level of excellence, we thrive to set the standards of the filter industry’s major trade groups and organizations.

**System solutions**

- **STATIC FILTER SYSTEMS**
  Air filtration for power generation, industrial and oil & gas installations in a large part of land-based environments.

- **PULSEJET FILTER SYSTEMS**
  Air filtration for power generation, industrial and Oil & Gas installations with highly polluted environments.

- **OFFSHORE FILTER SYSTEMS**
  Air filtration for installations on drilling and production platforms and ships exposed to marine and industrial environment.

- **ACOUSTIC SYSTEMS**
  Enclosures, Inlet and Exhaust Silencers for stationary and mobile turbomachinery.

**SERVING THE TURBINE INDUSTRY FOR 50 YEARS**

Camfil operates 24 manufacturing facilities around the world. As illustrated on the map shown above, our gas turbine business units, located in Sweden, Belgium, Canada, the USA, Germany, India and the UAE, span the globe. Information on our gas turbine filtration solutions can be obtained from any of these six locations or via any of the other direct sales offices or authorized representatives.

Camfil designs and manufactures complete gas turbine air intake and acoustic packages for all types of applications and environments.
FIRST CHOICE OF THE GAS TURBINE OEM’S

Camfil has a long history of supplying systems to the gas turbine industry. Our engineers work closely with the gas turbine OEM’s to develop optimum solutions in terms of performance, reliability and economy.

With our broad range of products, we have delivered systems to all types of turbine installations: industrial, desert, offshore, arctic and marine. Our expertise in system design for various environments is an asset that all our customers can benefit from.

The expertise, product range in addition to the fact that Camfil is the world leader in air filtration combined with our global capability makes us often a preferred partner for many of the gas turbine OEM’s.

User benefits
The prime function of the inlet filter system is to protect the gas turbine from pollutants in the inlet air. Particles entering the gas turbine can cause erosion or fouling of the turbine internals. Erosion is mainly caused by relatively coarse particles above 5 µm in size. Smaller particles in the sub micron size, cause fouling of turbine blades and cooling coils which rapidly reduces performance and becomes a serious threat to the turbine. Hot corrosion is an accelerated corrosion of metal surfaces that results from the combined effect of oxidation and reactions with sulfur compounds and other contaminants such as chlorides. Effective capture of small particulate and airborne salt is therefore of vital importance for long and efficient operation.

A properly designed filter system gives the user:

Reliability,
The engine will be protected from risk of damage from erosion, fouling and hot corrosion.

Economy,
High filtration efficiency results in less fouling and less degradation, which is the key to maintaining maximum efficiency and power production. Low pressure drop provides high power output and high dust holding capacity increases filter service life.

LIFE CYCLE COST IS THE KEY

End customers are requesting more and more that filter systems be optimized, not only in terms of price but also with regard to the total cost for the intake system, including filters usage, compressor cleaning, CO2-emission costs, energy costs and other factors. The LCC programme developed by Camfil for gas turbine inlet systems takes into account such factors as engine sensibility, energy cost, running time, filter price, cleaning cost, different environments and filter characteristics.

For example:
100 Pa less operating pressure drop at the intake system will increase the turbine output by approximately 0.2% and reduce the fuel consumption by approximately 0.1%. Camfil can run calculations to determine the optimum combination of filters needed for the lowest total cost over a given time period. Camfil Farr’s calculations are based on real life testing data from a large number of sites.
EXEMPLARY
TESTING CAPABILITY

With air filters it is difficult to judge the performance just by looking at them. The particles they should catch are very often not visible to the human eye. Since filters typically last for a very long time, laboratory testing is used to compare filters. For laboratory testing to be fair, industry standards has been established to define the method of testing. Currently in Europe and North America, there are different laboratory filter test standards utilized for determining how an air filter should be measured and classified as well as a European test method.

The present standards are:

- EN 779:2002 (Europe)
- Eurovent 4/9 (Europe)
- ANSI/ASHRAE Standard 52.1-1992 (North America)
- ANSI/ASHRAE Standard 52.2:1999 (North America)

The latest revisions to the laboratory test standards bring them closer together. Eurovent 4/9 and ASHRAE 52.1 both utilize the same efficiency test methodology. EN 779:2002 and ASHRAE 52.2:1999 are the latest test methods and both utilize particle count efficiency measurements.

EN 779:2012
This standard classifies a filter’s performance by the average efficiency at 0.4 \( \mu \text{m} \). In addition, this standard requires tests including filter efficiency when all electrostatic charge has been eliminated, to give a true minimum efficiency value.

ASHRAE 52.2:1999
This standard reports a filter’s performance across a range of particle sizes for 0.3 \( \mu \text{m} \) to 10.0 \( \mu \text{m} \). The minimum measured efficiency during the test is reported, but this standard does not require discharging to give a true minimum efficiency. Particle size efficiency will be the new test method “world wide”.

Several test rigs around the world
We were the first company to own our own Eurovent 4/9 / EN 779 test rigs. The rigs have been tested so that they give the same results as independent test labs. We were the first filter manufacturer to own an ASHRAE 52.2:1999 test rig according to the new US standard. By having a number of our own test rigs, we can test new and used filters from the field to build up our own database how filters work and perform in real life.

In gas turbine applications, it is important to understand that small particles of less than 1 \( \mu \text{m} \) in size can form clusters that cause wear and damage to the turbine blades. It is for this reason that air filters must maintain their nominal efficiency throughout their useful life.
The Camfil CamClose is specially designed to be fitted directly – close coupled to Camfil final filters, such as CamGTs and Opakfil GTs. Its major strength is that it makes it possible to add an extra filter stage to the filter system without the need for an extra filter bank. The CamClose’s structural integrity is maintained by the use of a high strength ABS frame. Downstream pleat separators are used to ensure optimum operation. Integrated clips facilitate easy snap-on mounting.

**Filter classes:** G4 and M6 per CEN EN 779:2012.

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**CAMVANE**

A high efficiency droplet separator using vertical separation vanes. Ideal when high droplet separation efficiency is required in combination with low operating pressure drop.

Typical applications include air intake filtration for turbo machinery and ventilation intakes which experience high humidity and/or heavy rainfall. The CamVane housing is made of extruded marine grade aluminum. The droplet separator profiles are available in black polypropylene or extruded marine grade aluminum.

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**CAMPICLOSE**

The photo shows a CamClose attached to a CamGT filter, class F9.

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**30/30 GT**

An extended area pleated filter which has long been established as the industry standard prefilter for gasturbines. Its favorable efficiency ratings, low initial pressure drop and extended service life have made the 30/30 GT the prefilter of choice for those seeking both economy and proven performance.

The 30/30 GT is rated as a medium efficiency, totally disposable filter offering extended service life to final filters. Unique “radial pleat” design assures total usage of the filter media, maximum dust holding capacity and extended service life.

**Filter classes:** G4 per CEN EN 779:2002 and a MERV 7 filter according to ASHRAE 52.2.

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**R30/30 WR**

A filter that has been specifically developed for wet conditions. When subjected to water testing at a feed rate equivalent to 11 inches (280 mm) per hour of rain – the R30/30 WR test filters allowed no water penetration on the downstream side. The filter combines high efficiency removal of water and mist with medium removal of airborne particulate.

**Filter classes:** G4 filter per CEN EN 779:2002 and a MERV 7 filter according to ASHRAE 52.2.
**HI-CAP GT**

A pocket filter made of synthetic media. It has a large filter area, high dust holding capacity and is widely used as a prefilter and coalescer in 2 and 3 stage systems offering extended service life to final filters.

*Filter classes:* G4 per CEN EN 779:2002 and MERV 6 according to ASHRAE 52.2. The filter is also available with plastic frames.

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**CAMFLO GTX7**

The Cam-Flo GTX7 GT is a high velocity air inlet filter for turbomachinery. With its robust design, large effective filter area and unique composite filter media, it offers clear advantages to today’s existing alternatives on the market. The synthetic media has excellent mechanical strength, which makes it a perfect match for gas turbine operations, especially in areas where considerations for high humidity and/or turbulence is important.

*Filter classes:* F7 per CEN EN 779:2002 and MERV 13 according to ASHRAE 52.2.

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**CAMFLO XMGT**

The Cam-Flo XMGT filter is the first and only synthetic filter on the market that keeps its efficiency stable over its entire lifetime according to EN779:2012. Self-supporting bags and a unique design make this filter an excellent pre-filter and coalescer choice for turbomachinery applications.

The Cam-Flo XMGT filter is a robust filter suitable for all environments such as industrial urban areas, rural areas and applications in high humidity areas like off-shore.

*Filter classes:* M6, F7, F9 per CEN EN 779:2002 and MERV 12, 13, 15 according to ASHRAE 52.2.

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**TURBOPAC**

TurboPac is a box type filter designed to withstand the high pressures and surging airflows associated with gas turbine operation. The filter casing consists of a galvanized steel frame with either flanges/headers on one side or both. Media pack with vertical pleats protected by face guards on air entering and air leaving sides.

*Filter classes:* F6, F7 and F8 per CEN EN 779:2002 and MERV 11, 13 and 14 per ASHRAE 52.2. Also available in XL-version.
The market leader and state of art, high-capacity filter for turbo machinery. Its unique design with vertical pleats assures that performance is maintained in humid or wet conditions, guaranteeing a long service life and an economical filtration solution. The CamGT has a solid, airtight frame and a new technique for fixing the media to the frame; the double-sealing design. Each filter grade is aerodynamically optimized in order to provide the lowest possible pressure drop and longest available life. Combined with its sturdy and heavy duty design, the filter withstands a continuous pressure drop of over 6250 Pa, the Cam GT's high efficiency and low pressure drop guarantee optimum protection and engine performance under the most demanding operating conditions.

The Cam GT is suitable for both onshore and offshore installations where its exceptional performance is maintained during periods of high humidity and extensive fog. A gas turbine filter is sometimes exposed to extreme peaks in pressure drop, and so to prevent the media from bulging or bursting aerodynamic grids are added to the air exit sides.

**CamGT 3-V600**: The design features a 600 mm-deep frame fitting almost 50 square metres of media in one single cartridge. The unparalleled filtration area offers the lowest pressure drop in the industry for this type of filter. A longer replacement cycle also reduces installation, removal and disposal costs significantly.

**CamGT 4-V300**: The standard 300 mm-deep frame available in an XL version with +26% filtration area, and Reverse Airflow configuration in order to allow any kind of filter fitting.

**Filter classes**: F7, F8 and F9 per CEN EN 779:2012. E10, E11, E12 and H13 per EN 1822.

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The Opakfil GT offers a cost effective solution in areas with dry environments and where considerations for high humidity and hygroscopic dust are less important. The Opakfil is designed with horizontal pleats and is, just as the CamGT, fully incinerable.

To ensure no risk of filter damaging during handling and installation, external exposed pleated packs are equipped with protective integrated sealed mesh.

**Filter classes**: F7, F8 and F9 per EN779:2002. H10 per EN1822.

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Based on the same unique filter pleat design as the standard CamGT, the box type version is set into a rigid enclosing plastic frame. It is therefore very suitable for upgrading existing filter systems from older box type filters to a modern high performance filter product. Just as the standard CamGT, its performance is maintained in humid or wet conditions, making it suitable for operation also in salty environments.

Combined with its sturdy and heavy duty design, the CamGT’s high efficiency and low pressure drop guarantee optimum protection and engine performance under the most demanding operating conditions.

**Filter classes**: F7, F8 and F9 per CEN EN 779:2002. E10 per EN 1822. Also available in XL-version.
CAMPULSE

Pulse filter elements used in automatic, self-cleaning air filter systems providing high performance in a single stage of filtration. Each set consists of two conical elements of type CO-2612. Top and bottom caps are made of pressed or spun galvanized steel. A rigid expanded metal inner core supports the media pack and prevents the element from collapsing under conditions of extreme differential pressure. An outer expanded metal wrap protects the media from damage during handling and from large foreign objects during operation. Mounting gasket is permanently glued to the end cap.

CamPulse GT is available in four different media options fully compliant with gas turbine manufacturers’ performance specifications. See media guide right. Replacement upgrade available for non-Camfil inlet air systems. Conical and cylindrical elements, flange top and twist lock.


FARR TENKAY

Vertically hung self-cleaning air filter cartridge providing high performance in a single stage of filtration. Camfil’s HemiPleat® pleat design ensures uniform pleat spacing and maximum utilization of the filtration media. Offering leak-free performance, the filter media is factory bonded to a closed steel bottom pan and to a top clamping plate. A triple helical cord is bonded to the outer surface to prevent media distortion during back flushing. A wide variety of models are available with header, gasket and media options to meet your particular needs.

The Farr Tenkay is available with the same media configuration as the CamPulse cartridge filters.

HEMI PLEAT™ open pleat technology

Camfil’s state-of-the-art in pleating technology is the key to the superior performance in operating and maintenance for pulse cleaning cartridges. Synthetic beads hold the pleats more open and the wider spacing in the HemiPleat® design gives greater media utilization and more effective filtration providing enhanced performance.

MEDIA OPTIONS

GTC

GTC Synthetic has non-discharging fibre media with unique properties, giving the filter a high level of efficiency over its entire lifetime. The smooth synthetic fibres offer low resistance to airflow and, therefore, maintain a low pressure drop during the life of the filter. The combination of depth-loading coarse fibre media and a nano fiber core is the ideal solution for removing hygroscopic particles in areas of high humidity, such as coastal and wet tropical environments. The GTC option is the preferred choice for most installations.

GTD

GTD Synthetic is ideal for areas with high concentration of airborne dust. A layer of nanofibres over the synthetic substrate significantly increases dust collection on the media surface, resulting in improved dust release when pulsed. Pure surface-loading with a high dust-loading capacity media ideal for desert and dry/arid environments.

CAMBRANE

The CamBrane is an EPA media with 99% efficiency built in 5 layers including a pre-filter synthetic media layers with high dust loading capacity and excellent performance in both dry and humid conditions and a supporting base made of a robust synthetic substrate that gives strength and allows it to meet high burst strength requirement. The high efficiency results in lower engine degradation and prolonged service intervals without need of shutdowns for compressor cleaning.

POLYTECH HE

PolyTech HE blended media have a microfibre, melt-blown surface laminate and moisture-resistant silicone treatment for optimum filtration efficiency and dust release characteristics. The blend of cellulosic and synthetic fibres provides added moisture resistance. PolyTech HE media is recommended for good performance in both dry and humid areas.

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At Camfil Farr, we are deeply committed to R&D and quality control, performing rigorous laboratory testing and field trials under controlled conditions. We design, develop and build our own production equipment to maximize our control over the quality and performance of the filtration products that we manufacture. Our software packages assist in reviewing our customer’s needs and provide the optimum air filter product for each application.

Tech Center Trosa Sweden
Our main R&D center is located at our corporate headquarters in Trosa, Sweden and is well equipped with a myriad of sophisticated instruments including, but not limited to, an SEM (Scanning Electron Microscope) and particle testing devices.

NEW MATERIALS & EQUIPMENT

Always at the forefront of emerging technologies, Camfil is a recognized filtration leader and is continuously developing new materials to optimize our clean air solutions. We work closely with media suppliers to obtain products that meet our very high quality standards. We are constantly introducing new products such as the Cam GT box, Opakfil GT and HemiPleat technology for pulsjet filters. All new products which incorporates our patented media pleating technique for the GT market.

Climate chamber
One of Camfil Farr’s latest investments is our full scale test device used to evaluate filtration needs under difficult circumstances. Using this apparatus, we can modify all of the important parameters such as airflow, relative humidity, temperature and salt content. The device can be used with air or other gases and will allow rapid prototyping, product validation, evaluation of competitive products and for research and development testing.

Mobile test rig
Another new investments is Camfil Farr’s mobile approach to filter tests consists of a mobile test rig installed in standard 20-foot container. Tests can be performed on eight different filters simultaneously in four different air ducts. The mobile test laboratory documents the actual performance of filters in the application they are intended for, with complete control over the operating parameters. Customers see, right on their site, what the most cost-efficient and effective filtration solution will be for their gas turbine system, building or process. Customers can also participate in monitoring the results. Accelerated tests are also possible to test filters at a higher air flow, with the exact same dust load, to shorten the test period and simulate a long-term test.

Airaudit service
The airaudit service of Camfil have as main objective to verify, maintain or improve the quality of filtration of your installation. Sampling of air is made before and after the filter house or individual filter stages and a qualitative and/or quantitative analysis of the air will be reported. Qualitative analysis is an electronic microscope analysis of particles collected in the air. Quantitative analysis is a counting of individual particles per volume of air. Camfil report will include recommendations and advise on possible solutions to reduce operating cost by improving the efficiency and reliability of your installation.
CAMFIL is the world’s largest and leading manufacturer of filters and clean air solutions.

There is a good chance that, at this very moment, you are breathing clean air that has passed through a filter manufactured by us. Our products can be found everywhere from offices to clean rooms for sensitive electronics production, mines, factories, hospitals and nuclear power stations. Camfil is a global company with 29 subsidiaries, 22 production plants and an extensive network of agents in Europe, North America, Middle East and Asia.