

E-MOBILITY

Lithium ion batteries and other long-term storage solutions with electric motor driven powertrain are the future of the transportation landscape



WHY CHOOSE CAMFIL FOR YOUR CLEAN AIR REQUIREMENTS

Camfil is a world leader in clean air technology and air filter production. Our organization is a specialist in the field of air filtration solutions. We are focused on research and development, state-of-the-art manufacturing, we don't just market them, we supply solutions of air filtration products solutions and services on a global basis.

The Camfil group of companies are the world's largest designer and manufacturer of air filters and associated products including fume, dust and solvent extraction and abatement solutions with currently 33 manufacturing facilities and plans to invest in more production units around the globe as our customer base continues to grow. Camfil takes great pride in the fact that our products are of the highest quality, offering our customers air filters with the longest life, and lowest operating and maintenance costs. For the past 55+ years we have been a leading supplier of air filtration solutions and services to facilities using clean air to create cleanrooms and protect people and/or products and all indoor areas requiring good indoor air quality.

Many of our clients have multiple facilities located around the world. Camfil is viewed by many of the largest industrial manufacturers as a partner as we are well positioned to support their air filtration demands on a local and global basis. **Major investments have been made in our R&D departments located around the world to develop products specifically for the clean process industry.** It is common for us to 'partner' with our customers and their consultants or contractors to meet and often exceed their most demanding air filtration requirements.

CAMFIL AROUND THE WORLD



THE GROWTH IN E-MOBILITY

Green and sustainability are the axioms for future generations as we move away from fossil fuels and into renewable technologies. Rechargeable batteries are recognized as a regenerative power source and are now being used to power everything from wrist watches to automobiles. Because both pure electric vehicles and hybrid vehicles offer the prospect of reduced emissions and decreased reliance on imported petroleum, these vehicle types have attracted great interest from environmentalists and other groups over the past 20 years. Although there are multiple types such as nickel metal hydride (NiMH) and various configurations of the lithium-ion battery, the lithium-ion type seems poised to dominate the market because of its high energy and power densities. It also has the potential to last the lifetime of the car, (150,000 miles is expected by consumers). This use period could span hundreds of thousands of charge/discharge cycles. With the increase in demand for these batteries, a consideration for the environments they are produced needs to be made. Understanding the air quality requirements and concerns for these production processes are key for a sustainable future.

Air Quality Concerns



Different types of lithium-ion batteries use different chemistries and have different performance, cost, and safety characteristics. The cells of a lithium-ion battery contain separators that keep the anodes and cathodes, or positive and negative poles, from touching each other. If a piece of metal gets too close to the separator, it can puncture the separator and cause a short circuit. **Controlling the air quality during the manufacturing process reduces this costly contamination, increases yield and assures that a quality product will make its way to the user.** Camfil clean air solutions will protect your processes by reducing the airborne contaminants that foul or short circuit cells. Yield is increased and a quality product is packaged for the user.

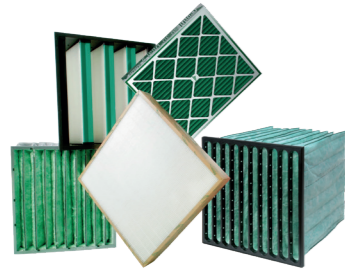


During the production of Lithium-ion batteries different particulates, gases and toxins are created that can cause a risk to both the people within your factory and external stakeholders. **Ensuring that the health of all stakeholders is properly addressed will ensure a safe working environment.** Camfil clean air solutions can help to capture and remove these potentially harmful contaminants in the air to ensure a safe and clean working environment.



Reducing energy costs and becoming "Net Carbon Zero" is a key initiative of many of the worlds leading brands. **Did you know that HVAC systems can equate to over 50% of your total energy consumption and of this 30% can be directly related to the air filter?** Camfil clean air solutions are designed to ensure your plant is energy optimised without compromising on air quality.

CAMFIL RECOMMENDATIONS



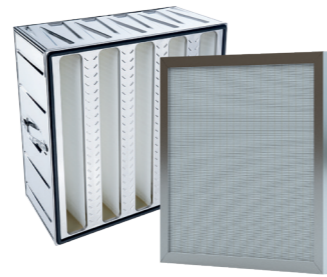
HVAC Filters

Low energy HVAC air filters are used to control the supply air quality in facility ventilation systems. Choosing the right air filter can reduce energy consumption and prolong HEPA filter lifetimes.



CamCarb Family

Molecular solutions are available to control odours, toxins and gases from entering and leaving your facility. This protects product and people from the hazards present in industrial production environments.



HEPA Filters

HEPA filters are required for areas that are classified controlled areas. All Camfil HEPA filters are certified to EN1822:2019. HEPA filters protect product from contaminants that may have a quality impact.



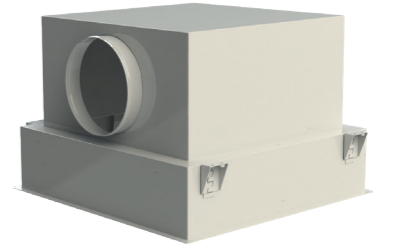
CamFFU

Our range of Fan Filter Units are easily installed to help create a controlled environment and protect your processes. FFUs are the flexible alternative to fixed housing systems and offer many control and installation advantages.



Silent Hood

The silent hood is a complete housing and filter system that offers great performance at a very affordable first installation cost. It is a quick reliable solution and is suitable for a range of applications in this industry.



CleanSeal

Terminal HEPA housings are used in controlled environments. The CleanSeal offers industry leading modularity, performance and reliability with the opportunity to upgrade HEPA filter selection after installation.



Quantum Series

Designed for laser and welding applications to deal with fine dust. A compact design allows the Quantum Series to be located close to your processes in order to minimise duct work.



Wet Scrubber

Safe separation for applications involving flying sparks, explosive, sticky, damp, or flammable dusts or solvents. They provide the highest degree of separation when used in critical processes with mid to high levels of pollution.



APC Gold Series®

Gold Series Collectors use crossflow technology and the unique baffle configurations creates uniform airflow extending filter life. They comply with ATEX, OSHA and NFPA standards for safety protection.



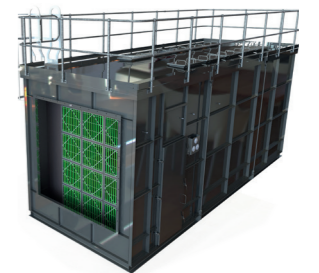
Flexible Housings

Air filter housings can be installed to ensure the correct levels of air cleanliness is provided to your facility. They can also be used to upgrade existing installations or AHUs to add further filtration stages.



Air Cleaner

Air cleaners can help improve air quality and reduce the presence of airborne contaminants such as particulate matter, odours, toxins and gases. Our Air Cleaners utilise molecular and HEPA filtration to ensure performance.



ProCarb

Vertical or Horizontal deep bed filters are used to ensure that no odours, toxins or gases are emitted from your facility. Molecular filtration media is used to ensure your focus contaminant is removed from the airstream efficiently.

ZONING AIR QUALITY REQUIREMENTS

Supply air applications

The most critical environmental item to be controlled in battery production facilities is relative humidity, sometimes as low as a -70° celsius. In order to maintain this level, the rooms must be sealed to prevent the introduction of any moisture. For lithium ion battery cells level materials account for 85% of that pack level materials cost. Reducing contamination through all levels of the manufacturing process will significantly increase the yield, which has been known to be 50% when contaminant levels are not controlled properly. Increased yield and better performing cells will foster the market's acceptance of this new technology. Improving and maintaining air class inside the building will increase yield and produce better performing cells this will improve productivity and promote faster adaptation of this transport mode.

Exhaust air applications

During the production of lithium ion batteries many different airborne contaminants are generated that can affect the health of workers and with VOC emissions damage the environment. Ensuring that these airborne contaminants are removed and captured from your facility is critical to the safe operation of your production facility. New manufacturing processes such as laser welding and laser 3D printing can increase both plastic and metallic compounds in the air while during battery production and battery testing there is an urgent need for the removal of airborne molecular contaminants such as NMP and carbonates.

Motor production applications

Sometimes considered a separate industry, electrical motor production has a high demand on clean air. Through many different contaminant generating activities the motor production areas can often be the most polluted areas within this industry. As an emerging technology a new manufacturing process is electrical motor hairpin production with laser technology. This production process not only generates dry dust but also generates solvent wet dust and oil streams. As the pollutants are generated throughout the production process, removal of these often harmful contaminants with our exhaust air systems are key to ensuring people, product, environmental and process safety.

Facility Production Areas with Recommendations for Air Filtration and emulsion mist and dangerous solvents in the air								
Area	HVAC Prefilter	HVAC Secondary Filter	ISO 8 (Class 100,000)	ISO 7 (Class 10,000)	ISO 6 (Class 1,000)	ISO 5 (Class 100)	Exhaust Air application	
Standard Offices	30/30® ePM10 50%+	Opakfil ES or Hi-Flo® ePM1 70%+	Manufacturing Areas				Dust Systems Quad Pulse package, Quantum Series and Gold Series X-Flo	
Anteroom/Airlock			5-15% ¹ Ceiling Coverage	15-25% ¹ Ceiling Coverage	25-40% ¹ Ceiling Coverage	35-70% ¹ Ceiling Coverage		
Mixing			5-60 ACH ²	60-150 ACH ²	150-240 ACH ²	240-600 ACH ²		
Coating			CleanSeal/FFU	CleanSeal/FFU	CleanSeal/FFU	CleanSeal/FFU		
Compressing			Megalam/Absolute V HEPA filters and associated diffusers as needed	Megalam HEPA filters and associated diffusers	Megalam HEPA filters and associated diffusers	Megalam HEPA filters and associated diffusers		
Drying			Opakfil ES or Hi-Flo® ePM1 60%+	N/A	N/A	N/A		Solvent and Acid Control Vertical and Horizontal deep bed filters (ProCarb) Diverse thin bed filters (CamCarb)
Slitting								
Case Manufacturing								
Sub Assembly								
Welding			Opakfil ES or Hi-Flo® ePM1 70%+	N/A	N/A	N/A		Dust Systems Quad Pulse package, Quantum Series, Gold Series X-Flo, Vertical Deep Bed and Handte Oil Expert
Packaging								
Motor Production areas								

¹ Values provided for guidance, related to typical industry parameters. Ceiling coverage includes filter efficiency of 99.99%.
² ACH, or air changes per hour. Consideration must always be given to air circulation patterns and other parameters that could negatively affect the required cleanliness level.

LEADING THE WAY IN CLEAN AIR TECHNOLOGY

The solution is clear - protect your best in class technology with ours

Camfil is a family company with an unusually strong interest in technology. Since the earliest days we have invested large amounts of money in research and development. We believe that R&D is one of the most important factors behind our success. By constantly investing in our business, we have become the world's leading filter manufacturer. And by collaborating with universities, colleges and organisations such as the Karolinska Institute, the Wallenberg Laboratory and the IVL Swedish Environmental Research Institute, we keep ourselves permanently up-to-date.

We also have representatives within a number of international organisations, including Eurovent, CEN, ISO and ASHRAE. We are continuously working to ensure that our end-products are the best on the market. And by staying at the leading edge, we can meet the requirements of the future.



1. IAQ Lab

- Quantitative and qualitative air quality analysis
- Media and fibre development
- Air quality research
- Scanning Electron Microscope, SEM for use in problem solving or research work

2. HEPA Lab

- Test rig for full-scale filters and smaller filters
- Nano particle measurements using an electrostatic classifier with CPC
- Filter media testing and development
- Classification of filters according to all international standards
- Classification rig and IPA discharge rig



3. Molecular Lab

- Development of molecular filters
- Climate controlled test rigs for molecular filtration media and full-size molecular filters
- Adsorbent porosimetry (surface characterization)

4. Dust Lab

- Particle size analysis
- Video Microscopes
- Abrasion Testing
- Moisture Testing

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

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

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

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

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For further information please contact your nearest Camfil office.