

Air Management for Hospital Applications





Specialised solutions for the high demands of healthcare and hospital applications

HVAC systems for hospital and healthcare facilities have special requirements because of the inherent nature of their functions and the unique susceptibility of patients to infection. In perhaps no other application is the HVAC system a more important and integral, component of the building's processes.



With experience from over 300 installations in hospital and healthcare facilities, Fläkt Woods is the safe choice for air management systems. Our solutions provide ultimate function for the specific demands of, for example an operating theatre, whilst meeting the highest standards of energy efficiency to deliver low life-cycle costs for the entire building.

Specific Healthcare demands

Where the healthcare building has specific demands, Fläkt Woods has solutions. Our product portfolio includes equipment and systems that meet the challenging requirements for air cleaning, leakage standards and infection control. Effective HVAC systems provide a comfortable environment, including temperature, air quality, humidity, odour and noise. It therefore affects not only the conditions of the hospital staff and visitors, it also facilitates good conditions for the patients' healing processes – comfortable patients heal faster.

Cleaning and maintenance

Maintenance operations such as cleaning are always a major issue with any plant, mostly because of functionality issues. Within the healthcare sector requirements are even higher due to the stringent hygienic demands. Every component within our HVAC systems has been designed to facilitate visual inspection, along with easy and effective cleanability.

Certificates and standards

Our systems have been designed and developed in accordance with the most stringent Hygiene standards in Europe. As an example, our eQ Plus AHU received the ILH certificate delivered by the German Institute for Hygienic Air. Fläkt Woods AHU's are well designed according to the German standard VDI 6022 and the Swiss SWKI Richtlinie VA104-04 (04/2006). This guarantees that maintenance will be easy and effective and that the materials used are microbiologically inert. We also strive to extend the use of recyclable materials and operate in accordance with ISO 14001.

HVAC systems have a major impact on:

- Infection control
- Environmental control for medical functions
- Hazard control
- Life safety
- Energy consumption of the building

Fläkt Woods solution:

- Hygienic components
- Non hygroscopic
- Easy to clean
- Efficient products system combination



Products you can depend on

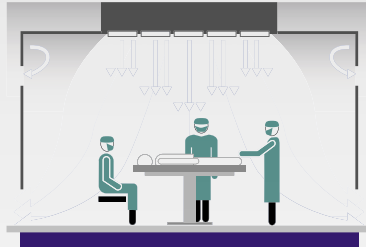
Fläkt Woods is not only an experienced HVAC systems integrator. We also produce many of the components ourselves. That puts us in the unique position where our systematic demands can be closely met by component features, and component development is always done with the functionality of the entire system in mind.

Air Terminal Devices

DIF OT

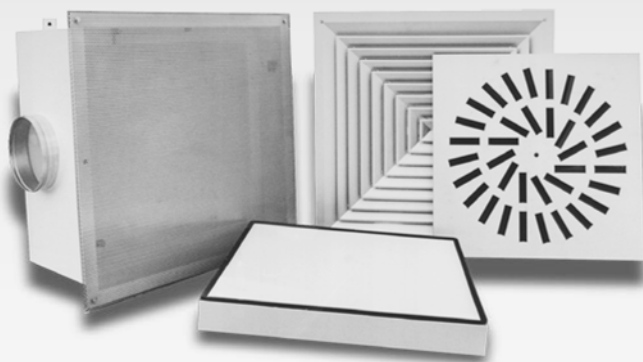
The DIF OT system ensures the highest levels of cleanliness. This is achieved through a uni-directional diffusion and circulation pattern where only sterile, filtered air hits the Aseptic Zone around the operating table. A tightly controlled laminar flow ensures that contaminants are not inducted back into the supply air.

- ISO5 class in "operation simulation mode"
- ISO4 class over the surgery table



DIF T

DIF T diffusers are suitable for operating rooms with a lower classification. When vertical space is limited DIF T can offer a viable solution that supplies the clean zone with sterile air through DELTA series absolute filters.



DIF P and K

These systems have a double function, passing the air through Absolute Filters before distributing it through carefully selected Air Terminals to provide optimal flow patterns.



Hygiene Verification Check function

To ensure correct configuration of hygiene units, ACON has a Hygiene Verification Check function that helps the user to configure a unit compliant with VDI 6022 for standard hygiene or EN 1946-4 for hospital environments. ACON provides clear recommendations and instructions to ensure that the unit meets relevant standards.



Cleanvent exhaust

Thanks to the unique Avalon® coating, the valves stay clean and there is less need for cleaning. In addition, as the air diffusion and the throw pattern function as planned, energy is saved. CleanVent air terminal devices are particularly useful in places that are difficult to access.



Optivent Smart

Combination of VAV with diffuser. It keeps the supply air velocity constant at the supply air slot, which prevents a feeling of draught. It prevents the cold air stream from settling down into the room too soon, allowing the supply air enough time to mix with the warm indoor air before descending.



eQ Plus AHU

In providing environmental comfort and ventilation for facility, an air handling unit simultaneously performs several functions including the intake of outside air to meet ventilation air requirements, thermal mixing of this air with recirculated from the occupied zones, thermal conditioning, moisture control, filtration to protect equipment and to remove contaminants, and attenuation of fan generated noise to control ambient levels in occupied spaces. The design of an air handling unit should minimize water and dirt accumulation, resist corrosion and permit adequate access for inspection and maintenance. With our long experience in manufacturing AHUs, Fläkt Woods have designed a unit with all details making a unit Hygienic.

Hygienic features:

- The door locks fitted into the door frame to allow unobstructed airflow and prevent dirt accumulation
- Non-metallic material is microbially inert
- Panel joints internally sealed with anti-fungal sealant, no visible internal framework for easy cleaning
- Large Inspection sections
- Coil with pull-out tray
- T2/TB2 version available

For high risk zones we recommend:

- 3 stages of filtration ending with HEPA
- Stainless steel panels
- Run around coils heat recovery to avoid any contamination
- Coils Fin pitch with at least 2,5 mm and covered with Epoxy
- Plug fan with EC or IE1 motors



Energy recovery

In a hospital environment, no risk of leakage between the extract air and supply air is tolerated. To ensure secure ventilation, we offer the ECONET® – a high efficiency liquid-coupled heat exchanger. ECONET®, with an efficiency up to 75%, can be equipped with a double pump for areas where ventilation is crucial, making it imperative that the ECONET® system never stops. If one of the pumps breaks down, the other pump takes over.



Chilled beams

Fläkt Woods have complete range of chilled beams with matching accessories. These systems can treat high cooling demands and be used for individual regulation of the temperature. They create every stable and comfortable environment by supplying draught free cooling. They use little or no energy leading to minimal energy cost over the lifetime of the system. Moreover, they have no moving parts so they are easy to clean and maintain.

> For more information about the systems, please consult our technical brochures or our website: www.flaktwoods.com



Solutions for a healthy air climate

Air management systems for healthcare facilities have specific requirements that need to be addressed. Different zones have different requirements, from the extreme hygienic demands of a surgery room down to the more traditional air quality demands of an administrative working environment. During the design phase of a new hospital or refurbishment, it is crucial to dedicate a multidisciplinary team in charge of the risk analysis of each zone within the building. This survey takes into account, for each zone, parameters such as:

- Functionality
- Level of adaptability required
- Type of people received (Patients or visitors)
- Level of transmission potential
- Presence of specific medical devices
- Comfort required by medical team
- Hazardous substances handling
- Recovery time

The entire HVAC system must be developed around this analysis. The most restrictive areas will request a level of cleanliness of the air according to standard ISO 14644-1. In order to reach the required level, the right design has to be chosen with a main focus on pressure balance, air flow, type of diffusion, filtration and level of fresh air.

European standards like the DIN 1946/4 in Germany, NF S 90351 in France, SWKI 99-3 in Switzerland, or HTM 2025(1999) in England will define the main parameters for the design.

As an example, an operating theatre designed for orthopaedic Surgery needs to achieve ISO 5 (according to ISO 14644-1). In Switzerland, the System would have to provide a laminar flow of 8,000m³/h with a speed of between 0.20 and 0.24m/s.

Class	Number of Particles per Cubic Meter by Micrometer Size					
	0.1 µm	0.2 µm	0.3 µm	0.5 µm	1 µm	5 µm
ISO 1	10	2				
ISO 2	100	24	10	4		
ISO 3	1 000	237	102	35	8	
ISO 4	10 000	2 370	1 020	352	83	
ISO 5	100 000	23 700	10 200	3 520	832	29
ISO 6	1 000 000	237 000	102 000	35 200	8 320	293
ISO 7				352 000	83 200	2 930
ISO 8				3 520 000	832 000	29 300
ISO 9				35 200 000	8 320 000	293 000



Zone 1: Operating theatre

The operation room must be an ultra clean room to protect the patient against infection. The surgery table is the most critical zone of the room. The contamination must be controlled below specified levels. The ceiling filtration system must also have the ability to clean the room rapidly between operations, in order to avoid cross contamination. Each operating room must have a risk analysis to estimate the level of protection of this room, including: Pathogenicity of all the agents present in the operating room, possible consequences of an exposure, methods of transmission, duration of operations, number of staff, etc. These parameters will define the requirements of the operating room:

- Dimensions
- Quality of diffusion
- Supply air volume
- etc

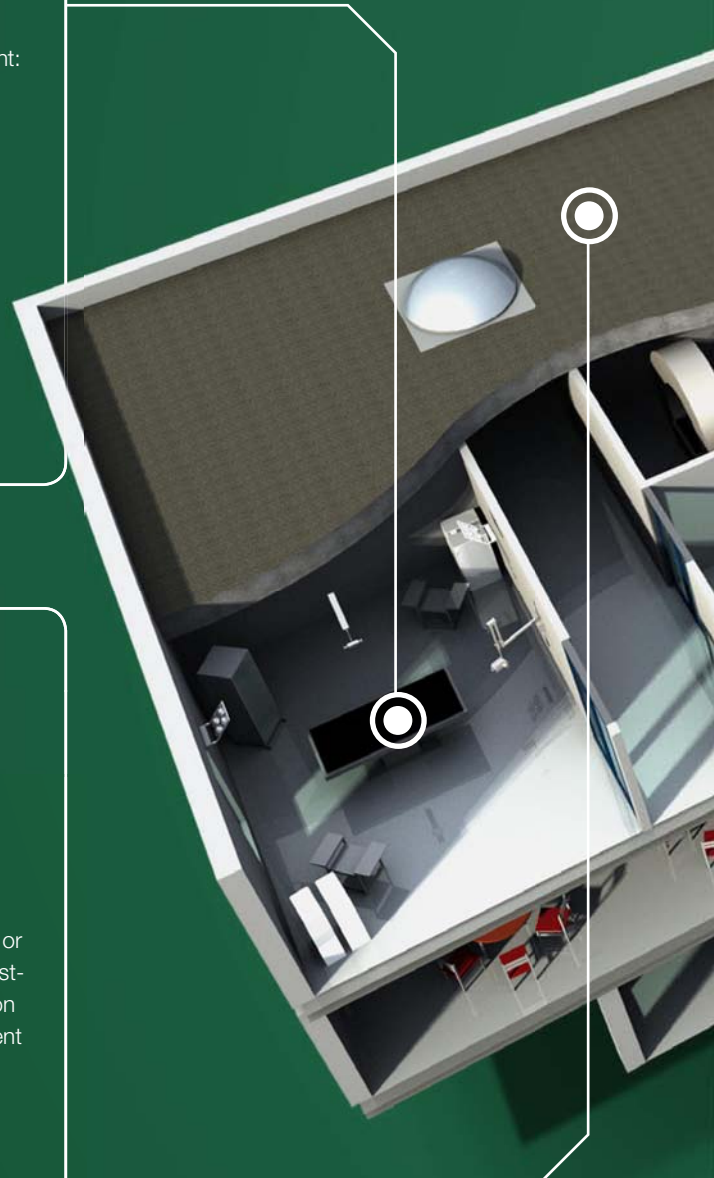
Challenges

Operation theatre must be scrupulously clean to protect the patient:

- Control of contamination, recognising the zones of focus around the operating table
- Efficient anaesthetic gas removal
- Fast particle decontamination
- Fast to clean and readjust between operations
- Comfort working conditions for the surgical staff
- Uninterrupted working for the surgical team

Recommended products

- eQ PLUS with Econet
- DIF OT
- DIF T



Zone 2: Isolating room

Isolation bedrooms may generally be classified into two types: *Airborne Infectious Isolation Rooms* for patients having an airborne, communicable disease and *Protective Environment Rooms* for patients suffering from weakened immune systems who require protection against infectious airborne agents.

Challenges

These rooms have two ventilation features in common: negative or positive air pressure relative to all adjoining spaces, and an air distribution pattern within the room which facilitates airborne infection control. The flow pattern should be designed to protect the patient and reduce the exposure of uninfected visitors to the room.

Recommended products

- eQ PLUS with Econet
- DIF P
- Cleanvent



Zone 3: Patient room

Research has shown that a comfortable patient will recover faster. The indoor climate is therefore crucial.

Challenges

The air supplied into the patient room area must be hygienic to avoid any airborne particle contamination. The patient will also require a comfortable temperature, without noise or draughts.

Recommended products

- eQ PLUS with Econet
- Chilled beams
- Optivent Smart
- Cleanvent





Zone 4: Other areas

Waiting rooms, administrative areas, diagnostic centres, support services (cafeteria, pharmacy, shops, etc)... With a wide range of AHU's and Air Terminal Devices, Fläkt Woods is able to provide an optimised HVAC solution for every zone within the hospital. Specific challenges may include:

Admin/staff areas

Variable occupancy during the working day requires demand-based ventilation, as well as the provision of optimum air quality and comfort to facilitate staff concentration at work.

Conference rooms

High occupancy levels during meetings require energy-efficient and controllable demand-based management of air quality and temperature. The comfort, health and alertness of staff and guests is ensured during meetings, whilst operating costs are minimised when these facilities are unoccupied.

Restaurant

An area that can be virtually empty for much of each day, punctuated by periods of very high occupancy and heat generation. The comfort and health of users needs to be balanced with energy efficiency considerations.

Kitchen

As well as normal ventilation, food preparation areas typically need additional air management functions, including ambient cooling, safeguards against carbon monoxide, and the effective containment and neutralising of food smells.

Smoke control

The safety of staff and patients must always be a priority. In case of a fire, the extraction of hot, smoky gases must be controlled.

This can be achieved by using fully designed natural or powered extract systems (or via a bespoke pressurisation system).





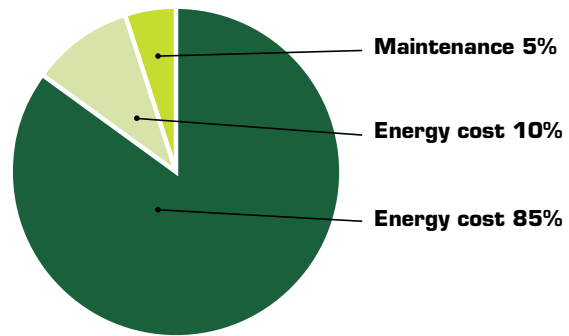
Saving energy and the environment with Fläkt Woods

Highly efficient heat and cooling recovery

A great deal of energy can be recovered from extract air which can be used to reduce energy costs. Typically, in new hospitals, only 40–50% is recovered. With Fläkt Woods systems it is possible to recover around 70% of the energy, providing a further substantial reduction in the heating load of the building. Perhaps even more interesting is the potential to recover cooling from the extract air. With the higher efficiencies now available from Fläkt Woods' equipment, the amount of cooling energy recovered can be significant, and as chillers are one of the major users of energy within a hospital, any reduction in the chiller load has a dramatic positive effect on savings.

Focus on Life Cycle Cost

About 85% of the lifetime cost for an air handling unit is energy cost, 10% initial investment and 5% maintenance. This fact and the Energy Performance of Buildings Directive (EPBD) from the European Union leads to a demand for accurate energy calculations and LCC-calculations for air handling products.



To address the needs created by the EPBD directive, Fläkt Woods has created a model for calculating both the annual energy consumption and the LCC. The calculation of LCC focuses on the energy cost, LCCE. Fläkt Woods' selection tool Acon can calculate the annual energy cost and the LCCE cost for the selected air handling unit. When calculating, Acon will consider all energy consumers (e.g. fans, pumps, drive equipment for heat exchangers, heaters and coolers) and also different kind of heat exchangers.



Reference projects



Fläkt Woods deliver energy efficient indoor climate system for the Turku University Hospital in Finland

Fläkt Woods' modular product range is modern and highly specified, designed for customers with high demand on quality and energy efficiency. Each unit can be optimized for acoustic and/or efficiency requirements. ECONET® is a system inside the air handling unit. In the ECONET® concept, all energy functions, such as heat recovery, heating and cooling are integrated into one common circuit. That makes it one of the most flexible and energy efficient solutions on the market.

Juhani Kokko, Project Manager for TYKS at the Engineering Company Åke Jokela Oy, says:

"When we compared the energy consumption between the new and the old hospital building we found it to be approximately 50% less thanks to Fläkt Woods' Econet solution. We decided to let Fläkt Woods be our air handling unit supplier, as Fläkt Woods provides the best ventilation solutions on the market. It was the combination of the energy efficient solution, operational safety and the service-mindedness that convinced us to choose Fläkt Woods."

Fläkt Woods is an acknowledged leader in the field of hospital air management. Our reference list includes:

Germany

- Anhaltische Diakonissenanstalt Dessau
- Ärztehaus Nürnberg
- Asklepios Paulinenklinik Wiesbaden

Ireland

- Galway Clinic
- Hermitage Clinic Dublin
- Limerick Maternity Hospital

UK

- Paterson Institute Manchester
- Phatology, University Hospital Hartlepool
- Princess Royal Hospital NHS Trust Telford
- Royal Berkshire Hospital Reading

Norway

- Akershus University Hospital
- Alesund Sykehus Ålesund
- Birkenes sykehjem Birkenes

Sweden

- St Görans Sjukhus Stockholm
- Sundsvall Sjukhus Sundsvall
- Södertälje Sjukhus Södertälje

Finland

- Meilahden Sairaala Helsinki
- Moision Sairaala Mikkeli
- Naantalin Terveyskeskus Naantali
- Nokian Terveysasema Nokia

Belgium

- H. Hartkliniek Eeklo
- H. Hart-Ziekenhuis Campus Roeselare

Other countries

- International Private Hospital, United Arab Emirates
- Al Tawan Hospital, United Arab Emirates
- Climatech Sofia, Bulgaria
- Tervise Polikliinik Tallinn, Estonia



Energy Efficient Air Handling Units to Akershus University Hospital in Norway

Customer: Akershus University Hospital in Oslo, Norway.

Need: An energy efficient and cost effective solution for air handling.

Solution: 141 EU Air Handling Units. 106 of the units are in the hygienic layout and with casing air leakage class B.

We Bring Air to Life

Fläkt Woods is a global leader in air management. We specialise in the design and manufacture of a wide range of air climate and air movement solutions. And our collective experience is unrivalled.

Our constant aim is to provide systems that precisely deliver required function and performance, as well as maximise energy efficiency.

Solutions for all your air climate and air movement needs

Fläkt Woods is providing solutions for ventilation and air climate for buildings as well as fan solutions for Industry and Infrastructure.

Air Handling Units (AHUs)

Modular, compact and small AHU units. Designed to ensure optimisation of indoor air quality, operational performance and service life.

Air Terminal Devices and Ducts

Supply and exhaust diffusers and valves for installation on walls, ceiling or floor are all included in our large range and fit all types of applications.

Chilled Beams

Active induction beams for ventilation, cooling and heating, and passive convection beams for cooling. For suspended or flush-mounted ceiling installation – and multi-service configuration. With unique Comfort Control and Flow Pattern Control features.

Residential ventilation

A complete range of products for residential ventilation. Consists of ventilation units, exhaust air fans and cooker hoods designed to optimise indoor comfort and save energy.

Energy recovery

Dessicant-based product and systems that recover energy, increase ventilation and control humidity.

Fans

Advanced axial, centrifugal and boxed fans for general and specialist applications. Comprehensive range including high temperature and ATEX compliant options. Engineered for energy efficiency and minimised life cycle cost.

Chillers

Air-cooled and water-cooled chillers with cooling capacity up to 1800kW. Designed to minimise annual energy consumption in all types of buildings.

Controls and drives

Variable speed drives and control systems, all tested to ensure total compatibility with our products. Specialist team can advise on energy saving and overall system integration.

Acoustical Products

A complete line of sound attenuating products, including rectangular and round silencers, Media Free silencers, custom silencers and acoustic enclosure panels.

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