

Air Management for Hospital Applications



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Fläkt Woods has the capability to combine energy efficient (e 3) products into fully integrated (i3) systems.

FläktWoods

Specialised solutions for high demands of healthcare applications

HVAC systems for hospital and healthcare facilities have special requirements because of the susceptibility of patients to infection. Heating and ventilation systems play an important part in providing a clean, safe and comfortable environment for recovery.

Integrating our *leading*  *products* into *unique*  *solutions.*

Air climate solutions to meet your needs

We specialise in air management and can deliver solutions with maximised energy efficiency from the wide range of products we manufacture.



Our solutions can be found in over 300 hospital and healthcare facilities, meeting the highest hygiene standards with the lowest life cycle costs without compromising patient comfort.

Specific Healthcare demands

When healthcare facilities need more than heating and ventilation, we can deliver equipment and complete systems for control of infection, air movement and odour, yet maintain temperature, humidity, air quality and noise at comfortable levels for patients and staff.

Our HVAC equipment and systems are designed to meet strict hygiene standards in Europe. Certified by ILH of Germany, our eQ Plus uses materials that are microbiologically inert and meets

- German standard VDI 6022,
- Swiss standards SWK Richtlinie VA104-4 (04/2006)

We design our equipment and systems to

- be accessible for regular cleaning
- be easily cleanable
- enable visible inspection during operation

to ensure Hospitals are able to operate continuously around the clock

Committed to improving the environment, we operate to ISO 14001 and strive to include more recyclable material in our products.

HVAC systems have a major impact on:

- Infection control
- Hazard control
- Internal climate control
- Building energy consumption

Fläkt Woods solution include:

- Hygienic components
- Easy clean design
- Highest efficiency systems





Products you can depend on

Flakt Woods is not only an experienced HVAC systems integrator. We also manufacture many of the components ourselves. This puts us in the unique position to meet specific system requirements with component features. Development of our components are always carried out with functionality of complete systems in mind.

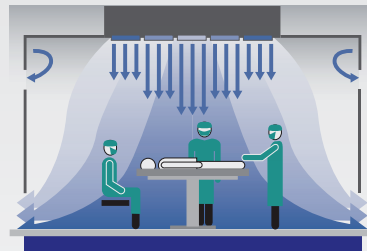
For more information about the systems, please consult our local representative, technical brochures, or our website: www.flaktwoods.com



Ultra Clean Ventilation

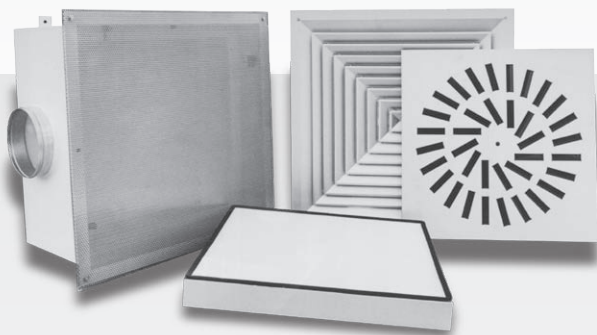
DIF OT

- Screenless UCV system with variable velocity canopy
- Aseptic containment with optimised laminar airflow ensuring the highest level of cleanliness
- ISO5 class in operating simulation mode
- ISO4 over the surgery bed



DIF T

- For operating rooms with a lower classification
- Perfect solution when vertical space is limited
- Clean zone with sterile air through DELTA series absolute filters



DIF P and K

- Double function for extra flexibility
- Passing air through absolute filters
- Distribution of air through hygienic air terminal devices
- Offering optimal flow patterns



Optimert Smart

- Easy set active diffuser with integrated VAV
- Constant velocity draft free air diffusion
- Compact, easy, tool free opening

Hygiene Verification check function

Hygiene check function in ACON – AHU selection tool. Compliance guide for correct configuration to:

- VDI 6022 for standard hygiene or
- EN1946-4 / HTM 03-01 for hospitals



CleanVent Air Terminal Devices

Unique Nanotechnology Avalon® coating

- Infection control and dirt repellence
- energy saving with up to 20% reduced pressure drop
- easier cleaning and degreasing
- Remains cleaner for longer 40% cleaner than traditional devices

Perfect for high level and difficult to access installations.

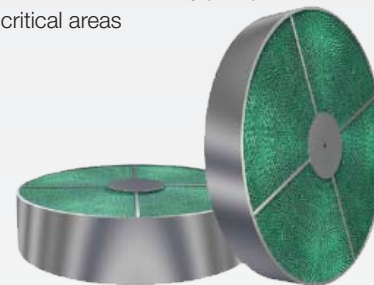
Energy Recovery Solutions



Econet Energy Recovery

High efficiency run around coil

- Up to 75% efficiency
- No contamination risk between extract and supply air
- Shorter AHU footprint
- Twin, run & stand-by pump, for mission critical areas



SEMCO 3A® Energy Recovery

Molecular Sieve Thermal Wheel for less critical areas

- Up to 90% efficiency with less than 0.04% cross-contamination - 3 angstrom desiccant coating
- High corrosion resistance
- Anti-microbial/anti-stick face coating
- Low maintenance and operating costs, long life expectancy
- Field adjustable purge



RECUTHERM® Energy Recovery

High efficiency Plate heat exchanger For less critical areas

- Up to 65% efficiency
- Low leakage up to 1%
- Stainless steel drain tray



eQ Plus Air Handling Unit

High efficiency AHU to hygienic standards with:

- High efficiency energy recovery solutions
- Variable speed, plug fans with IE2 motors
- Corrosion resistant, smooth surfaces for easy cleaning
- High insulation class T2/TB2, airtight to CEN B class, construction
- Lights, viewing ports and doors with lockable handles, inspection, for easy access and maintenance.
- Micro-biologically inert non metallic materials internally,

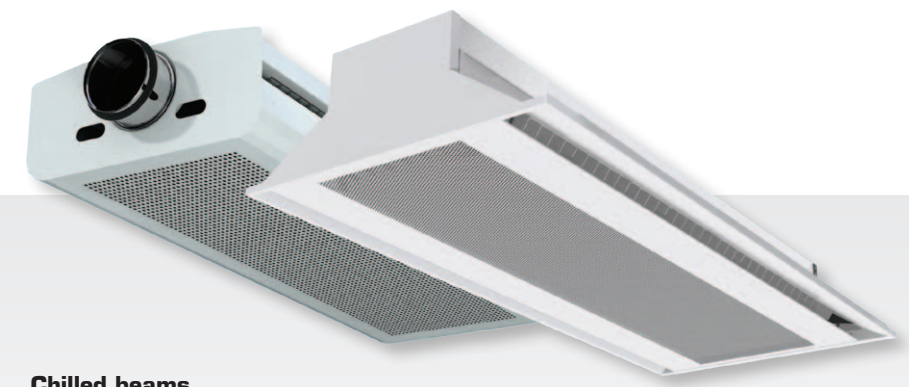
Cost Effective Energy Saving Products

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 stainless steel tray
- T2/TB2 version available

For high risk zones we recommend:

- 3 stages of filtration ending with HEPA
- Stainless steel panels
- ECONET® run around coils heat recovery to avoid any contamination
- Coils Fin pitch with at least 2,5 mm and Epoxy coated
- Plug fan with PM IE2 motor



Chilled beams

Hygienic principle of operation

- Energy efficient high performing cooling to high comfort levels
- No cross contamination between ceiling void space and room
- No moving parts – easy clean, low maintenance
- Full controls for demand based ventilation and individual temperature regulation

Solutions for a healthy air climate

Air management systems for healthcare facilities have specific requirements. 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
- Required flexibility / adaptability
- Occupant type (Patient or visitor)
- 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 03-01 in UK 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					
ISO 2	100	24				
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

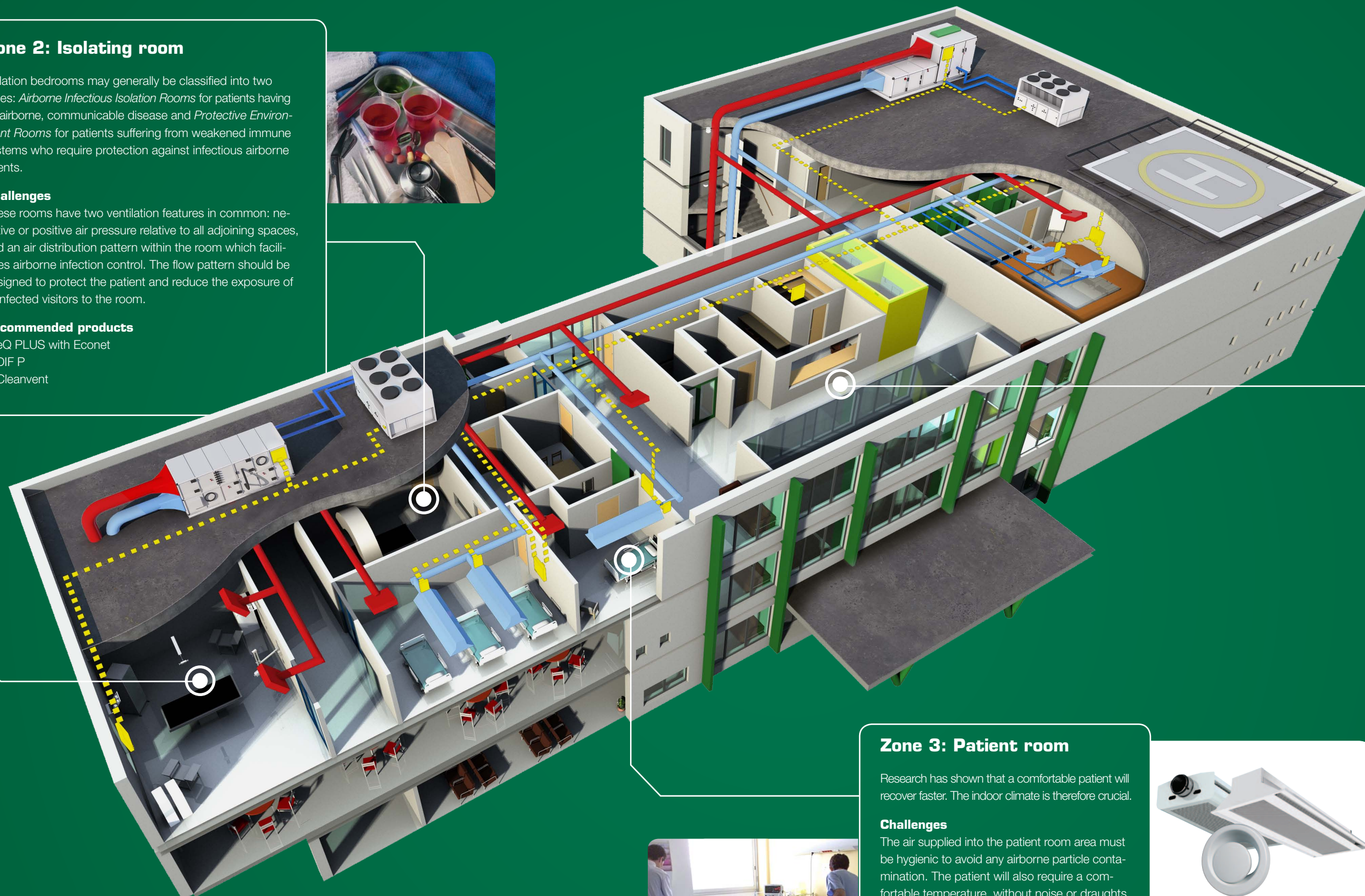
Research has shown that a comfortable patient will recover faster. The indoor climate is therefore crucial.

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).

Controls

To achieve an energy-efficient climate control system, the components must be carefully chosen to optimise the system's overall performance.

Integrated Intelligent Controls that interfaces with the building management system is therefore essential to providing the optimum performance



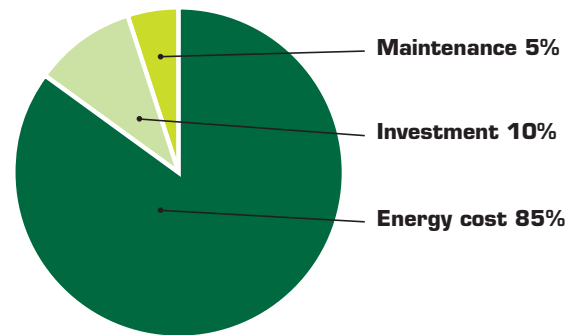
Saving energy and the environment with Fläkt Woods

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 both energy and cost 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

Umeå, Sweden - THORAX NUS

Need: Outdoor AHU's for uninterrupted fresh air supply with Rotary Heat Recovery. Operation Theatre Re-circulation units with water heating and cooling for refurbishment of 3 Operating Suites.

Solution: UCV Operating Theatre System with Uninterrupted Fresh Air supply and heat recovery met with four outdoor EU-64 AHU's up to 12 m³/s, eQL-090 with rotary heat exchangers, eQ units for re-circulation and 6 no DIF-OT Optimised Laminar Flow Ceiling HEPA Filter installations.

User Comments:

- meets future stringent hygiene requirements with very low CFU measured in comparison to replaced facility.
- spacious and provides a better working environment for our staff



Turku, Finland - TYKS T-hospital

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.

Heating Energy Savings:

- Original Sections of Hospital: 76 kWh/m³
- Phase 1 of the ECONET® installation (10 year old): 59 kWh/m³
- Phase 2 of the ECONET® installation (3 year old): 39 kWh/m³
Saving of almost 50% in Heat Energy!



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, *EU Air Handling Units*
- Alesund Sykehus Alesund
- Birkenes sykehus Birkenes

Sweden

- St Görans Sjukhus Stockholm
- Sundsvall Sjukhus Sundsvall
- Södertälje Sjukhus Södertälje
- Höglandssjukhuset Eksjö Eksjö
- Umeå Universitetssjukhus Umeå
- Lycksele Lasarett Lycksele

Finland

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

Belgium

- H. Hartklinik 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.

