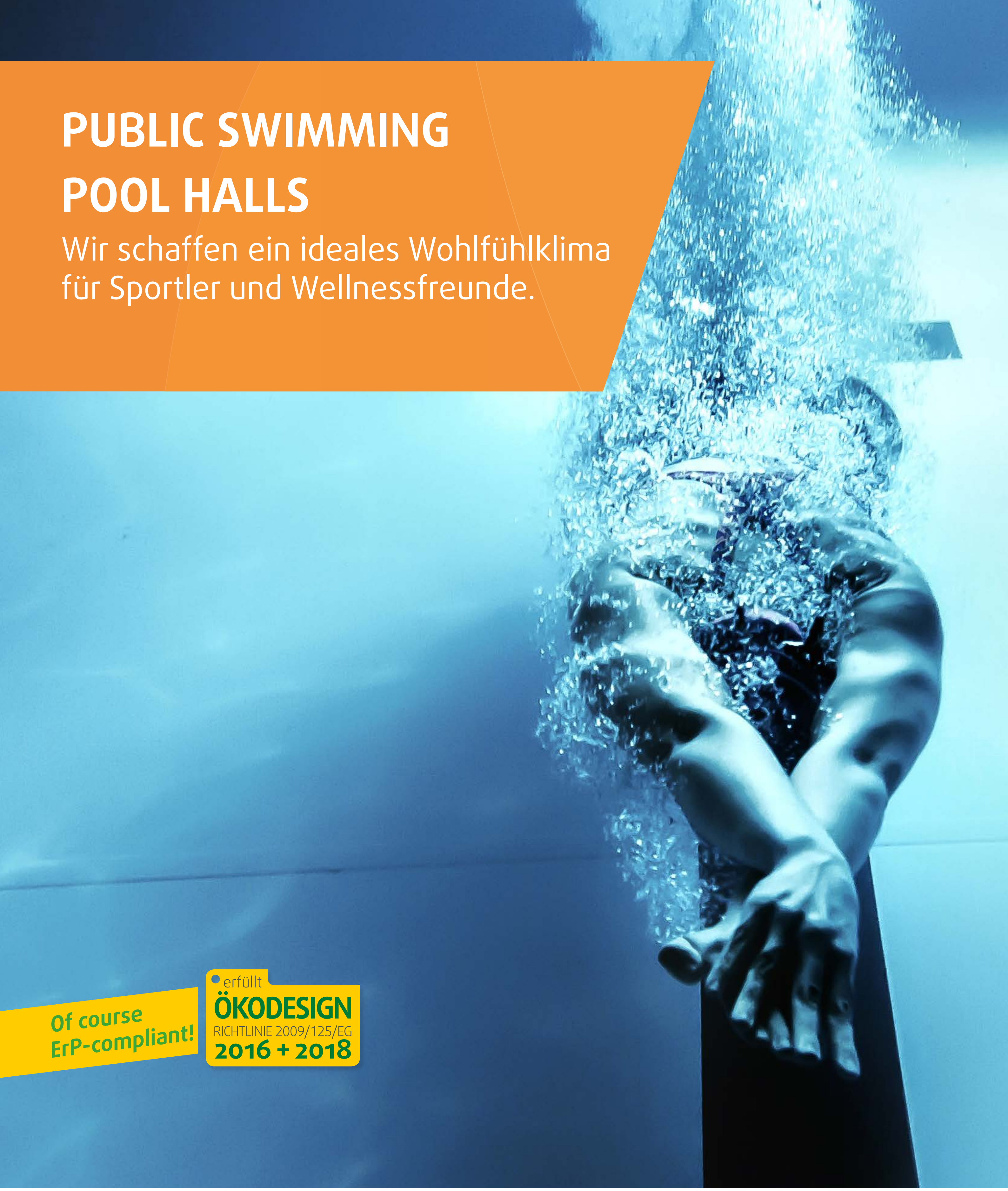
PUBLIC SWIMMING POOL HALLS

Wir schaffen ein ideales Wohlfühlklima für Sportler und Wellnessfreunde.



menerga
a systemair company

The air quality is key

WHY AIR QUALITY IS SO IMPORTANT IN THE SWIMMING POOL HALL

Modern wellness and leisure pools offer guests much more than just an opportunity for swimming. Water attractions, such as slides or white water channels, as well as complete waterscapes for children, offer recreational fun for the whole family. Outside of the pool there are lounge areas to rest and relax. The associated long length of stay of the guest also outside the pool increases the requirements for the pool hall air.

Due to the constant evaporation of the pool water and in order to satisfy the comfort criteria, indoor pool dehumidification systems are used. Modern control systems ensure continuous adjustment of the swimming pool hall temperature and humidity level and the volume of outside air required for dehumidification. The minimum volume of outside air stipulated by VDI 2089 must be complied with.

Besides the comfort needs of the bather, protection of the structure of the buildings is of enormous importance. Well-thought-out air distribution ensures that all parts of the swimming pool hall remain supplied with air. As a result, the formation of moist spots is prevented - ensuring that the dew point of components is not reached. Regardless of the intensity of use and type of swimming pool hall, 24-hour operation of the HVAC device is always required. The selection of a highly efficient dehumidification unit is crucial in order to keep down the operating costs in a swimming pool hall.

Good air ensures a good atmosphere!
The quality of the air decides whether a guests become regular customers or wether they will go to visit the competition. If it is too humid, too cold or too draughty, you will certainly not see him again. Air quality is one of the most important customer loyalty parameters in swimming pool halls.

Save energy costs!
The costs of water, energy and maintenance for the operation of an indoor swimming pool are rising year by year. Any opportunity to make savings has to be used to keep entrance fees stable. The use of highly efficient technology reduces the energy demand significantly.

Protect the fabric of the building!
Poor heat insulation in conjunction with a poorly designed vapour barrier is the most common cause of potential damage due to the temperature falling below the dew point on the inside of the building envelope of a swimming pool hall.

Avoid health risks!
The process of water treatment can lead to a concentration of disinfection by-products in the air of the swimming pool hall. These can be removed from the swimming pool hall by a ventilation system in combination with well-designed air distribution.

TEMPERATURE AND HEAT REQUIREMENT

The **pool water temperature** of a sports pool is usually 26-28°C and that of a wellness pool 28-32°C. The **room air temperature** is usually designed to be 2 K higher than the water temperature.

The **temperature** and the **air humidity** in the swimming pool hall contribute greatly to the well-being of the bather. The absolute water content plays an essential role in the swimming pool hall. Here, a value of 14.3 g of water per kg of air should not be exceeded permanently as long as the absolute water content of the outside air is < 9 g/kg. This value represents the humidity limit of an undressed person.

Surface temperature
Temperature of furnishings, equipment and room-enclosing surfaces. A temperature difference is perceived as uncomfortable by the bather and can lead tofalling below the due point.

The **heat requirement** of a swimming pool hall is determined by three variables:

1. **Transmission heat loss:** The quantity of heat which is required to compensate for the heat loss through the building envelope. High-quality insulation reduces this heat requirement.
2. **Ventilation heat requirement:** Heat quantity needed for warming the outside air up to the temperature of the swimming pool hall. A highly efficient recuperator reduces this heat requirement.
3. **Evaporation heat requirement:** Heat requirement for compensation of the heat loss resulting from the evaporation of the pool water. The amount of heat required for this evaporation is extracted to a level of 90% from the water and 10% from the air and has to be covered by a customer-provided heating installation or a heat pump integrated into the dehumidification unit. In addition there is the amount of heat which is required to replenish the quantity of water that has evaporated and heat it up to the pool water temperature.

Indoor swimming pool dehumidification

REQUIREMENTS OF SPECIFIC TYPES OF INDOOR SWIMMING POOLS

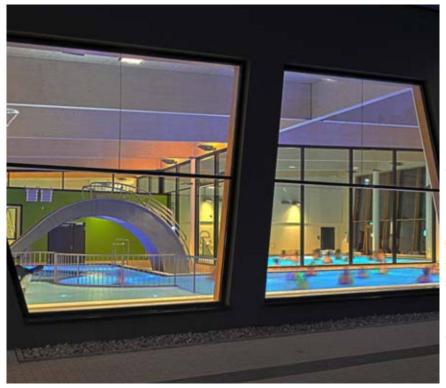
The pool surface area and depth, as well as the type of pool use, are decisive for the evaporation of the water at the pool surface. Another important influencing variable is the partial pressure difference between the saturated vapour pressure at the pool water temperature and the partial pressure of the water vapour of the swimming pool hall air. With these factors, the evaporating water mass flow is designed for bathing and stand-by mode in accordance with VDI 2089 sheet 1. A higher amount of evaporation by existing water attractions is also taken into account.

The determination of the amount of air required during bathing activities based on … and outside air, results in the amount of outside air required for dehumidification and thus the size of the respective dehumidification unit can be selected.

© City of Rijeka

Kantrida Rijeka, Croatia

SPORTS POOL
Focus on training, 50-metre lanes.
Competition venue with stands.
Temperature: 26/28°C (water/air)
Roof can be opened



© Bädergesellschaft Lunen mbH

Lippebad Lunen, Germany

LEISURE POOL
Combination of sport and leisure,
25-metre lanes.
Temperature: 28/30°C (water/air)
First public passive house swimming pool

© Therme Lasko

Lasko Thermal Baths, Slovenia

ADVENTURE POOL
Strong orientation on leisure activities, many water attractions, slides, etc.
Temperature: 28/30°C (water/air)
Connection to the outdoor pool

© Helmuth Rier

Terme di merano, Italy

SALTWATER POOL
Brine water promotes health.
Temperature: 30/32°C (water/air)
Very corrosive air

© Europapark

Hotel Bell Rock in Rust, Germany

HOTEL POOL
Wellness and relaxation.
Temperature: 28/30°C (water/air)
Wellness oasis in the Europa Park in Rust

© Klaus Bauer

Hotel Edelweiss in Wagrain, Austria

HEALTH SPA
Swimming pool, e.g. for health treatments.
Temperature: 28/30°C (water/air)
First hotel passive house swimming pool

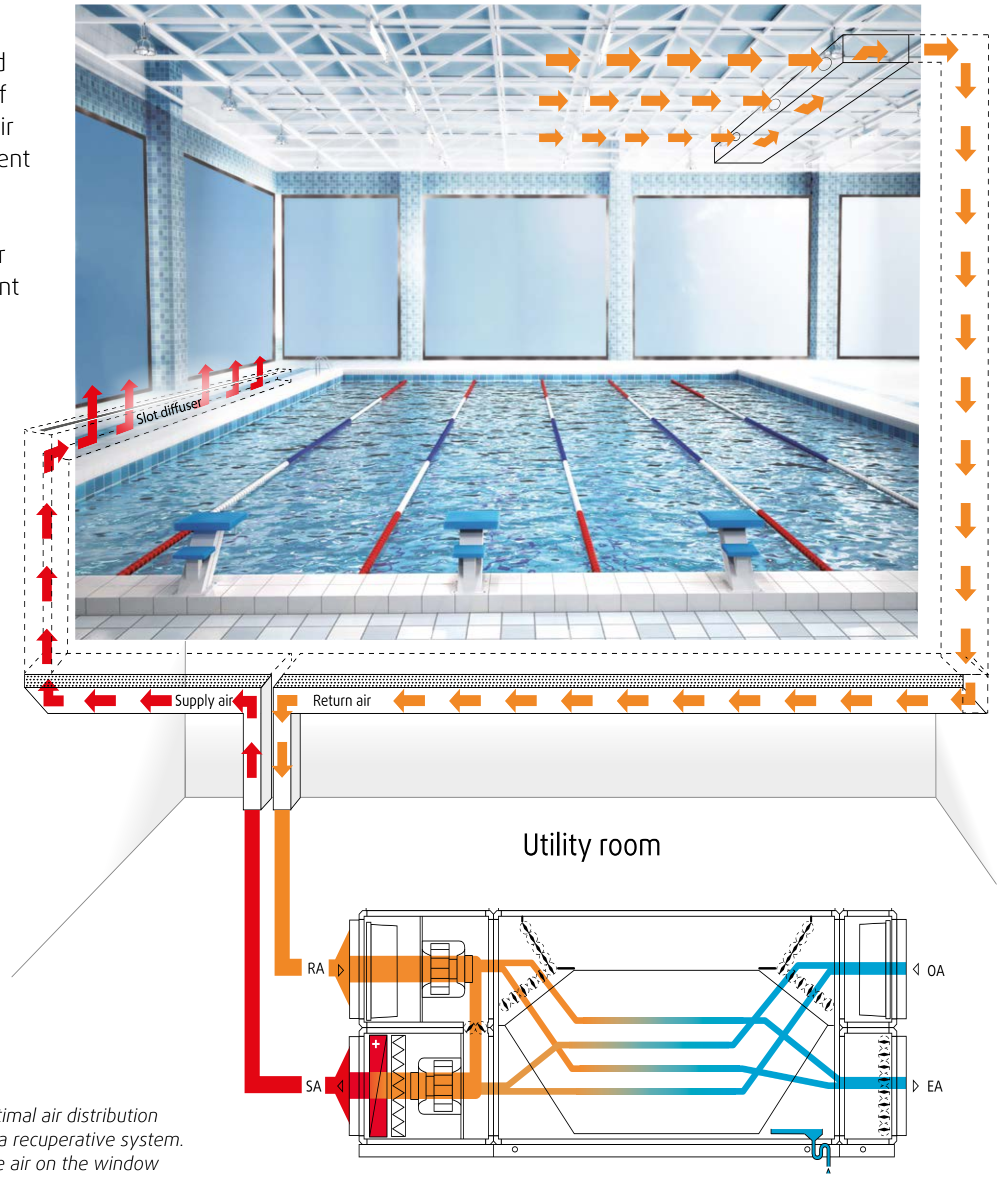
Ventilation in swimming pool halls

BASIC PRINCIPLES OF AIR DISTRIBUTION

The air distribution system in a swimming pool hall performs several tasks. The main task is to discharge the moist return air from the hall and feed it to the dehumidification unit. At the same time, the drier supply air is fed from the bottom up into the swimming pool hall through the duct system, normally via air outlets in the area of the windows. The position of the air inlets and outlets in the hall make an important contribution to the comfort of the bathers. The air inlet, in particular, must be arranged such that the common area is draught-free for bathers. The supply air helps to generate an air flow that ensures air circulation in all areas of the swimming pool hall. The successful performance of this task mainly depends on whether the fans provide a constant quantity of supply and return air at all operating points. The position of the air outlet at the top of the swimming pool hall is selected in such a way that an air-side short circuit between the supply air and return air is ruled out.

By-products which find their way into the swimming pool hall air are formed during the cleaning and disinfection of the pool water. A further task of the air distribution system is to actively prevent a concentration of these substances.

In general, 4 to 5 air changes per hour have proven effective for the fulfilment of all tasks.



Example of an optimal air distribution system based on a recuperative system. Introduction of the air on the window facades, extraction at the top. The amount of supply and return air is constant.

Ecodesign Directive

ERP ALSO APPLIES TO VENTILATION UNITS IN SWIMMING POOL HALLS

European Directive 2009/125/EC (ErP or "Ecodesign Directive") provides a European legal guideline for the establishment of requirements for the environmentally friendly design of energy-related products and came into effect in October 2009. The objective of this directive is to provide minimum requirements regarding the energy efficiency of various product groups which fall under the category of energy-related products and therefore drive inefficient products from the Single European Market in order to achieve the European climate protection targets. The requirements for the ecodesign of ventilation plants were established in EU Regulation 1253/2014, which came into force in 2014. Besides the basic requirements for the design of the ventilation unit, efficiency criteria are being formulated in two steps for 1 January 2016 and - with increased requirements - 1 January 2018. Particular focus is on the efficiency of the heat recovery system according to the rules of EN 308. These rules describe the test method in order to determine the efficiency of all heat exchanger systems and ensure cross-system comparability.

Another decisive factor for compliance with the requirements of the Ecodesign Directive is the power consumption of the fans. If this exceeds a reference value, the device may not be placed on the market within the EU.

The objective of the ecodesign requirements for ventilation systems is to increase the primary energy savings of this product group to 60% before 2025 relative to 2010.

IMPORTANT STANDARDS AND DIRECTIVES

BUILDINGS

Energy Conservation Act (EnEG)
Law on saving energy in buildings

Renewable Energies Heat Act (EEWärmeG)
Law for the promotion of renewable energies in the heat sector

Energy-saving Regulation (EnEV)
Regulation on energy-saving thermal insulation and energy-saving installation engineering for buildings

DIN V 18599
Calculation of the energy needs, delivered energy and primary energy for heating, cooling, ventilation, domestic hot water and lighting of buildings

KOK Directives
Recognised basis and benchmark for the planning and construction of public swimming pool halls

Regulation on the Construction and Operation of Places of Public Assembly (VStättVO)
Ordinance on the construction and operation of public assembly places (among other things open-air swimming pools with fencing, swimming pool halls with a volume > 200 people)

VDI 2050, Sheet 1-5
Planning and Holistic View of Buildings and Technical Building Equipment

HVAC

Machinery Directive 2006/42/EC

Ecodesign Directive 2009/125/EC

Directive 2004/108/EC Electromagnetic Compatibility

Pressure Equipment Directive 97/23/EC

EN 378
Safety and Environmental Requirements for Refrigeration Systems and Heat Pumps

DIN EN 13779
Mechanical Ventilation and Air-Conditioning of Non-Residential Buildings

DIN EN 15251
Input Parameters for the Room Climate for the Design and Assessment of the Energy Efficiency of Buildings

DIN EN 12599
Testing and Measuring methods for the Operation of Installed HVAC Plants

VDI 2089
Building Services in Swimming Baths;
Sheet 1 = Indoor pools,
Sheet 2 = Efficient Use of Energy and Water

LüAr - Ventilation Plant Directive
Directive on the technical fire safety requirements for ventilation systems

TA-Lärm
Technical Instructions on Noise Abatement

German Sustainable Building Council - Leaflet 60.07
Maintenance of Technical Installations in Swimming Pools, leaflet of the German Society for Bathing.

German Study Group of Public and Municipal Administration for Machines and Electrical Facilities in Buildings - HVAC Plant Construction Directive
Scope of application: public buildings

DIN EN 13053
Rating and performance for air handling units, components and sections

DIN EN 13501 Part 1 (May 2007)
Fire classification of construction products and building elements

DIN EN 1886
Air handling units - Mechanical Performance

VDI 3803
Central Air Conditioning Systems – Structural and technical principles (VDI ventilation code of practice)

DIN EN 1751 (January 1999)
Air terminal devices

VDI 6022
Hygiene Requirements for ventilation and air-conditioning systems and units

HVAC Directive 01
General Requirements for HVAC Systems, issued by the German Association of Ventilation and Air-Conditioning Equipment Manufacturers (Registered Association)

RLT-TÜV-01
Test Guideline of TÜV-Süd for Energy Efficiency

IMPORTANT LABELS

ErP Directive
Device complies with Directive 2009/125/EC

EUROVENT
Certification Programmes for Cooling and Air-Conditioning Products

HVAC A+, A, B
Certification of Efficiency and Quality of an HVAC System

Design Parameters

FOR PUBLIC SWIMMING POOL HALLS

Important Design Parameters
- Pool surface, pool depth
- Water temperature
- Air temperature and humidity
- Type and number of attractions
- Operating hours
- Type of use

Design
- Provide for multiple use of the air
- Operate wet areas in low pressure compared to dry areas
- Air distribution system must ensure air exchange in the swimming pool hall

Planning
- Early examination of building statics and possible access openings
- When setting up the device and planning the channels, take the minimum space for maintenance work into account
- Exhaust air channel: Air lines for the dehumidification unit as short as possible
- Cleaning opportunity and discharge for any penetrated water
- Inspection opening at chamber or channel
- Exhaust air passage: Ensuring the removal of any water that has entered
- In the case of suction through the building's roof: The distance of the air intake to be at least 50% above the maximum snow depth Also keep in mind:
  - Main weather direction
  - Fallen leaves
  - Sound (see table on the right)
- Choose the position of the exhaust air duct such that air is not blown out below parts of the buildings (roof)
- Check the fire protection concept! Provide smoke detectors in supply and return air duct in order to turn off system in the event of fire automatically
- According to VDI 2089, weight-loaded overpressure relief valves must be provided in order to protect the duct system.
- Adjustment depending on the room temperature and room humidity, or alternatively depending on the room temperature and pool temperature
- Only exceed absolute humidity in the hall of 14.3 g/kg if OA humidity exceeds >9 g/kg
- Reduction of the minimum external volume flow from 30% to 15% is permissible if the pool water trihalomethanes are permanently <0.020 mg/l
- Monitor the chemical room

Maintenance
- Provide monitoring with automatic test signals
- Schedule maintenance framework agreements at fixed intervals as well as measures for energy optimisation
- Inspection twice a year
- Inspections must be documented in the log book

Immission guide values according to TA Lärm	during the day 6⁰⁰ am - 10⁰⁰ pm	at night 10⁰⁰ am - 6⁰⁰ pm
Industrial areas	70 dB(A)	70 dB(A)
Industrial estates	65 dB(A)	50 dB(A)
Rural and mixed areas	60 dB(A)	45 dB(A)
General residential areas	55 dB(A)	40 dB(A)
Exclusively residential areas	50 dB(A)	35 dB(A)
Spa areas, hospitals etc.	45 dB(A)	35 dB(A)

Terme di merano, Merano
Photo: Helmuth Rier

Design parameters
(Standard parameters, can be varied at the request of the operator)

- **Room temperature**

Swimming pool hall	30 - 34 °C
Changing rooms	22 - 28 °C
Showers	26 - 34 °C
Sanitary area	26 - 34 °C
Staff rooms	22 - 26 °C
Entrance area	> 20° C
Adjoining areas	> 20° C
Stairwells	> 18° C

- **Pool water temperature**

Swimming pools	28° C
Diving pools	28° C
Recreational pools	28 - 32 °C
Wading pools	32 °C
Exercise pools	32 °C
Therapy pools	36 °C
Whirlpools	36 °C
Warm bubble pools	36 °C
Warm pools	35 °C
Cold pools	15 °C

- **Surface temperatures**

Surface type	
Surfaces of seat and lying areas	30° to 39° C
Surfaces of the floor in the barefoot area	22° to 30° C
Heating surfaces in the barefoot area without protection against contact	<50° C
Heating surfaces in the barefoot area with protection against contact	any

- **Volume flows**

Entrance area	5 m³/hm²
Single changing rooms	15 m³/hm²
Group changing rooms	20 m³/hm²
Supervisory rooms	25 m³/hm²
First aid rooms	25 m³/hm²
WCs (per seat)	100 m³/h
Showers (per shower)	220 m³/h

For further information and parameters, see VDI 2089 Sheets 1 and 2.

- **Attractions:**
Overview of the parameters of the relative field amplification according to VDI 2089 Sheet 1.

Detailed instructions for the calculation according to VDI 2089 are available on request from your sales partner.

Attraction	Technical Data			Rel. field amplification
	No. of nozzles per system	Flow rate water	Flow rate water	
Jet stream canal	6 to 8	80 to 100	-	30
Water mushroom	-	40 to 50	-	5
Counter-current system	1 to 2	20 to 50	-	20
Neck shower	-	30 to 60	-	6
Floor jet	-	50 to 100	-	4
Bubble geyser	-	-	200 to 300	3
Geyser	-	50 to 70	-	3
Children's slide	-	60	-	3
Massage area	-	10 to 20	-	4
Recess for relaxing	-	-	40 to 50	2
Sitting area	-	-	40 to 50	2

Make the Right Choice!

SYSTEM AND COMPONENT SELECTION

EQUIPMENT SELECTION

Recuperative heat recovery systems transmit the sensitive energy stored in the swimming pool hall return air to the outside air. Substances contained in the air are not transmitted from the return air to the outside or supply air. With low OA temperatures in which water condenses out of the return air, this cannot enter the supply air. Only the quantity of outside air which is necessary for dehumidification is used.

Recuperative: Device with counter-flow heat exchanger, without heat pump
Devices with counter-flow heat exchangers achieve the highest-possible heat recovery rates. Modern control systems provide the quantity of outside air required for dehumidification continuously and consistently. The ventilation heat requirement is reduced to a minimum. This solution is ideal for well-insulated swimming pool halls in which the transmission heat loss is very low.

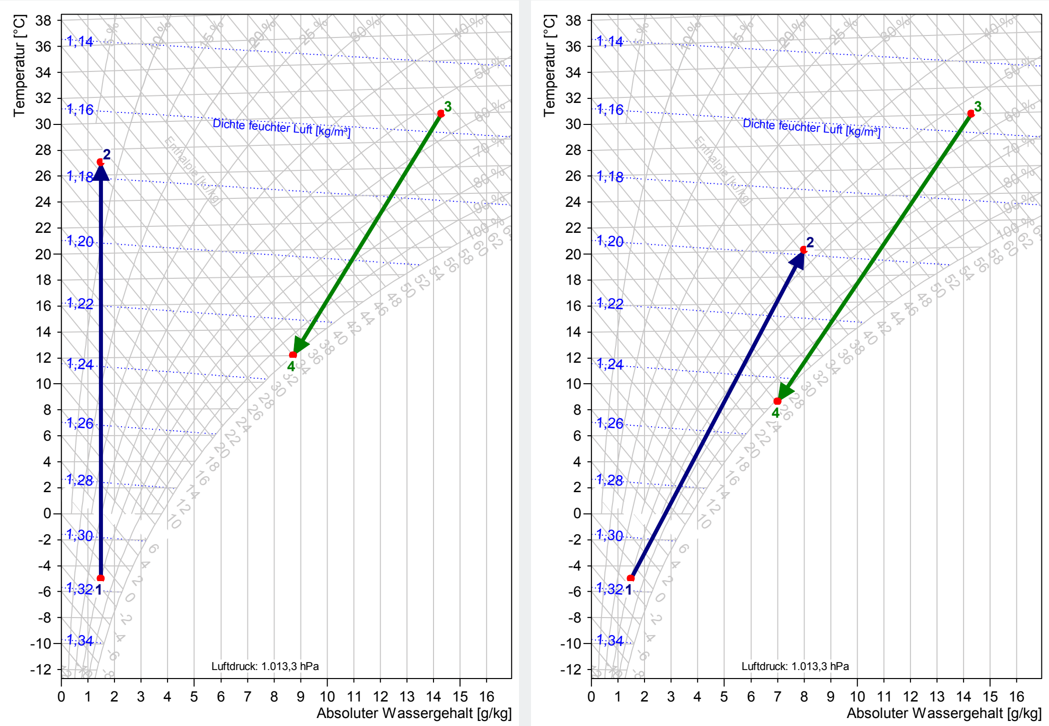
Recuperative: unit with cross-flow heat exchanger and heat pump
Combination of recuperator and downstream heat pump. Here, the exhaust air is further cooled with the help of the evaporator after the recuperator in outside air mode. The sensitive and latent energy obtained is transferred to the supply air. The electrical capacity of the compressor is transferred to the swimming pool hall as additional heat gain through the supply air. That way, a large share of the transmission heat requirement is covered and the heating system can be sized smaller. This solution is ideal for energetically refurbished swimming pool halls.

Regenerative: Device with rotary heat exchanger; Heat wheels
For regenerative heat recovery via a rotary heat exchanger, substances from the swimming pool hall air can be transferred in addition to the sensitive heat. Moisture recovery results due to the design if the dew point is not reached, since the condensate produced by a heat wheel gets into the outside air flow with the help of the rotation. This moisture recovery increases the absolute water content in the supply air and has to be compensated for with a greater quantity of outside air. The significantly higher fan input power results in higher energy requirements in addition to the driving power of the heat wheel.

COMPONENTS

Pool water condenser
A pool water condenser can emit heat to the pool water during the transitional period.

Energetic examination of recuperative and regenerative heat recovery

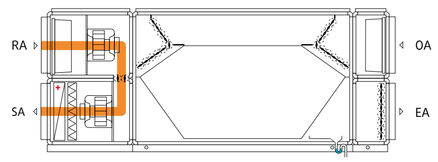


Energetic examination of recuperative and regenerative heat recovery (left) and heat recovery with heat wheel (right).
The diagram shows that there is a big difference in the absolute water content between the return air and outside air in the case of low OA temperatures.

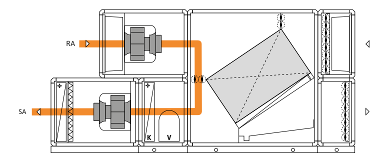
How it works...

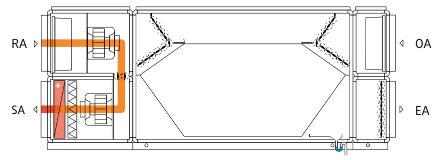
COUNTER-CURRENT HEAT EXCHANGER VS. HEAT PUMP

Device with counter-flow heat exchanger, without heat pump		Unit with cross-flow heat exchanger and heat pump

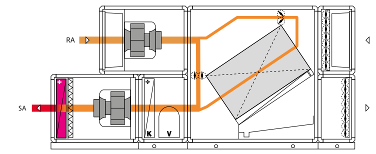


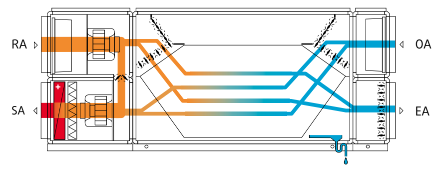
Stand-by mode
No requirement for temperature or dehumidification, device operates solely in recirculation mode. The aim is air circulation with reduced performance of the fans.





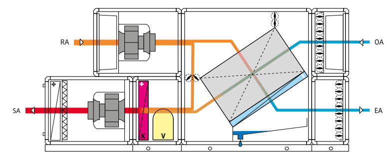
Recirc Air Heating Operation
Heating in accordance with requirements for each heating coil. The OA and EA dampers are closed.

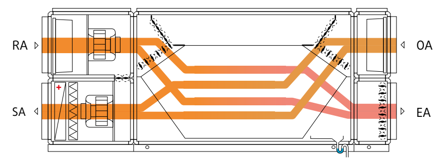




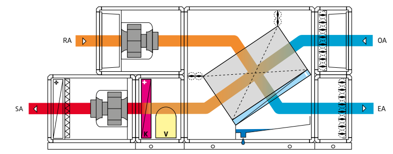
Dehumidification at the device with counter-flow heat exchanger
Dehumidification of the swimming pool hall air through demand-based mixing of outside air (in bathing mode in accordance with VDI 2089 minimum required amount of outdoor air) for the recirculated air flow. If required: reheating of the supply air.

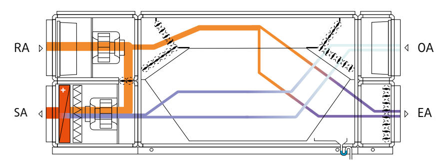
Dehumidification of the device with heat pump
The return air is cooled to below the dew point in the evaporator of the heat pump, reinforced by the recuperator. Outside air with a low moisture content is preheated in the heat exchanger, then mixed with an amount of untreated recirculation air, heated at the condenser and routed into the hall as supply air. If necessary, further heating is carried out with the help of heating coils. During swimming pool mode, the minimum required amount of outdoor air is added as needed.



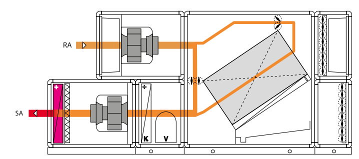


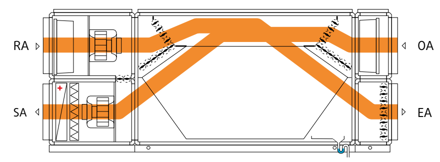
Outside Air Exhaust Air Mode
In the case of rising OA humidity, the recirc air damper is continuously closed as required. During high OA humidity, the flap closes completely, the device operates in outside air-exhaust air mode.





Defrost Mode
Recuperative heat exchangers tend to ice up if the OA temperatures are low. This is prevented by opening the return air-exhaust air bypass.





Heat exchanger bypass
The proportion of the air guided through the heat exchanger and the bypass can be regulated up to free ventilation.

Quality Factors

YOU CAN RECOGNISE A GOOD HVAC DEVICE BY THESE PARAMETERS.

Control and regulation
Control and regulation is part of any energy-efficient device. The device can be connected to BACnet and other systems and can be operated and analysed by remote control and remote monitoring (vicomo).

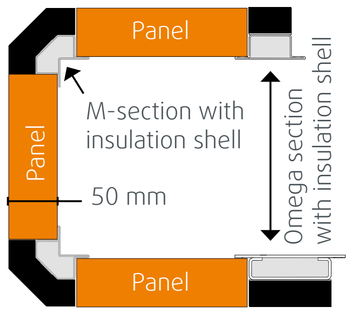
Unit structure
The unit design ensures the durability of a device, as well as simple, secure integration. Menerga units are based on a long-lasting, robust frame structure.

Thermal insulation
A good HVAC device is based on a comprehensive thermal insulation concept. It has a solid construction with sufficient rigidity in conjunction with a unit cover designed as sandwich panels. The thermal insulation shell reduces heat losses and hence energy consumption. Thermal isolation is ensured by design. This means best possible avoidance of thermal bridges, and no condensation on the outside of the unit. This is very important when used in the swimming pool hall area.

Cleaning and maintenance
A unit design according to VDI 6022 ensures the high hygiene standard of HVAC units. This includes the possibility of thorough cleaning of all components, in particular the heat exchanger. This has to be made possible already at the design stage.

Highest efficiency confirmed
Menerga is a member of the German AHU Manufacturers Association and certified by them and by EUROVENT. The basis for this is measurements and tests which have been created by independent institutes such as TÜV or DMT. With these we ensure design and production according to standard market quality and efficiency criteria.

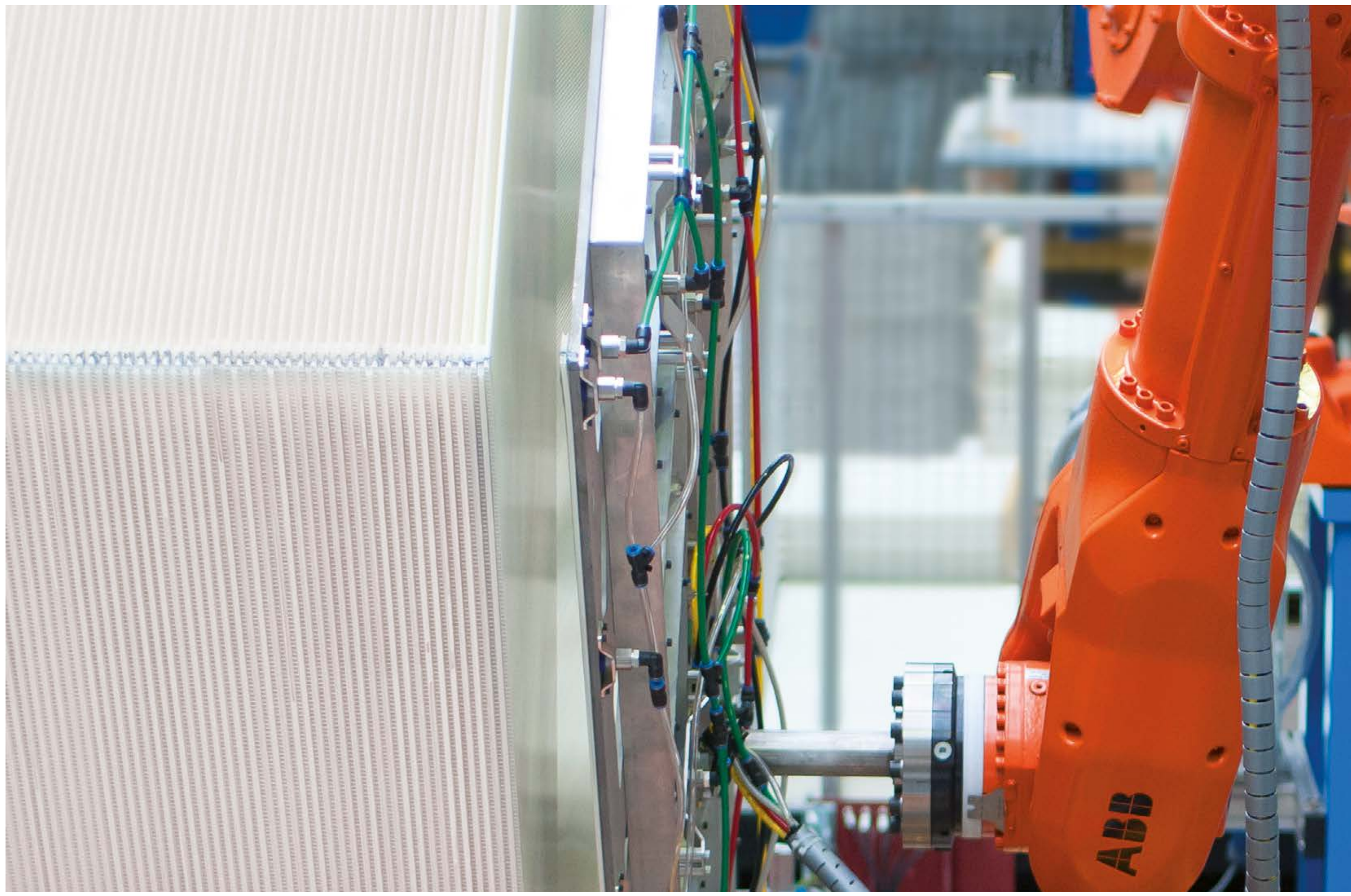
Extra corrosion design
If the swimming pool hall air is particularly corrosive, for instance in the case of brine baths, units have to be provided with increased corrosion protection.



Measured values according to EN 1886	
Casing stability	D1 (M)
Air tightness -400 Pa	L1 (M)
Air tightness +700 Pa	L1 (M)
Filter bypass leakage	F9 (M)
Heat transfer	T2
Thermal bridge factor	TB1

All components are complete with corrosion-resistant coatings or polypropylene panels. This ensures a long lifespan.

Polypropylene recuperator
Polypropylene (PP) is a thermoplastic material which is ideal for use in air-conditioning and ventilation technology. It is non-toxic and neutral to ground water. Polypropylene possesses a high level of resistance to many types of acids, alkalis, salts and solvents and is resistant to corrosion and to ageing. The material cannot be metabolised microbiologically and provides no basis for the growth of germs or lime scale and algae deposits. During production, significantly fewer CO_2 emissions are produced compared to aluminium. Furthermore, the weight is five times less.



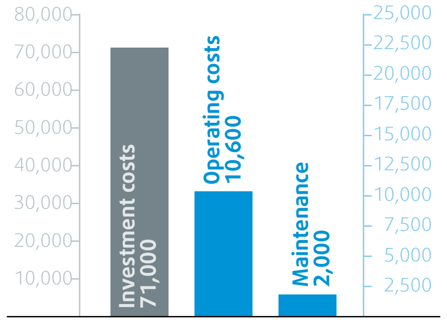
Heat exchanger made of polypropylene, fully automated production.

Comparison of Operating Costs

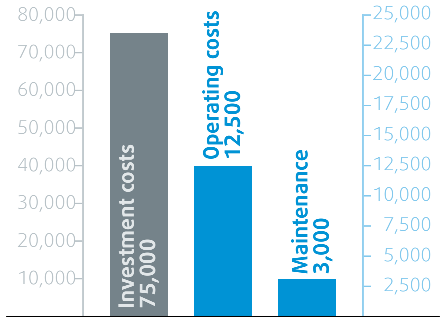
COMPARISON OF THREE SOLUTIONS FOR DEHUMIDIFICATION

Design conditions

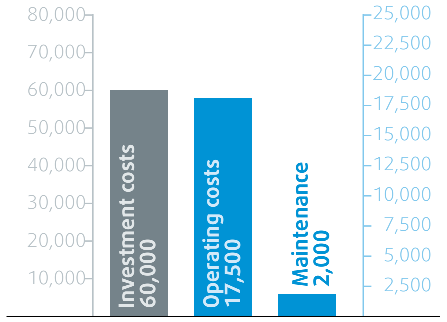
Pool size: 25 x 12.5 m
Pool water temperature: 28° C
Condition of the air in the swimming pool hall: 30 °C/54% r.h.
Swimming pool mode: 8 a.m. - 9 p.m.
Electricity price: EUR 0.165/kWh
Heating price: EUR 0.05/kWh
Air quantity: 15,800 m³/h
Calculation according to VDI 2089.
Specification of all costs in euros



unit with counter-flow heat exchanger



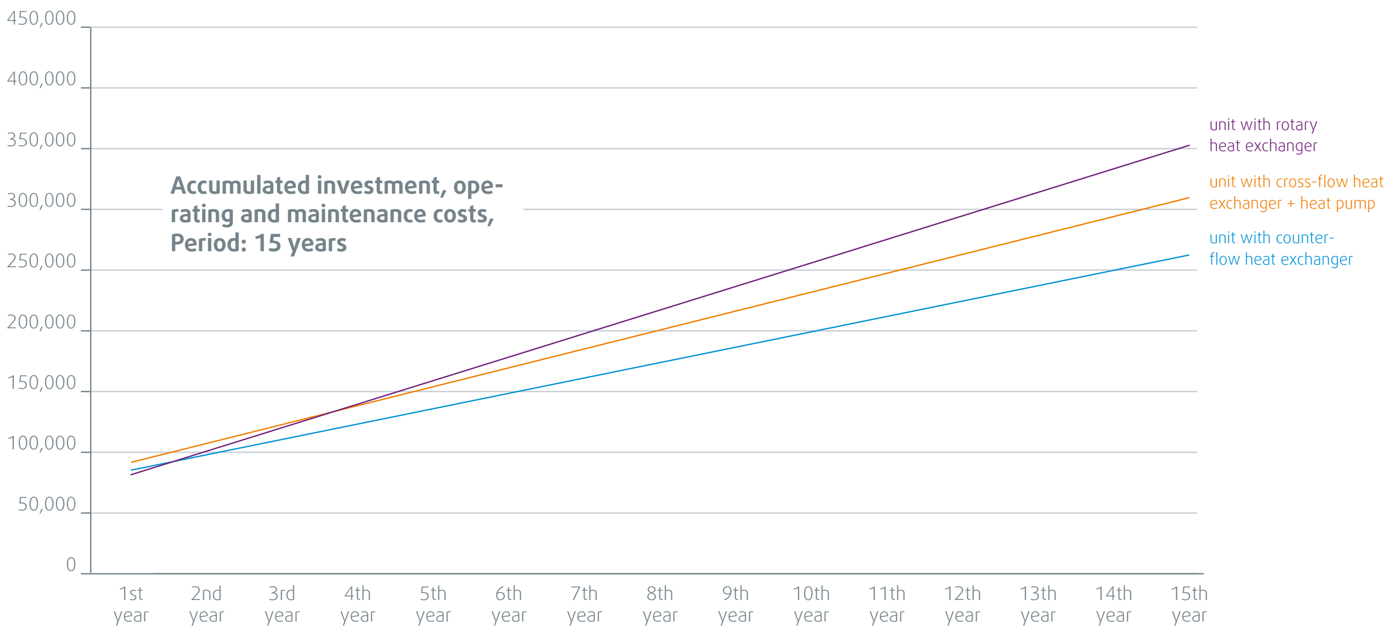
unit with cross-flow heat exchanger and heat pump

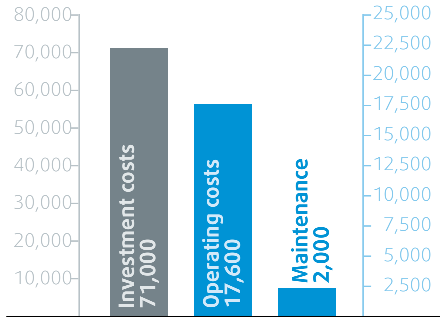


unit with rotary heat exchanger

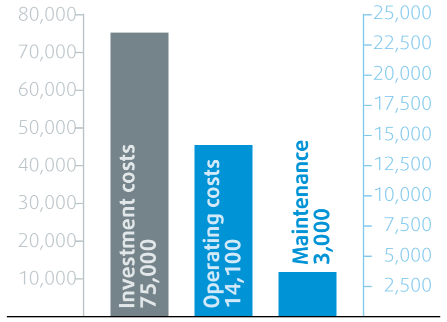
SYSTEM COMPARISON: SWIMMING POOL HALL WITH EXCELLENT THERMAL INSULATION

Requirement: coverage of ventilation heat requirements

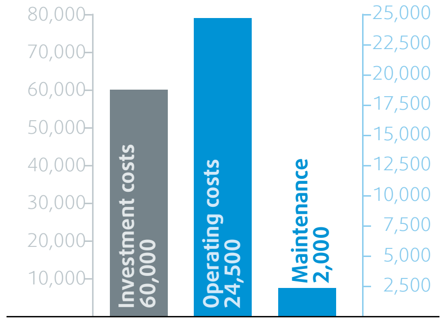




unit with counter-flow heat exchanger



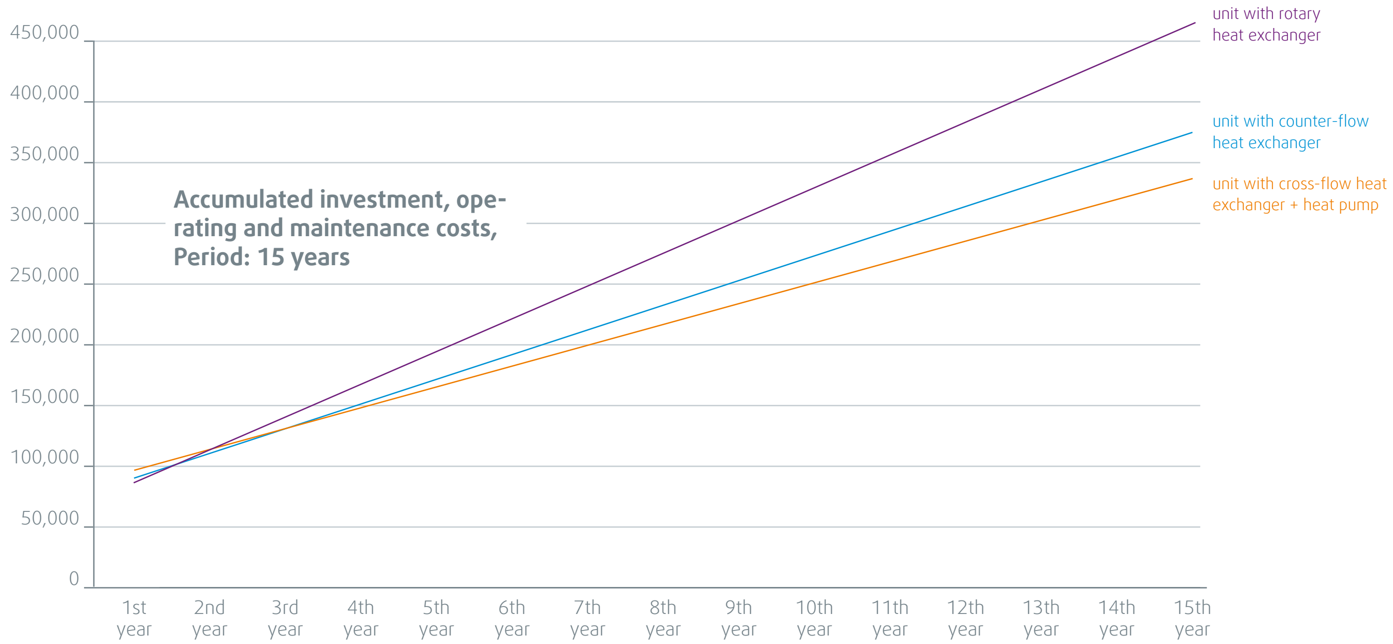
unit with cross-flow heat exchanger and heat pump



unit with rotary heat exchanger

SYSTEM COMPARISON: SWIMMING POOL HALL WITH POOR THERMAL INSULATION

Requirement: coverage of ventilation and transmission heat requirements

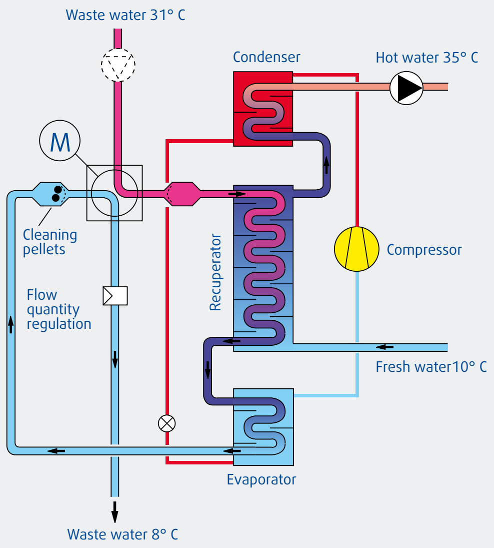


Saving energy with waste water

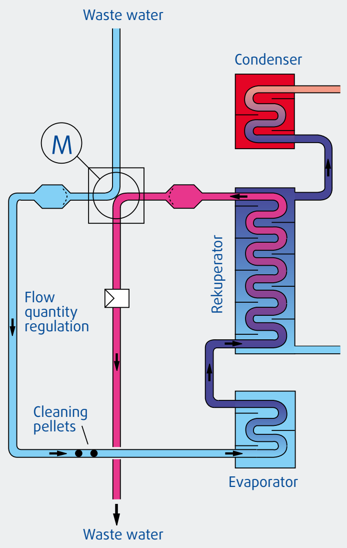
HEAT RECOVERY FROM WASTE WATER

Not only the waste water in the showers of the swimming pool hall, but also the fresh water in the swimming pool to be supplied per visitor offers great energy potential for swimming pool halls.

Per visitor, 30 litres of fresh water has to be supplied during standard swimming pool operation. This means that 30 litres of pool water brought up to the right temperature must be exchanged for unheated fresh water. Hence, heat recovery from waste water is a good solution for older swimming pool halls, including refurbishment cases. The crucial point for efficient operation is a continuous accumulation of waste water, for instance by using a tank.



Cleaning phase



HOW IT WORKS:

Heat recovery from waste water with fully automatic recuperator cleaning.

The combination of a recuperative counter-flow coaxial recuperator with a heat pump provides the highest possible heat recovery. The warm waste water flows through the recuperator and then through the evaporator of the heat pump. In counterflow and physically separated, the same volume of fresh water first passes through the recuperator, and then through the condenser of the heat pump.

Consistent pipe cross-sections ensure that flow rates are constant. If the waste water is organically contaminated, bacteria growth and organic sludge formation will possibly adhere to the exchange surfaces. These are removed by the fully automatic cleaning.
At regular intervals, cleaning pellets are carried along the waste water paths.

- Quantity of flow: 0.8 – 5.4 m³/h
- Heat pump system with fully sealed suction gas-cooled coolant compressor, mounted on vibration dampers
- Ready-to-connect complete device

Options:
- Additional prefiltering of the waste water
- Designed as a safety heat exchanger
- Recuperator bypass

COMPARISON OF OPERATING COSTS FOR FRESH WATER HEATING WITH WASTE WATER HEAT RECOVERY IN THE CASE OF REFURBISHMENT

Technical data of a swimming pool hall, 1,500 visitors per day

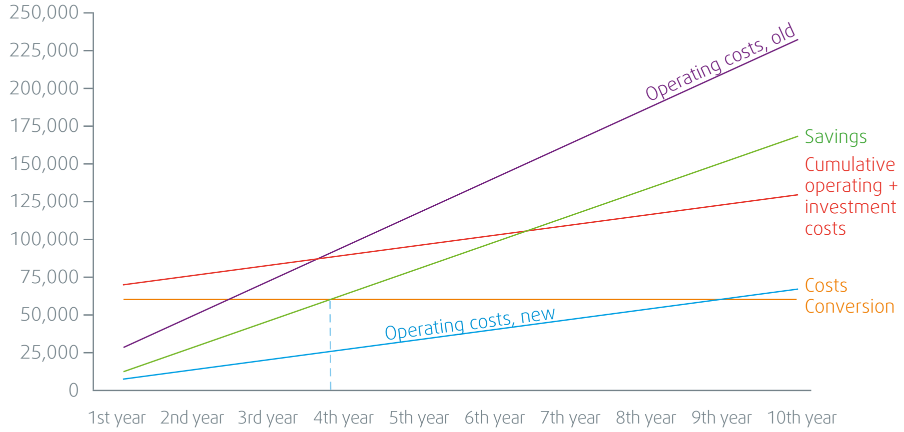
Number of swimmers/day:	1,500
Fresh water quantity/day:	45 m³
Electricity price:	EUR 0.165/kWh
Heating price (gas):	EUR 0.05/kWh
fresh water temperature:	10 °C
hot water temperature:	35 °C
fresh water/person under DIN 19643-1:	30 litres

Daily operating costs for the necessary fresh water heating

1. with gas:	€65.36/day
2. with heat recovery:	€18.87/day
Savings:	€46.49/day

Investment costs

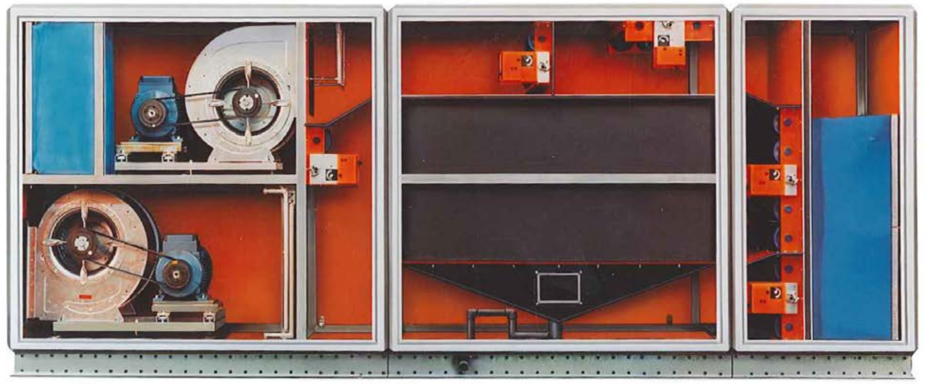
Heat recovery device:	€44,000
Installation:	€20,000



Amortisation of the conversion: 3.7 years

Energy Costs through Refurbishment

EVEN PARTIAL REFURBISHMENT CAN PROVIDE SAVINGS OF 30%



Swimming pool device from 1993. Through adjustments, for example to the fan technology, the energy consumption can be significantly reduced.

Our device technology is designed for permanent energy-efficient operation. Many devices which we installed during the first few years of the company still are or would be in running order today. Nevertheless, it pays to check a complete installed system regularly with respect to optimisation opportunities.

A complex system such as a dehumidification plant should be checked every five to ten years.The reason for this is not that there may be possible faults in terms of function or technology, but rather the fast pace of progress and the increasing air-conditioning requirements. Something that was impossible five years ago is state-of-the-art today. And may save you a good deal of money. Have changes turned up in the overall structure? Has a CHP plant been incorporated whose waste heat can be used for heating the swimming pool hall? We always factor the "big picture" into our assessment!

There is also a good deal that can be optimised with respect to regulation of the plant: From 1994 to 2013 each Menerga unit came with an A/B-DDC control system. Since 2009, A-DDC has only been used as a replacement, as has B-DDC since 2012. We modify old devices continuously and you benefit from the much improved technological status, e.g. communication via BacNet, visualised remote access, long-term data recording, lower energy requirements, connection of other components which can also be managed and much more. This pays off in many ways.

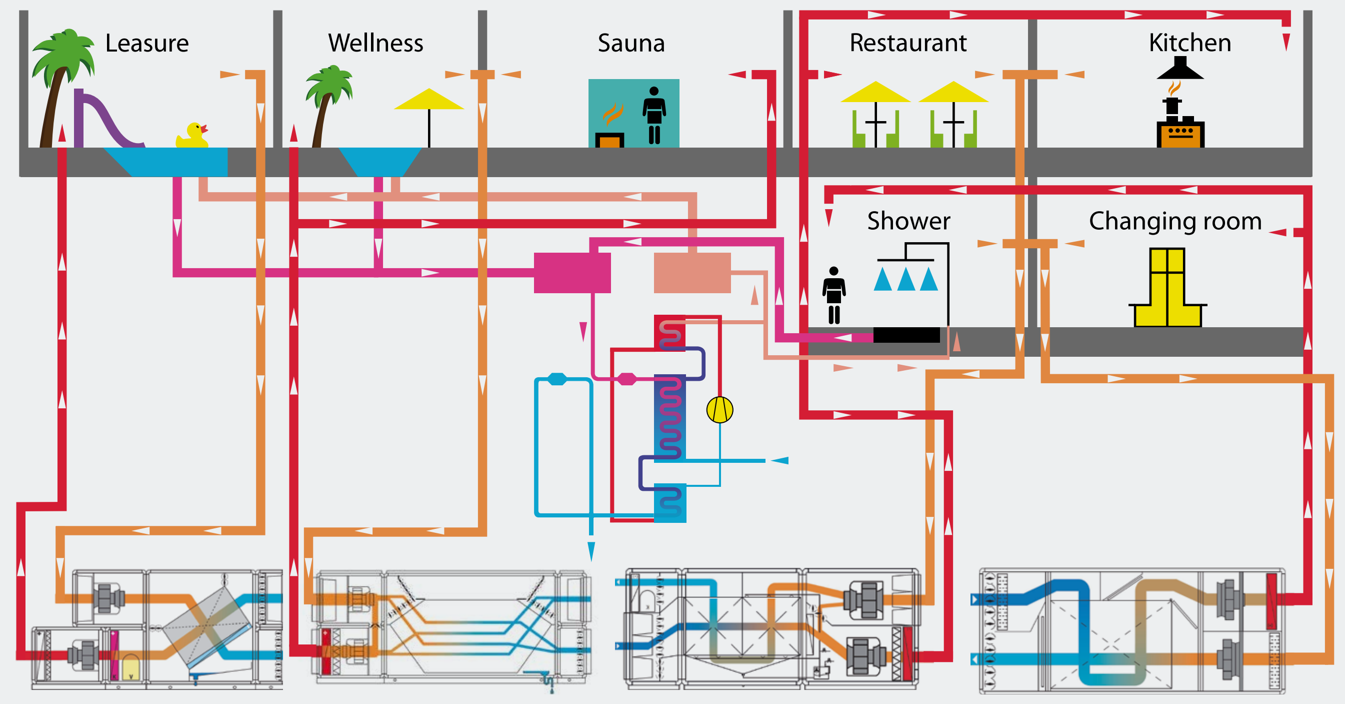
The largest amount of energy expenditure in a ventilation unit is caused by the fan motors. Currently, we are replacing V-belts and solvent fan units with EC fans in our old devices throughout Germany. This alone saves up to 30% energy.

Contact us today!

Anything else?

SWIMMING POOL HALL AND ADJOINING ROOMS AS INTEGRATED STRUCTURE

Schematic diagram of a public swimming pool



A modern public swimming pool consists not only of the swimming pool hall, but also of many other areas which place various requirements on the ventilation and air-conditioning. The areas have to be considered separately from one another to a large extent.

Entrance area
The business card of a swimming pool hall. If it smells of chloroform here and is stiflingly hot, it will make a bad impression. Temperature recommendation at least 20 °C.

Toilets, showers
In these areas, the bather is lightly dressed. The temperature in the shower and sanitary rooms should be between 26 and 34 °C.

Changing rooms
In the changing rooms the visitor is either lightly dressed or fully dressed. The air temperature in this area is maintained between 22 and 28 °C so that the guest neither freezes nor sweats.

Staff and first aid rooms
The people here tend to be lightly dressed. The ideal air temperature is between 22 and 26 °C.

Fitness areas
In order to avoid putting additional stress on the body during exercise, an air temperature of between 18 and 20 °C is recommended.

Wellness complex
In the wellness complex, the people are mostly lightly dressed, but not wet. Depending on the form of use, the air temperatures are usually between 26° and 30°C.

Restaurant
According to the German building regulations for restaurants, the room air temperature in a restaurant is supposed to be between 19 and 26 °C.

Kitchen
In the kitchen area the room air temperature should be at least 17 °C and preferably not above 26 °C. It should be borne in mind that a high fat content can occur in the return air, for which an encapsulated ventilation unit is required.

Sauna
Heat can be recovered in the sauna area - however, the supply of fresh air must also be ensured. Recommended air temperature: 22° - 26°C.

Hotel, conference rooms and more
Currently, leisure oases are being created worldwide with an adjoining hotel, business rooms etc. We also provide the appropriate air-conditioning for these additional applications.

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