

The background of the entire page is an underwater photograph of a woman in a blue swimsuit and goggles, smiling and giving two thumbs up. The water is clear and blue, with light rays filtering through. The Calorex logo is overlaid on the top right of this image.

calorex[®]

Swimming Pool Environment Control Systems

Simultaneously monitors and controls humidity,
water and air temperature

reduces running costs by up to 70%

reduces carbon emissions by up to 70%

saves installation space and set up time

THE PROBLEM?

Commercial and Municipal swimming pools give enjoyment and healthy exercise to millions of people but can be very expensive to operate.

An expensive problem!

There are many important factors to consider when planning and designing an indoor swimming pool. These include safeguarding the building structure from dangerous condensation, optimising the internal environment for the safety and comfort of bathers and saving energy whilst minimising running costs and CO2 emissions to the lowest possible levels for logical economic and environmental reasons.

Maintaining a comfortable pool environment requires the pool water and air to be heated and held at approximately 27°C and 29°C respectively. In many cases this heating is normally carried out by heat exchangers via LPHW boilers using oil or gas as fuel.



Commercial and Municipal swimming pools can be very expensive to operate

As a result of continuous evaporation, uncomfortable warm humid air containing vast amounts of valuable heat in the form of latent energy must be removed from the pool hall in order to protect the pool building from destructive condensation and chemical damage whilst maintaining a safe and comfortable leisure environment for bathers.

Swimming pools continuously evaporate large volumes of moisture into the space around them

A dangerous threat

Swimming pools continuously evaporate large volumes of moisture into the space around them. Unless this moisture is removed the humidity level will increase, creating not only an uncomfortable bathing environment but also leading to structural and building fabric damage.

In the days when energy was far less expensive than it is today, the normal method was to sweep out the humidity using large quantities of heated fresh air. This is a continuous operation and energy consumption is excessive and very costly. Heat losses include all of the pool latent and sensible energy which is not recovered and therefore entirely wasted.

Excessive energy loss

Over the last 30 years or so various methods of minimising heat losses have been proposed. Most utilise some form of fresh air handling unit (AHU) where heat exchange takes place between the warm moist out-going air and the cooler incoming fresh air.

False economy?

Some manufacturers claim 100% efficiency for these units when fitted with a top up heat pump. Unfortunately this 100% refers to air heating only, with most of the energy rich moisture being driven out to atmosphere and the pool water regaining nothing at all.

Key requirements for an Indoor pool:

- 1 Water heating
- 2 Air heating
- 3 Humidity control
- 4 Air cooling
- 5 Fresh air control



THE SOLUTION!

Today's answer to this problem is the **Calorex HRD heatpump dehumidifier** - a completely automatic climate and environmental control unit.

World leaders

Calorex are the world's leading manufacturer of swimming pool, environmental control systems that provide dehumidification, heat recovery and ventilation solutions based around heat pump technology.

A swimming pool environmental control unit must carry out its primary task of dehumidifying the pool hall air, be designed and constructed to withstand any pool air chemical condition and provide a continuously modulated quantity of heated or cooled fresh air for the comfort of users.

The Calorex solution

A Calorex HRD will provide the complete answer to humidity control, water/air temperature control and real time fresh air requirements.

By recovering the latent energy in the moisture laden air of a pool hall, your Calorex HRD will return this energy to heat the pool water or use it to assist with pool air heating.

Energy efficiency and CO2 savings

Huge hikes in gas, electricity and water tariffs have added tens of millions of pounds of massive costs to the country's annual community swimming bill. Consequently, local authorities and leisure operators find themselves under more pressure than ever to demonstrate effective energy efficiency.



Calorex are the world's leading manufacturer of swimming pool environmental control systems

Key points at a glance:

- ✓ Dehumidification with automatically modulating heat recovery to water and air
- ✓ Automatically modulating fresh air with heat recovery to air and water
- ✓ Built in LPHW, with control thermostat and three way valve, for supplementary space heating
- ✓ Dynamic fresh air cooling with heat recovery to water
- ✓ Double skinned cabinet
- ✓ Purpose built to withstand swimming pool hall atmospheres
- ✓ Choice of fan pressure statics
- ✓ BMS interface options

Furthermore, there is usually sufficient recovered energy to provide all the operational water heating requirements with any further surplus used for air heating.

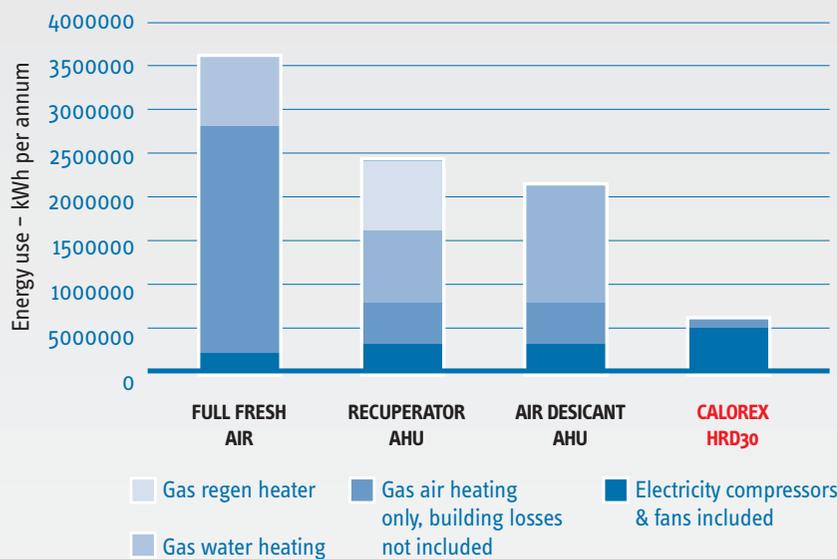
Calorex systems can simultaneously care for and preserve the building structure, reduce energy usage by up to 70% and lessen associated CO2 emissions by up to 70% when compared to a conventional full fresh air ventilation system with cross plate heat exchanger. As the units are based on heat pump technology, efficiencies are normally around 300% which is well above the 50-60% normally offered by a cross plate heat exchanger.



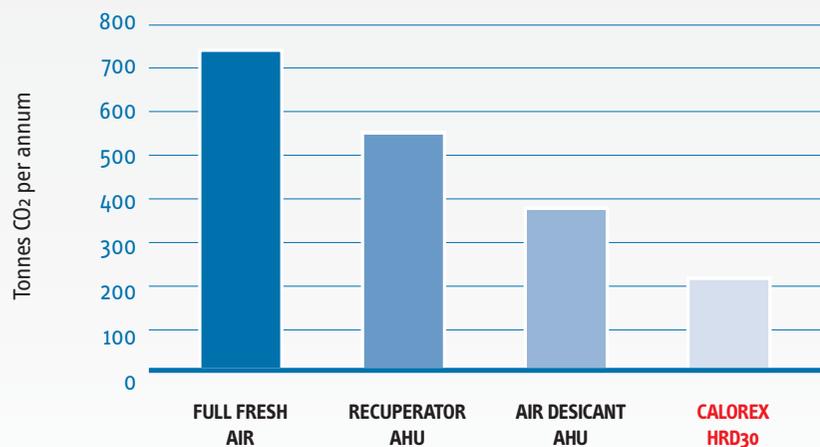
CASE STUDY:

A leisure centre with a main pool of 25m x 13m and a learner pool of 13m x 8.5m would enjoy emissions and energy cost benefits from Calorex HRD technology as follows:

Comparative Energy Use per Annum



CO₂ Emissions per Annum



Clearly evident, the Calorex HRD30 guarantees minimal CO₂ emissions (per annum) compared to the other processes tested.

DID YOU KNOW?

CONTROLLING HUMIDITY

A typical leisure pool can contain up to a million litres of water heated to around 30°C. Water evaporates from the surface at hundreds of litres every hour.

Evaporated water needs to be removed or it will turn to condensation that will immediately start to cause problems to the building environment and fabric.

The HRD contains all necessary sensing and control equipment within its cabinet. It will remove all of this moisture from the air, collect its latent energy and reuse it to assist water and air heating.

Heat recovery from the unit is usually sufficient to satisfy all of the operational pool water heat requirements.

By this means a heat cycle is created which keeps heating costs to a minimum.

This also significantly reduces the carbon footprint of the leisure centre.



HOW IT WORKS: Powerful circulation: Integral to the operation of the HRD is a powerful circulation fan which will, via appropriate ducting, ensure that all areas of the pool hall are fed with dehumidified air at the correct temperature.

Independent compressor system

An efficient refrigerated dehumidification system operated by two independent compressors, strips out the excessive moisture, reclaims the latent energy and replaces it into the pool water and air, along with all of the energy used to drive the HRD.

Fresh/stale air processing

During dehumidification a Calorex HRD, operating at normal pool temperatures recovers 2kWh of latent heat from every 3 litres of water condensed. Fresh air inlet and stale air exhaust is catered for by an exhaust fan and motorised dampers.

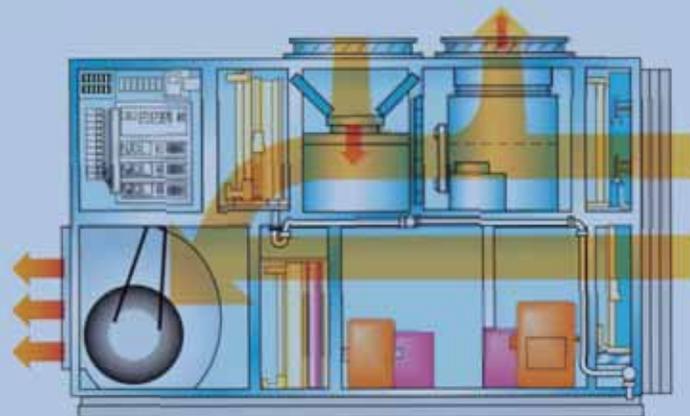
Moisture prevention

Exhaust air is driven out at a 10% - 15% higher rate than fresh air is introduced to create and maintain a slight negative pressure on the pool hall. By this means, moisture is prevented from being driven into the building fabric.

Pool hall heat management

An automatically controlled air heater battery is integrated into the unit to allow for pool hall heat variations. Provision is also made for substantial air cooling so as to negate excessive heat loads.

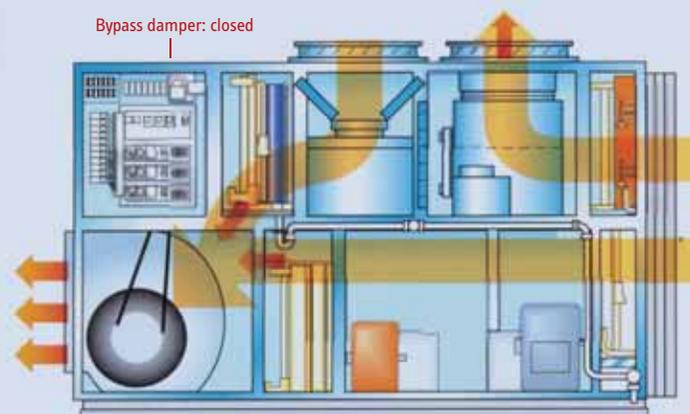
HEAT RECOVERY DEHUMIDIFICATION



Bypass damper, fresh and exhaust air dampers: part open

Maximum mechanical dehumidification in cool ambient conditions. Recovered heat energy into both water and air. Compressor 1 on high rate dehumidification. Recovered heat to air & water. Compressor 2 on heat recovery to water. Intermediate fresh air rate.

AIR CONDITIONING



Fresh and exhaust air dampers: fully open

The unit is shown in Air Conditioning Mode. The pool water, which has first choice of the removed energy, is satisfied as is the pool hall air. The energy is therefore being rejected to atmosphere. Compressor 2 on air conditioning. Displaced heat via exhaust to atmosphere. Maximum fresh air rate.

CASE STUDY:

continued...

To further enhance energy conservation and efficiency exhaust air is passed through a heat recovery unit to strip out latent and sensible energy.

POOL WATER AND AIR HEATING AND/OR COOLING

- The majority of pool water and air heating needs can be provided from the dehumidification process.
- A fully controlled LPHW air battery will replace any unrecoverable pool air heat via the building fabric etc. A further option is that this LPHW coil can be supplied to operate with chilled water giving controlled pool air cooling. A control interface connection to drive a motorised valve feeding an external calorifier for initial and top up pool water heating is available from the control panel.

FRESH AIR / AIR HANDLING

- The HRD range is fitted with an automatic, modulating fresh / exhaust air system. This system continuously and automatically provides an optimum pool air condition regardless of pool duty; it provides a greater degree of air temperature control during warm weather and ensures a slight negative pressure is maintained within the pool hall.
- By this means, all building air leakage is inwards, safeguarding the building from the effects of airborne chemicals and preventing the migration of pool air into adjoining rooms.
- During cold weather, energy is recovered from the exhaust air to reheat the incoming fresh air supply. This process will reverse during hot weather to cool the incoming fresh air and maintain a comfortable temperature within the pool hall.
- A CO₂ / air condition monitor is available as an optional extra and this can also be retro fitted to existing units.

OPERATIONAL CONTROLS

- This range is available with either a conventional control panel or a Satchwell BMS control system. This is contained within the unit together with all necessary temperature and humidity sensors and a diagnostic light panel showing operating modes and conditions.
- Close control is maintained over pool water temperature, pool air temperature and relative humidity and a 7 day time clock is included to allow the pool air to be "set back" to a lower temperature when a pool cover is in place.

RANGE

The HRD series consist of four models, the HRD 15, 20, 25 and 30 covering air flow capacities from 6000 to 36000 cubic metres per hour.

An HRD is capable of the complete control of all sizes and capacities of all commercial and municipal swimming pools and water leisure centres.

To further enhance energy conservation and efficiency, exhaust air is passed through a heat recovery unit that strips out latent and sensible energy before rejecting the air to outside. From this process, incoming fresh air is preheated in the winter and cooled in the summer.

Where spectator numbers exhibit large variations a further optional extra available is a CO₂ monitor which enables the HRD to respond more quickly to changes in CO₂ loading. All units have provision for this facility so it can easily be retro fitted if deemed necessary.

All steelwork is galvanised and the panels, which are all removable for maintenance, are double skinned and insulated. They are located by rapid release fasteners for easy access and have plastic coated surfaces for aesthetic appearance and additional protection.

SPECIFICATION: HRD Systems data sheet

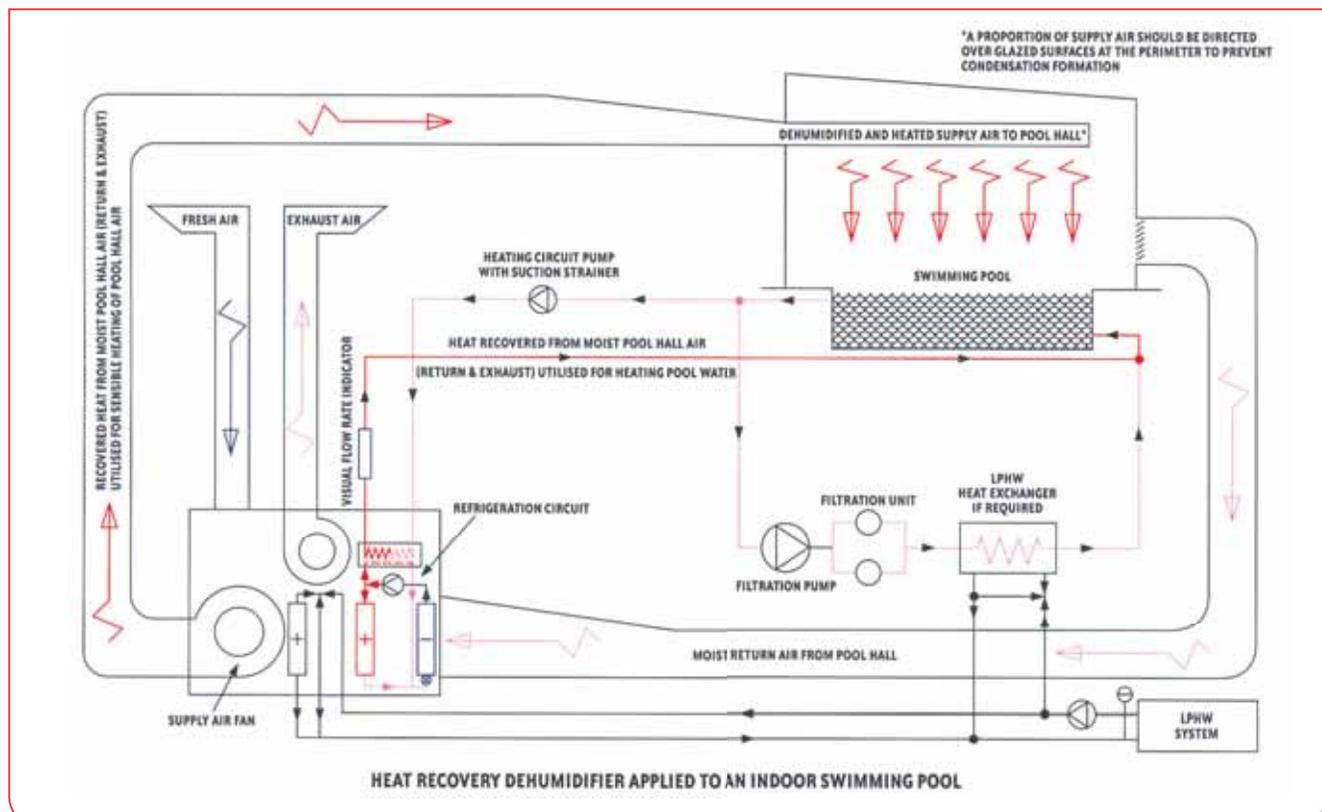


Pool hall Air Temp at 28°C / Relative Humidity at 60%		HRD15	HRD20	HRD25	HRD30
Dehumidification Capacity					
Outside air at 29°C DB/20°C WB					
By refrigeration	Litre/HR	31	45	68	88
TOTAL	Litre/HR	63	116	152	210
Heat Output to Water at 26°C					
Under maximum demand (mode A)	kW	40	60	95	117
Under maximum demand (mode B)	kW	5	8	18	25
Heat Output to Air at 28°C 60% RH					
Under maximum demand (mode A)	kW	-10	-15	10	14
Under maximum demand (mode B)	kW	37	55	72	90
Additional Heat Output to Air at 28°C 60% RH by LPHW Battery					
Water on at 80°C	kW	0-70	0-100	0-150	0-210
Sensible Air Cooling					
At 29°C 'Air-On' @ 60% RH	kW	-20	-30	Mode (A) -49 or (B) -30	Mode (A) -67 or (B) -37
Recirculating Air Flow					
@ Max External Total Pressure	m ³ /h	12000	19500	25000	35000
	Pa	250*	250*	300*	300*
Max Fresh Air Introduction					
@ Max External Total Pressure	m ³ /h	6000	13500	18000	25000
	Pa	100	100	100	60
Nominal Power Installed					
(Dependent upon main fan duty)	kW	17	23	31	44
Weight					
	Kg	1100	1400	2950	2980

Mode A = Recovered heat biased to pool water. (Pool water temperature not satisfied) Default State Mode B = Recovered heat biased to pool Air (Pool water temperature not satisfied)

Note: 'Nominal Power Installed' is the sum of the electrical motor ratings at full duty. Actual power consumption is dependent upon the level of swimming pool activity

* The nominal operating pressure can be increased or decreased to match the requirements of the installation



30
YEARS
1977-2007

Technical support and service:

Comprehensive engineering support is provided by our experienced and well qualified team

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COMPREHENSIVE SUPPORT

The HRD is designed and manufactured at our head office facility in Maldon Essex and is supported by our comprehensive customer service organisation.

To ensure equipment is correctly sized and specified, we offer a computerised quotation service which enables an accurate speedy response to enquiries.

Comprehensive engineering support is provided by our experienced and well qualified team and the units are commissioned by Calorex engineers.

HEVAC

