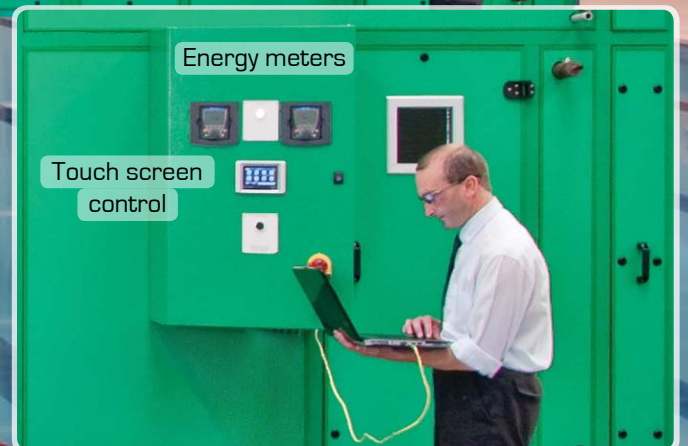


CRS2 HEAT RECOVERY EQUIPMENT



**LIFETIME
WARRANTY**

**OVER 90% HEAT
RECOVERY
EFFICIENCY**



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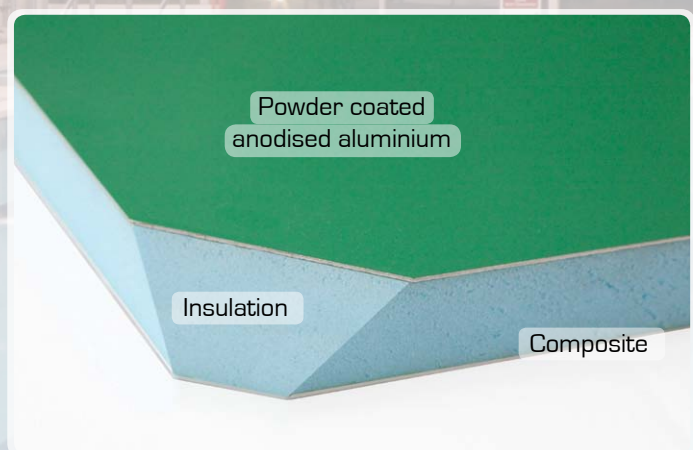
Aerofoil
dual flow

Plastic
aerofoil
dampers

Over 90% efficient
air to air heat exchangers

Direct drive high
efficiency motored
plug fans

Low pressure
drop filters



Powder coated
anodised aluminium

Insulation

Composite



LOW CARBON EQUIPMENT

CSR2 DESCRIPTION OF OPERATION

OVERVIEW

The CSR2 Low Carbon Solution heat recovery unit for Swimming and Leisure Centre Pool Hall provides high levels of internal air temperature and humidity control to establish a healthy environment for the bathers and to ensure interstitial condensation does not form within the structural envelope which due to the nature of the chemicals involved can cause structural failure.

At the same time as providing the highest level of internal environmental control, the CSR2 Low Carbon Solution heat recovery unit can recover over 90% of the energy required to heat the incoming fresh air, dependent upon specification reducing the heating requirement on the incoming fresh air.

The energy recovery is achieved by an exceptionally efficient air to air heat recovery matrix which has a very low energy requirement due to an advanced aerodynamic design. And together with a composite construction achieving a lifetime guarantee against corrosion.

In addition to exceptionally high heat recovery performance the CSR2 has an advanced fan speed regulation which allows fan power to reduce by up to 80% as the de-humidification load reduces at times of low occupancy and overnight.

HEATING CONTROL

In equilibrium conditions the LPHW coil provides heat into the supply air to maintain the required pool hall temperature. As the temperature reduces the valve opens, should the valve be fully open and pool hall temperature is not being achieved the air volume set point is first re-set to design capacity should the unit be running in low energy set back or alternatively should design capacity be achieved the fans increase performance for Boost Duty

In summer conditions where LPHW heating is not required the incoming fresh air is proportionally by-passed around the plate heat exchanger to provide fresh air free cooling. At times when this control cannot achieve internal design temperature and the pool hall temperature increases the recirculation damper closes to increase the percentage of fresh air introduction.

HUMIDITY CONTROL

In equilibrium conditions internal humidity is controlled by regulating the percentage of air re-circulated between the supply and extract fan chambers via the re-circulation damper. As the humidity increases the damper closes and as the humidity decreases the damper closes.

At times of low or no occupancy the fans re-set to low flow energy saving mode when the re-circ damper is at a percentage open to facilitate lower air flow.

This percentage is determined on a project by project basis and is dependent on the pool hall supply air distribution and how the air patterns are affected by lower air flow levels.

CONTROL POINTS

Inputs

- 1 Return air/Space Temperature
- 2 Return air/Space Humidity
- 3 Supply air Flow
- 4 Return air Flow
- 5 Fresh air Filter pressure drop
- 6 Return air Filter pressure drop
- 7 Re-circ Damper Positive (Option)
- 8 Plate Fresh air Damper Position (Option)
- 9 Plate By-Pass air Damper Position (Option)
- 10 Supply Air Temperature
- 11 Supply Fan Vibration (Option)
- 12 Return Fan Vibration (Option)

Outputs

- 1 Supply Fan Inverter Control
- 2 Return Fan Inverter Control
- 3 LPHW Valve Control
- 4 By Pass Damper Control/Face Damper Control
- 5 Re-Circ Damper Control

GENERAL SPECIFICATION AND CONDITIONS

The pool hall air handling unit shall be suitable for operation in a swimming pool environment where the water treatments is designed, installed and operated in accordance with the standards and recommendations set out in "Swimming Pool Water" published by the Pool Water Treatment Advisory Group.

The design, construction, testing and documentation of the pool hall unit shall be carried out under a certified EN ISO 9001: 2000 quality system.

The pool hall unit shall be certified to meet the machinery safety standard 9837EC and shall be CE marked.

UNIT HOUSING

The construction of the pool air handling unit shall be certified to EN1886 with the minimum classifications for an indoor unit:

- Mechanical security of housing class 1A
- Housing leakage class A
- Heat transfer classification T4
- Warm bridge factor classification TB3

The framework shall be manufactured from fully insulated extruded aluminium section, anodised and powder coated finish. All panels shall be double skin composite construction with a bonded internal insulation together with an external powder coated aluminium skin.

The internal finish of the panels shall be composite and totally impervious to chemical used in a swimming pool environment or any condensation that may form. All removable panels shall have a continuous high efficiency seal to prevent the ingress of air.

All panels on the service access side of the unit shall incorporate warm bridge free quick release fasteners.

Double glazed inspection windows with internal lighting shall be provided for monitoring all airways and components (ie fans, bypass dampers, recuperator drain tray)

Unit base shall be plastic lined or resin treated in the recuperator and outside air sections to allow free drainage of water during operation and cleaning. Return air filter section shall also be resin treated with drain. Separate drainage pipework from return air, recuperator and outside air sections including taps and fittings shall be incorporated in the unit.

BASE FRAME

Each section of the unit shall be supported on all 4 sides by a stable 120mm galvanized steel base frame with access points to all drainage pipework, traps and fittings.

FLEXIBLE CONNECTIONS

1 set flexible warm bridge free flexible duct connections shall be provided for SA (pool hall zone) SA (spectator zone)/OA and EA. The OA and EA flexible connections shall also be water proof.

DAMPERS

Air control dampers shall be metal free composite construction complete with blade seals to ensure effective isolation of air stream. All movement shall be achieved via composite drive gears fitted within the air stream to avoid contamination, damper linkages shall not be acceptable.

The damper construction shall allow full opening of the air path for the lowest pressure loss and optimum air flow onto the components.. Every damper motor shall include a feedback Potentiometer and shall be individually adjusted or closed over the direct digital control system.

FANS AND MOTORS

Fans shall be free running ventilator wheels directly coupled to capacity optimised motors with frequency controllers. The fan motor power consumption shall not exceed the values shown in the performance specification table.

High performance power optimised ventilator wheel with epoxy powder coated backward curved steel blades directly coupled to the motor shaft. Epoxy powder coated inlet cone with protection grid. Fan guards on service access side of unit.

Optimum efficiency motors with integral frequency controllers for power ratings from 1.5 to 7.5Kw mounting type B3, protection to IP54, isolation class F. From 11.0Kw capacity, optimum efficiency motor, mounting type B3, protection to IP54, isolation class F with separate frequency controller units.

The fan, motor and inlet cone shall be installed on a purposed built single mounting frame with anti-vibration isolation from the unit. The fan and motor assembly shall be balanced together to DIN ISO 1940 part G 25 and a certificate shall be issued.

Vibration sensors shall be installed for each fan as a security device for continuous monitoring of the fan/motor construction with a display of the actual vibration level in mm/s on the digital controller.

The fan motor assembly shall be continuously monitored on the digital controller for vibration during the life of the unit. Increasing bearing wear or mechanical damage shall be displayed as a clear text message on the control panel. The unit shall automatically shut down in the event of a serious mechanical fan or motor fault.

FREQUENCY CONTROLLER

Frequency controllers shall be optimally matched to the characteristics and parameters of the fan motors. Values shall be pre-programmed during factory tests for maximum fan motor currents and fan speeds and resonant frequencies shall be checked during factory tests and skipped.

Static frequency controller for step less regulation of fan wheel operation with speed dependant torque, full output motor voltage without capacity reduction at controller, manufactured to ISO 9001 quality standard and CE labelled. Automatic energy optimisation for optimum motor efficiency in all operating modes, unlimited output switching, hours run counter, minimum and maximum speed values, ramp functions variable time switching frequency, DC braking, frequency bypass function, direct motor connection to mains supply. Motor protection (thermal type) build into the motor heat sink to increase motor life and reduction of voltage ramp-up time du/dt short circuiting and earth protection, over current protection, thermal frequency controller protection, under and over voltage monitoring, phase failure monitoring.

Customer operation and programming with clear text display, programmable on two levels. The following values shall be available on the display, control set point (%), motor frequency(Hz), actual value(%), motor current(A), motor torque(%), motor power (Kw), electrical energy (KWh), motor voltage (V), voltage across phases (V), thermal load factor for motor (%), thermal load factor for frequency controller (%). Further display options shall allow values for status and operation to be viewed.

Mains overvoltage and mains transient protection shall be provided to VDE0160.

Separation for the purpose of safety (galvanic protection): the supply mains potential shall be separated from the low current circuits in the control section in compliance with VDE0106/0160.

Radio noise interference control shall conform to the following EN standards:

- Emission EN 55011 class B Group 1
- Immunity EN50082-2
- Serial interfact RS485 (9600 Baud)

FILTERS

Filters and filter housings to EN779 and EN1886. Bag filters class G4 shall be installed in the return air and outside air Filters shall not be installed in any mixed air stream. Fully incinerable filters with plastic frames. Filter housing to EN1886 with filter bypass leakage to class F8. Each filter shall have a filter pressure drop manometer with the actual pressure drop displayed on the control panel and low level alarm when filter dirty as a clear text message on the controller.

DUPLEX PLATE HEAT EXCHANGER

The recuperator shall be a high efficiency composite construction guaranteed against corrosion from the chemicals in a swimming pool environment for life. The recuperator shall not be manufactured from fluted panels without the current inward and exhaust airways to reduce pressure drop. The recuperator plates shall be vacuumed form thin section composite for maximum efficiency of heat transfer and not from the thicker fluted inefficient panel type. The recuperator shall be optimised for all operational conditions for maximum efficiency and have a pressure drop lower than and efficiency higher than the old fluted panel type of construction. Bypass dampers shall be incorporated on the outside and return air paths of the recuperator.

FROST PROTECTION

The unit shall be capable of operating down to an outside temperature of -15°C (continuous) without any form of outside air pre-heat. The dehumidification capacity must not drop below the minimum value shown in the performance specification at low outdoor temperatures.

HEATING SYSTEM

Low temperature hot water heating coil with aluminium fins and copper tubes. Polyurethane lacquer finish to fins, tubes, header and casing. 3 way mixing valve with screwed connections, actuator and frost protection thermostat. Bypass around low temperature hot water coil for separate duct connection to spectator zone.

SWITCHING AND CONTROL

The unit shall be supplied with a control panel including a readily programmable direct digital controller. Cabling to all control, regulation and drive components shall be built into the unit and factory tested. The control panel shall include door interlocked isolator, terminals for main power supply, motor and control components, component isolators, safety circuits and all necessary components for motor control including fuses and overloads. A terminal strip shall be provided for connections to external components and control signals. All potential free contacts suitable for 230V/2A.

DIRECT DIGITAL CONTROL SYSTEM HARDWARE

An operation and status panel with keypad for data entry and function control, shall be provided with an LCD display for set points and actual values, damper positions, hours run and status messages text as well as Trend BEMs complete with LED's for operation and fault status. Programs and time clocks shall remain secure in the event of power failure. The essential sensors for measuring outside air temperature, supply air temperature/humidity, return air temperature/humidity, all damper actuators and the hot water coil valve shall be connected to a single bus system. All sensors and actuators shall be individually readily programmable and individually addressable. Permanent communication shall be provided to monitor and detect failure of any sensor/actuator or any break down of communication with any component. Connection of all sensors/actuators shall be achieved by a M12 ply system with distribution junction boxes and tested shielded twisted pair cables for communication up to 100m over a free network structure.

DIRECT DIGITAL CONTROL SYSTEM SOFTWARE

The function control software and all aspects of control and regulation devices shall be tested and documented under a certified EN ISO 9001: 2000 quality system

Control and regulation functions shall include:

- Mode of operation selection: pool in use, pool not in use and automatic operation shall be selected on the user interface. Automatic operation for pool in use operation over the programmable time clock channel or from an external signal (eg movement sensor, light switch or BMS input)
- Enable outside air enable mixing of outside air to replace pool hall air on a timed basis. This shall also be enabled by an external contact
- Pool hall temperature regulation: return air temperature control with supply air minimum and maximum values. Return air temperature set point shall be adjustable on the controller within a preset range.
- Variable air volume: in recirculation operation the air volume shall be automatically adjusted according to the heating requirement in order to reduce energy consumption
- Humidity control: the humidity set point for the pool in use period shall be adjusted on the controller. When the pool is not in use the humidity set point shall vary according to the outdoor temperature.
- Sensor monitoring: short circuits, cable breakdowns etc shall activate general fault indication with a clear text message of the specific fault.
- Fault indication: Scheduled as high and low level alarms and shown on LED's and in clear text on the display. For remote indication of fault signals, potential free signals shall also be available on the terminal strip.
- Operating mode simulations shall be provided for testing, commissioning, maintenance or in the event of an emergency.

AIR VOLUME REGULATION

Air volumes shall be automatically adjusted to ensure that the pool hall remains under a constant negative pressure during the occupied period. The supply and return air volumes shall be individually programmable in m³/h. The supply and return air flow shall be continuously displayed in m³/h with an accuracy of $\pm 3.0\%$ through temperature compensation. The fan motor speeds shall be automatically adjusted in order to maintain the programmed air volumes during different modes of operation or when the filters become progressively dirtier.

UNIT TESTING

The pool hall unit shall be factory assembled. Testing and test documentation of the pool hall unit shall be carried out under a certified EN ISO 9001 : 2000 quality system.

REMOTE MONITORING BY MODEM

The control system shall have the facility for remote monitoring and adjustment by the supplier over an analogue or ISDN modem.

INTERFACE OR GATEWAY TO BMS

The unit shall include an interface or gateway approved for use with the following BMS systems:

- Bacnet over IP

The interface shall provide access to datapoints giving information on all temperature and humidity values, actuator positions, status of all motors, hours run, actual supply and return air flow in m³/h, filter pressure drop displayed in Pa.

CRS2 HEAT RECOVERY EQUIPMENT



LCS
LOW CARBON SOLUTIONS

IPT

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