High
Efficiency
Solutions.

CAREL

success story

Controlled humidification for research experiments

where

ALBA synchrotron

- humidification in winter and summer;
- Cerdanyola del Vallès - Barcelona - Spain.

what

humiFog multizone installation

- humidification with two adiabatic atomisers for six air handling units.

why

- energy saving;
- low running and maintenance costs;
- hygienically safe: system compliant with VDI 6022, VDI 3803, DIN 1946;
- high efficiency due to very fine atomisation of the water;
- smaller dimensions, lower capacity and reduced consumption of the cooling coil;
- easy to install;
- multilanguage interface on the display;
- rack supplied to measure
- temperature stability.

ALBA synchrotron: scientific infrastructure for the future

The ALBA synchrotron, the biggest scientific centre ever built in Spain, is located in Cerdanyola del Vallès, 20 kilometres from Barcelona. The centre, 50% funded by the Spanish and the Catalan governments, required a total investment of 210 million euro. During the inauguration speech, the president of Catalonia underlined how the particle accelerator represents significant progress for Spanish science as a whole and confirms the government's commitment to promoting research and innovation as drivers of the economy.
The synchrotron is an electron accelerator that generates very fine beams of X-radiation. These beams, when suitably focused, allow scientists to analyse the atomic and molecular composition of various samples of materials, ranging from proteins to viruses, as well as microelectronic devices and new materials.
Due to the heat created by the magnets used to deviate the path of the electron beam around the circumference of the storage ring (268.8 metres), a humidification and cooling system has been developed, made up of six air handling units.

"Master Ingenieria y Arquitectura", a company operating in the fields of engineering, architecture and building administration, was responsible for the design. This was then developed by Axima Suez (currently COFELY CONTRACTING S.A.U.), one of the leading European groups operating in the following fields:

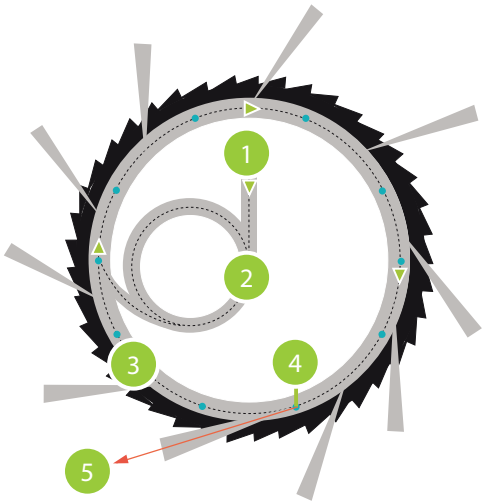
- systems administration and maintenance;
- engineering management;
- HVAC installations;
- industrial and commercial refrigeration.

The humidification and cooling system for the storage ring was commissioned in March 2010. The environment is now air-conditioned by six 18,500 m3/h primary air handling units (AHUs), complete with humidification compartment consisting of two 180 kg/h humiFog humidifiers. Other supplementary air handling units with heating and cooling coils have the purpose of bringing the primary air to a starting temperature of 22 °C and relative humidity of 46 %. Finally, additional air handling units are installed to serve the offices, fitted with CAREL humiSteam isothermal humidifiers.

humidification-for-life.com

The biggest microscope in Spain

The centre features a main building measuring 140 metres in diameter, housing a linear electron accelerator coupled to a second, circular accelerator, where the radiation energy reaches 3 million electron volts (GeV). From this second accelerator, the electrons enter a storage ring, 90 m in diameter, where the X-rays are generated and sent to the various laboratories to be used by scientists to analyse the samples.



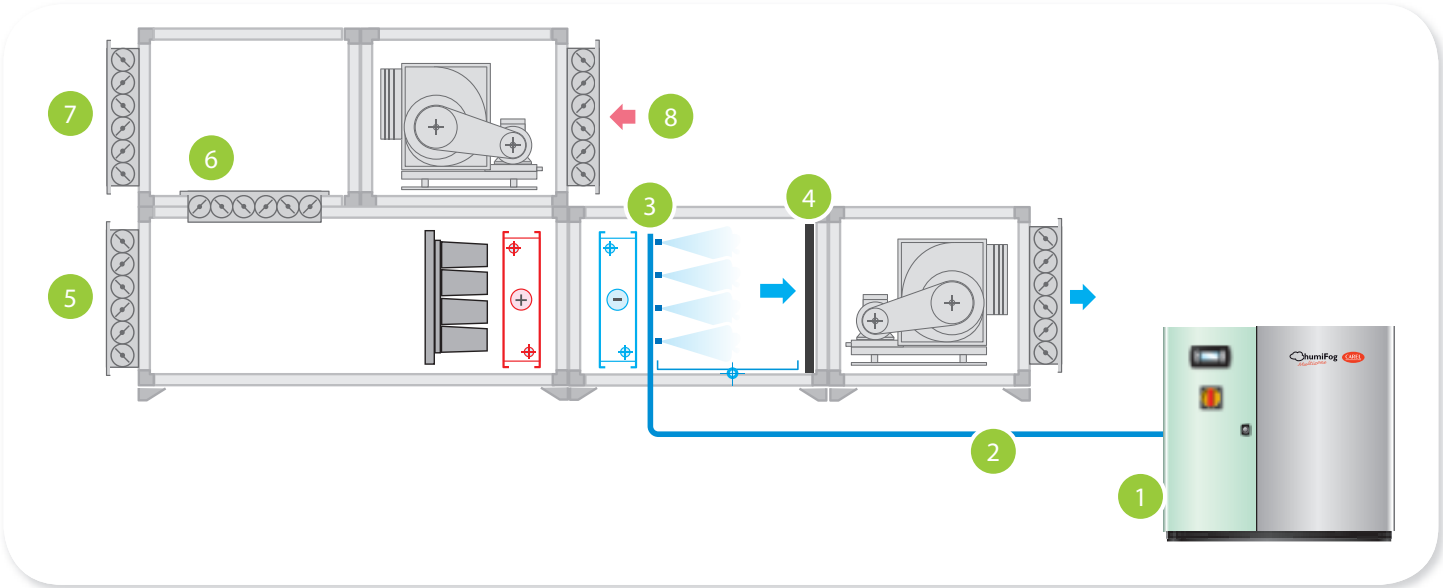
1. electron production: generated in a similar way to a TV cathode ray tube. The electrons are first accelerated by an electric in a linear accelerator;
2. acceleration: a magnetic field 20,000 times stronger than the Earth's accelerates the electrons to 99.999 % of the speed of light;
3. storage: the electrons are injected into the storage ring, where they maintain a circular orbit at constant speed;
4. circular magnets: the electrons are deviated by several degrees from their straight trajectory. This change in direction causes the emission of synchrotron light;
5. beamlines: the light beams are sent to the laboratories surrounding the storage ring. Each laboratory is designed for a type specific of experiment.

Circular ventilation system

The humidification compartment in the six air handling units humidifies the air in the air-conditioning system around the storage ring, to 75% RH at 17.5 °C. The magnets used to deviate the electron beam heat up due to the electrical current they carry and thus require a humidification system that also provides cooling as a secondary effect, ensuing operation at rated conditions. A circular duct is installed around the 268.8 metre circumference with vents that introduce air from the air handling units connected to the humiFog. Air humidification occurs due to spontaneous evaporation of the water droplets: the change in phase from liquid to vapour subtracts energy from the air, which is consequently cooled. Evaporation of 100 kg/h of water absorbs 69 kW of heat from the air. This means the size, capacity and power consumption of the cooling coil and chiller can be reduced.

circular ventilation duct with air vents

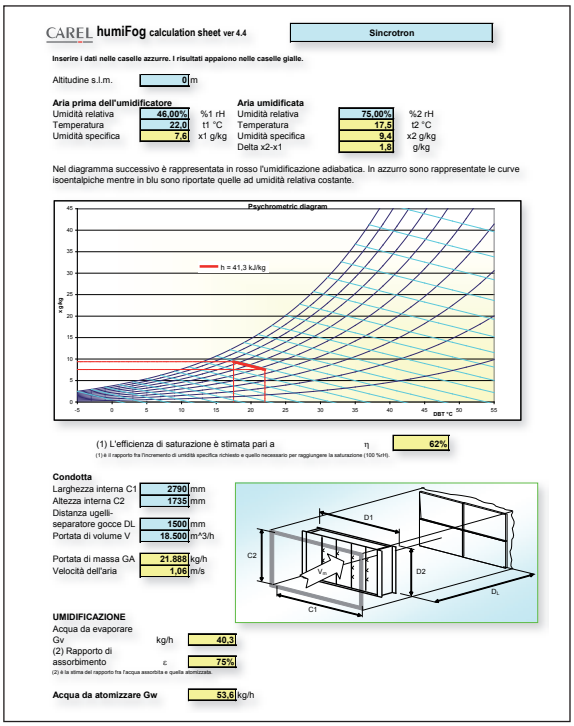
1. *pumping unit*
2. *pressurised water line*
3. *humidification rack*
4. *droplet separator*
5. *outside air*
6. *recirculated air*
7. *exhaust air*
8. *return air*



Simple design tool

The humiFog calculation tool, available to heating technology designers, automatically provides, based on the design specifications (temperature, air flow-rate, initial and desired relative humidity) and the rectangular cross-section of the air handling unit humidifier, the complete features of the humidification system:

- size of the humiFog atomiser;
- cooling capacity;
- power and water consumption;
- absorption efficiency.



humiFog

humiFog installed on site

reverse-osmosis demineraliser (already installed)

rack with nozzles and droplet separator

A powerful and complete solution

CAREL provides all the components ready for assembly, including pipes and fittings. The rack is supplied to measure and tested with pressurised water before delivery to the customer. The capacity control and drain valves ensure maximum hygiene by automatically washing the system. The humidification system consists of:

- humiFog atomiser;
- rack with manifolds, nozzles, valves, supplied with pre-assembled and tested components;
- stainless steel mesh droplet separator, certified in accordance with DIN 1946 and the VDI 6022 and VDI 3803 directives;
- reverse-osmosis demineraliser for water treatment (in this case already available in the installation).

Material supplied for each 18,500 m³/h AHU

Code	Description
UA180HD110	
Pumping unit + controller + inverter -230V 50Hz	
Water flow-rate (kg/h)	180
Pump material	brass
Damper	yes
Semi-assembled rack (3 racks for each humiFog)	
Atomising rack with manifolds, solenoid valves and nozzles	
Number of solenoid valves	3
Number of nozzles	14
Type of nozzles	2
Width (mm)	2676
Height (mm)	1602
Distance from nozzles to droplet separator (mm)	1500
Droplet separator	
number of layers	1
droplet separator material	AISI 304

humiFog in installation environment

evaporative cooling with atomised water

Conclusions

The air in the six air handling units is cooled and humidified by six humiFog units. The supervisory software, based on outside conditions, decides whether to activate freecooling or humidification. The temperature and humidity set points are maintained according to design requirements, as evidenced during the inauguration of the accelerator in March 2010. The project was developed through the partnership between CAREL Ibérica in Spain, represented by Elvi Macario, humidification sales manager, and Axima Suez, specialising in civil and industrial building systems and installations.
This ensured a high level of satisfaction for the customer who, as well as excellent products in terms of quality and reliability, identified an excellent partner for its industrial humidification applications.

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