Painting and coating

High-efficiency solutions for sustainable painting booths and paint shops

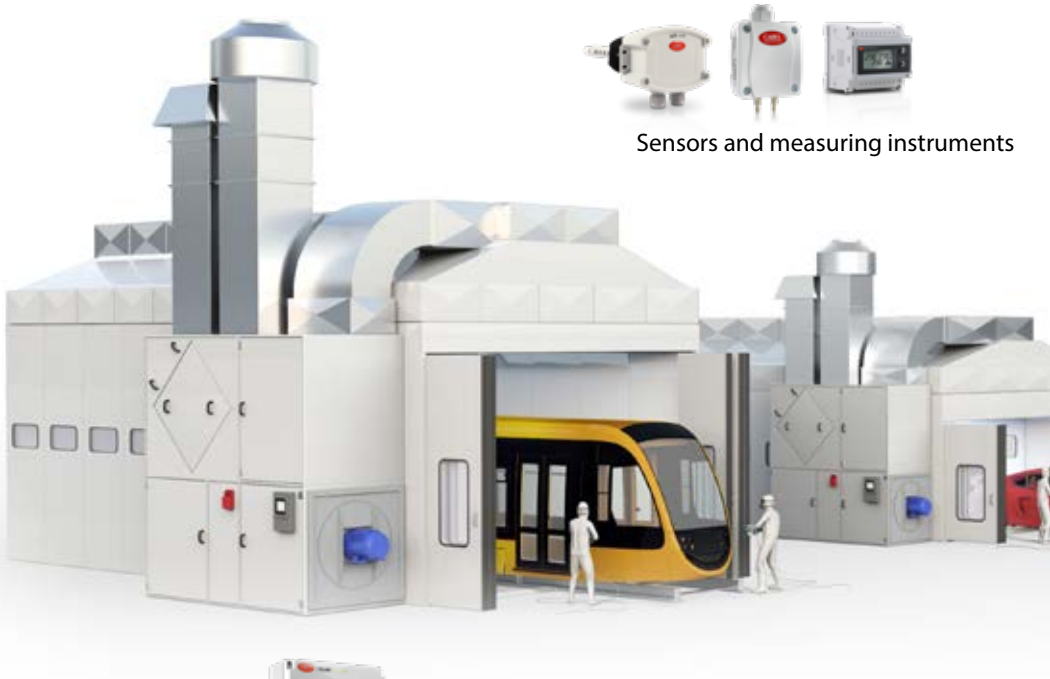
Surface treatment industry

Paints and coatings provide refined finishes and protection to products ranging from consumer goods such as smartphones and cars to heavy industry and infrastructure. Quality and reduced environmental impact are at the heart of this sector's evolution and are synonymous with efficiency and optimal process control.

- 50 years of technological innovations in air conditioning;
- 30 years of dedicated solutions for the world of painting;
- specific knowledge of painting & coating applications to work with manufacturers and end customers.

The entire air in a spray booth is replaced about every 7 seconds to ensure clean air for workers, remove solvents in paints and avoid potentially flammable and explosive atmospheres. Heating, cooling and humidifying this large amount of air involves large energy consumption.
Through the use of highly efficient heat recovery and air temperature and humidity control systems, this task can be fulfilled while lowering energy costs and improving the quality of the end result.

Sensors and measuring instruments



Programmable controls

Monitoring systems

Touch terminals

Control Panels

Speed regulators

Energy savings

Technologies designed to meet the highest standards in terms of energy efficiency, with a real impact on operating costs and CO_2 emissions.

Reliability

Products designed to perform in critical conditions and guarantee continuity of service. IoT features serving a network of authorised service centres.

High temperatures and ATEX

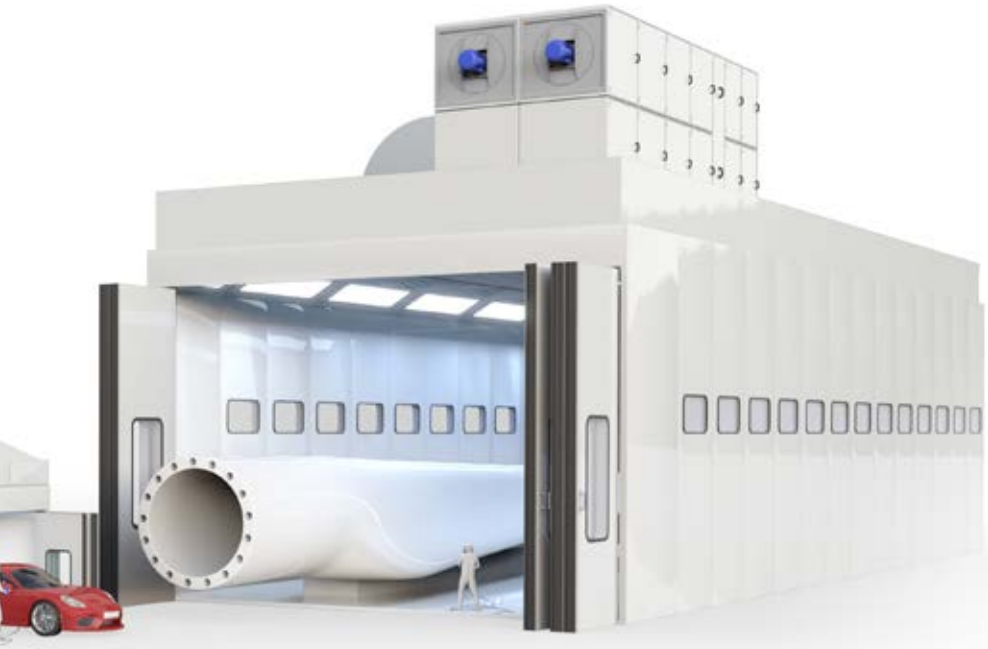
Dedicated solutions for potentially explosive and high-temperature air streams, constantly evolving with the needs of the market.

Adiabatic humidifiers and coolers

Electric isothermal humidifiers

Gas-fired isothermal humidifiers

Water treatment systems



Rotary heat exchangers with cleaning system

Components for AHU

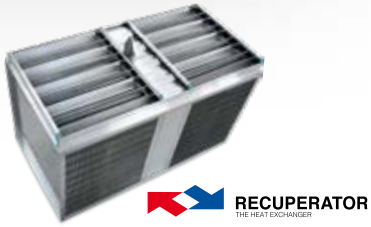


Plate heat exchangers

Process characteristics and requirements

High outside air flow rates
Every hour the booth air is replaced 300-400 times.

Controlled environment
Temperature, humidity and pressure influence the final result.

Explosion risk
Solvents released from paints are flammable.

High filtration
To remove dust from fresh air and excess paint from exhausted air.

Controlled distribution
The air flow in the booth must be laminar and at a constant speed.

Staff health
Regulated by national and international regulations.

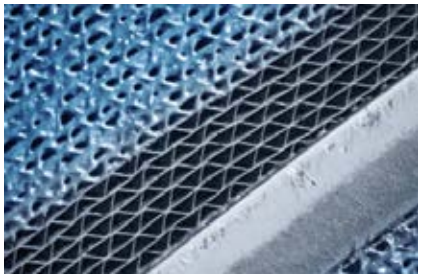
Heat Recovery Solutions

Maintaining the optimum temperature set-point for paint application requires high energy expenditure. A well-dimensioned heat recovery unit reduces heating and cooling costs without impacting operating and maintenance costs, ensuring a quick return on investment.

A heat recovery unit for spray booths and surface treatment plants must meet specific requirements:

- complete absence of silicones to avoid paint defects;
- corrosion resistance thanks to protective coatings;
- low maintenance and easy cleaning of paint deposits;
- safe operation with flammable or explosive air flow.

CAREL Group offers a wide range of solutions tailored to customer needs.

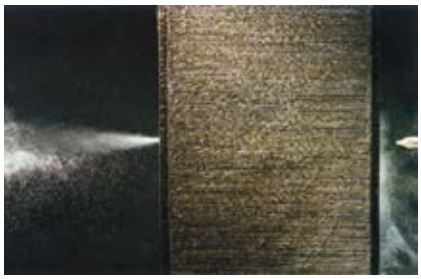


Deposit of paint on fins

Rotary heat exchangers

Technology mainly used in medium and large sized booths:

- air flow rates up to 200,000 m³/h and diameters up to 8000 mm;
- solutions for recovering humidity and latent heat in addition to sensible heat;
- wave geometry and surface coating designed to optimise efficiency, pressure drop, corrosion resistance and ease of cleaning;
- automated cleaning system, with combinations of high-pressure water and compressed air depending on the type of paint used;
- ad hoc solutions to prevent the leakage of solvent-laden exhaust air into the fresh air inlet of the booth.



High pressure cleaning system

Plate heat exchangers

Technology mainly used in small and medium-sized booths:

- air flow rates of up to 100,000 m^3/h;
- geometry, pitch and surface coating of the fins designed to optimise efficiency, pressure drop, corrosion resistance and ease of cleaning;
- modular design for easy installation and maintenance;
- profiles and side panels designed to facilitate module removal and make cleaning operations quicker;
- models with integrated bypass, with or without damper;
- no leakage between air streams, necessary with hazardous paints for the safety of operators;
- enables indirect evaporative cooling (IEC).

AC-Gold epoxy coating

73%
target efficiency of the heat exchanger

European Directive 2009/125/EC requires non-residential ventilation units (NRVU) to be equipped with high-efficiency heat recovery to reduce consumption and environmental impact (excluding ATEX units).

1 year
return on investment through energy recovery

It provides savings on both winter heating and summer cooling of up to 80 % of the energy required during painting and body preparation.

32 years
of experience in the surface treatment industry

Rely on CAREL's extensive know-how to integrate heat recovery, humidification and evaporative cooling systems.

Humidity control solutions

The increasingly widespread use of water-based paints with reduced environmental impact has led to an evolution in painting systems. The low solvent content in the paint requires a high humidity content in the process air to prevent defects from appearing during application and flash-off.

Steam humidification

- It allows rapid absorption of humidity into the air stream (up to 300 mm), even in narrow ducts and at high velocities (up to 8 m/s);
- Ideal for installation in compact air handling units or in direct ducts to the booth, and for retrofitting to already operational booths;
- Depending on the amount of steam required, the electrical power available at the site and energy costs, it may be advantageous to use humidifiers powered by electricity (humiSteam, heaterSteam) or gas (gaSteam).

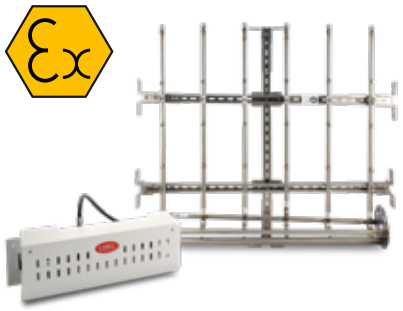
Adiabatic humidification

- It provides a high humidity load with very low power consumption (4W per l/h) and low pressure drop (30-50 Pa);
- It allows evaporative cooling in summer, up to 690 W per l/h atomised;
- Fast and precise set-point control at varying work phases;
- High hygiene and no water stagnation: all atomised water is absorbed into the air stream, avoiding the risk of leaks and the need for periodic disinfection;
- Direct room atomisation systems allow the abatement of dust and the control of electrostatic discharges.

humiFog Touch and RACK with external valves

Developed according to the needs of the industrial world and spray booths:

- silicone-free certified;
- ATEX certified;
- VDI 6022-1 certified;
- resistant to -20°C /150°C;
- it is no longer necessary to pass the humidifier during the paint baking phase;
- components subject to routine maintenance outside the AHU;
- oil-free pump option;
- up to 1350 l/h of adiabatic humidification or cooling.



saving

time and materials to increase competitiveness

Painting in a temperature- and humidity-controlled environment makes it possible to reduce painting and mixing times and avoid changing the amount of solvents and additives as environmental conditions change.

- defects

due to humidity and temperature

Accurately checking T and R.H.% always allows painting under the conditions specified by the paint manufacturer. Painting at low relative humidity can cause less brilliant colours, orange peel effect and cracking.

- costs

for humidification and cooling

State-of-the-art humidification technologies help minimize energy and water consumption. In summertime, adiabatic humidification allows low-cost evaporative cooling.

Plate heat exchanger + steam humidifier

It optimises energy consumption and investment costs without saving on the quality of the end result, thanks to modular plate heat recovery units and steam humidifiers that can be easily integrated into the supply air duct.

Recovering the heat during painting allows to:

- reduce the size of the heating system;
- reach the desired temperature more quickly;
- significantly reduce energy consumption.

Speed controllers and inverters

Components for speed modulation of fans, pumps and compressors.
Careful control of the fan speed maintains a proper fresh air flow through the filters by balancing pressure losses due to fouling. Reducing the speed of the fans during intermediate stages, such as preparation of the parts to be painted, saves considerable amounts of energy.

Resistive humidifier heaterSteam

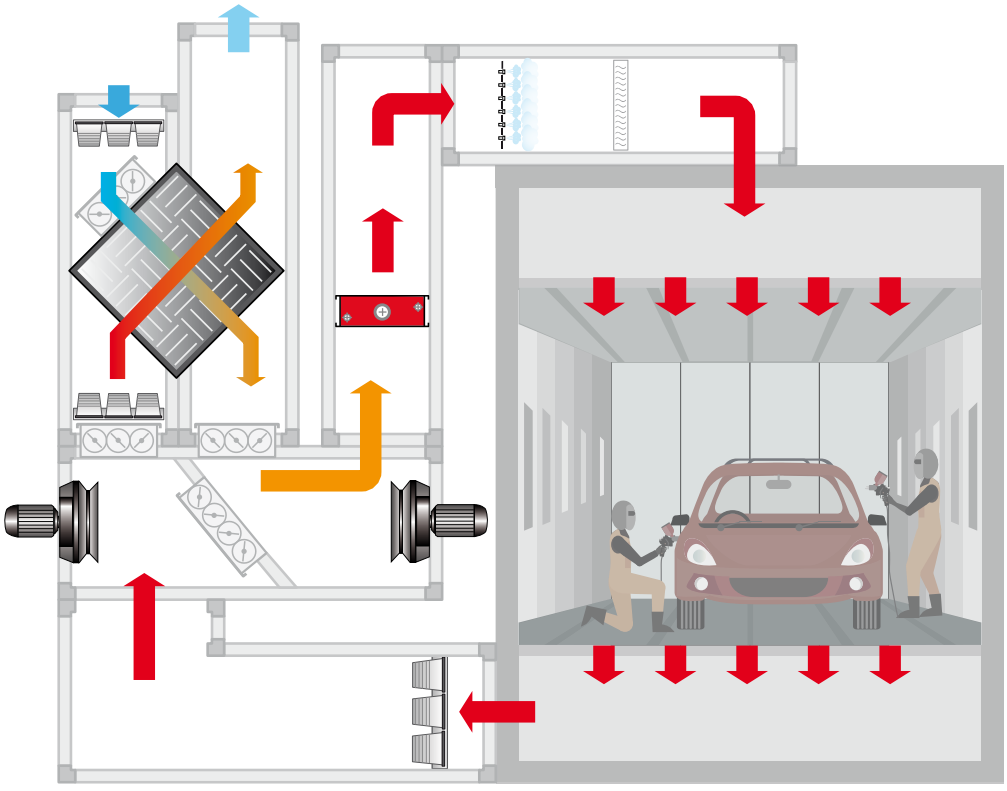
Steam humidifier for low maintenance and high precision. Suitable for all types of water, even those with high salt content and corrosive, and equipped with patented "thermal shock" functionality that removes limescale deposits and reduces maintenance. It also features backup and remote monitoring functions to ensure operating continuity.
The steam distributed in the channels is quickly absorbed into the air even at high speeds (8 m/s).

Plate heat exchanger

It allows heat to be recovered without the risk of contamination between the exhaust and fresh air streams.
The strengths of the solution:

- modularity;
- regulation dampers on board;
- central or side by-pass;
- by pass with damper;
- silicone-free;
- resistant to high temperatures.

The plate heat exchangers have high quality aluminium fins, which are corrosion-resistant, non-flammable and reliable over time.
In booths with an aggressive atmosphere and highly soiled paints, an epoxy coating (AC - GOLD) is recommended.
Maintenance required is minimized and dependent on the upstream filtration level. Cleaning is performed with compressed air or, if adhesive dirt is present, with warm water and neutral detergent or with pressurised water (<40 bar).



Rotary heat exchanger + adiabatic humidifier

Maximum efficiency through dynamic elements that adapt to the system. It maximises precision and process stability under varying external conditions and partial loads, minimising routine maintenance.

Rotary heat exchanger

It enables the heat recovery of exhausted, paint-particle-laden air with high efficiency (up to 80%) and low maintenance thanks to an automated cleaning system that combines high-pressure water and compressed air. Special components and dedicated design reduce cross-flow contamination to zero and allow use in ATEX environments.

Adiabatic humidifier humiFog Touch

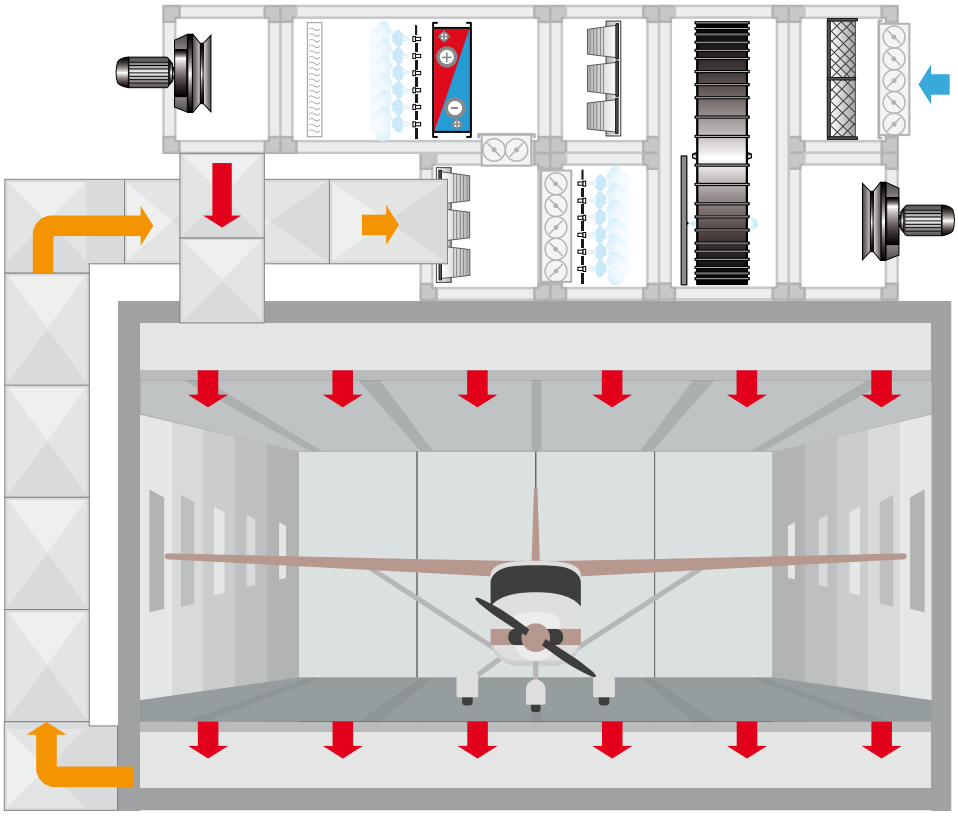
High-pressure atomiser for precision adiabatic humidification and cooling. It allows multi-zone control of up to 12 independent air handling units with a single pump station.
With stainless steel components, silicone-free and ATEX certification, backup functionality and remote connectivity, humiFog ensures maximum reliability for critical projects in the automotive, aerospace and renewable energies sectors.

Humidifying the air during painting and flash-off allows to:

- reduce the use of additives and thinners;
- reduce the risk of defects;
- use moisture-curing paints that dry at low temperatures and high humidity.

k.air

Integrated control of ventilation, heating, cooling, humidification and dehumidification for air handling units. It contains advanced logic that optimises the operation of high-efficiency components such as modulating fans, DX systems, heat pumps, adiabatic systems, evaporative cooling, heat exchangers and motorised dampers.



WTS

Reverse osmosis for the production of demineralised and silicon-free water. It eliminates salts in the feed water to the humidifier, preventing them from being atomised as dust in the air stream and greatly reducing routine system maintenance.

Who chose us

Find out who uses CAREL Group solutions in their paint shop.

For more references go to carel.com under Why CAREL "Who chose us".

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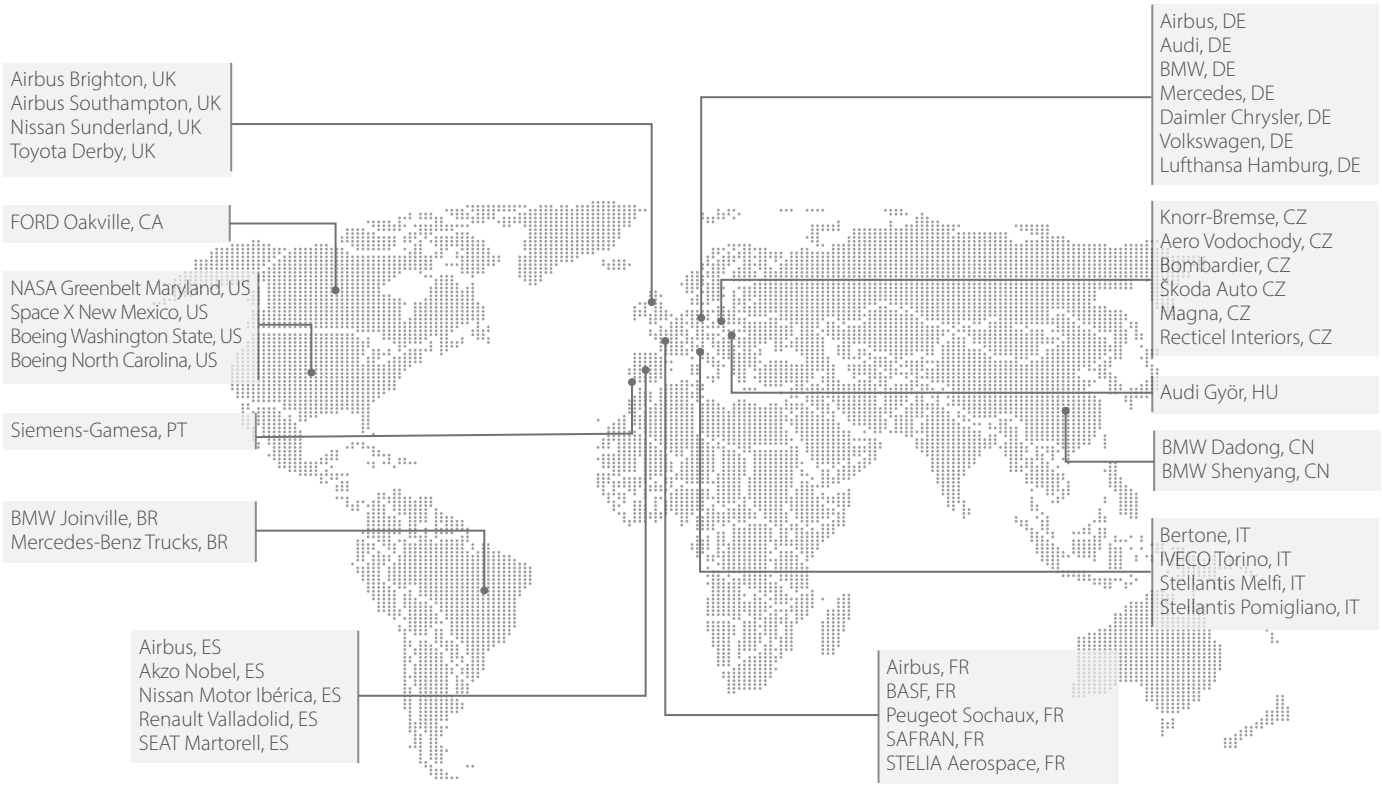

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