Wood industry

Highly-efficient solutions for eco-sustainable drying and processing

Solutions for the wood industry

Wood is increasingly being used as a sustainable material with a low environmental impact, however it requires controlled manufacturing processes to guarantee a high-quality finished product. Temperature and humidity management is critical to ensure quality and durability, from drying of the raw material to processing of the finished product.

For more than 50 years, CAREL has been one of the world's leading manufacturers of efficient and sustainable temperature and humidity control solutions for HVAC/R and systems for improving indoor air quality.

After having been cut, wood and timber processing begins directly at the harvesting site. Cutting and subsequent drying simplify transport, reducing the size and weight of the wood by up to 50%, meaning lower logistics costs and CO_2 emissions.

Drying is a crucial process that requires a high amount of thermal energy to dilate the pores of the wood so as to release excess moisture, ensuring a more stable, lighter and more easily workable material. In this stage, the use of heat recovery units can reduce boiler energy consumption by up to 30%.

Traditionally, wood scrap was burned to produce the heat needed for drying. Today, however, it is use to make innovative materials with high added value, such as plywood, composite panels and pellets, contributing to a more sustainable and circular economy. The heat required for the drying process is thus supplied using highly-efficient technologies, such as heat pumps.

Increased productivity

Controlling relative humidity during wood storage and processing helps avoid quality problems such as warping, gluing and painting defects.

Precision

Precise temperature and humidity control during drying is essential to ensure a high-quality finished product.

Energy saving

Heat recovery from the humid exhaust air and the use of heat pumps for drying can bring huge gains in energy efficiency, reducing energy consumption and CO_2 emissions by up to 50%.

Isothermal humidifiers

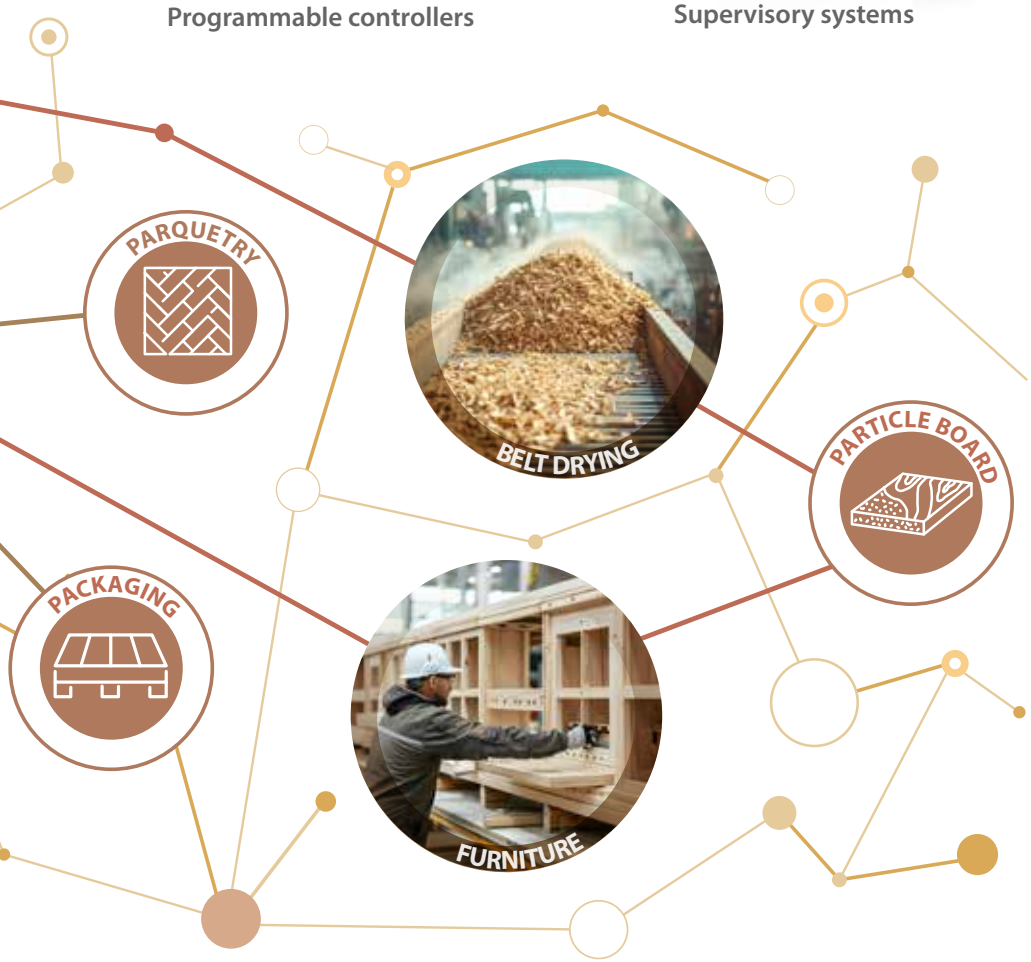
Adiabatic humidifiers

Water treatment systems

Programmable controllers

Supervisory systems

Electronic expansion valves



DC inverters

Electrical panels

Thermal break dampers

Plate heat exchangers

Thermal wheels with cleaning system

Wood drying solutions

Drying processes require high-temperature, humidity-controlled air for extended periods of time. Highly-efficient components such as heat recovery units and heat pumps reduce energy consumption and CO_2 emissions.

- Thermal energy used for heating reduced by 50% to 70%;
- Simple retrofits with installation of the heat recovery unit in the stack;
- Precise temperature and humidity control;
- High-efficiency components.

Drying kilns

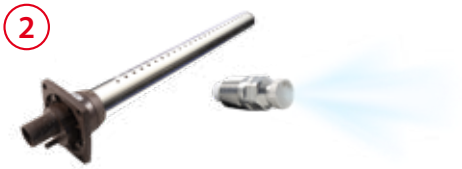
A traditional dryer heats the air to help moisture evaporate from the wood, then expels the moist air and replaces it with dry outside air. This process is energy-intensive, however it can be made more efficient using heat recovery units, modulating fans and thermally-insulated dampers, significantly reducing energy consumption.
Precise humidity control with the addition of steam or adiabatic mist ensures faster drying and higher-quality wood.

1

Programmable controllers

Dedicated controllers for the management of drying cycles with air temperature and humidity probes and wood moisture sensors.
High flexibility in terms of I/O and communication protocols.

2



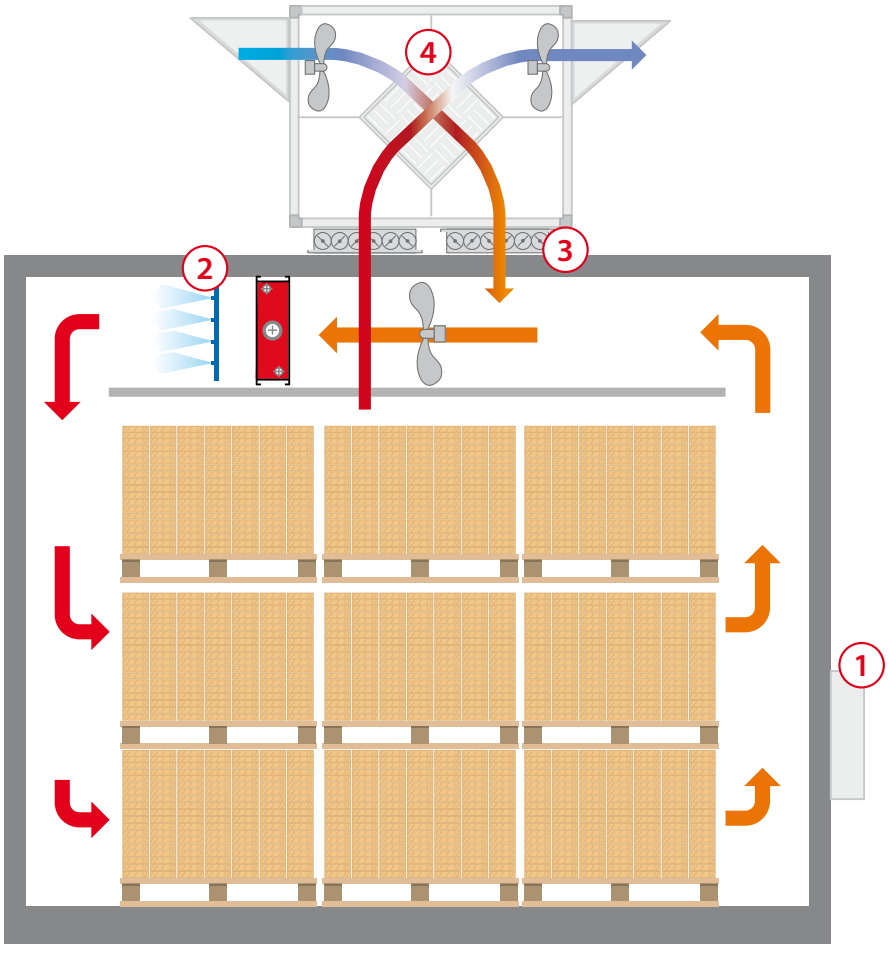
Humidifiers

Precision and low energy consumption in humidity control. Adiabatic atomisation helps open pores, especially on thick or hard woods. Steam humidification provides heat treatment above 90°C, for accelerated drying, structural and colour modification and wood stabilisation.

3

Thermal break damper

The thermal break dampers with class 4 tightness guarantee the highest thermal insulation by reducing heat loss from the stack and improving control of the incoming air flow.



High-efficiency dryer with heat recovery and adiabatic humidification

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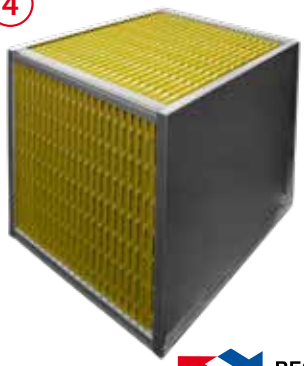


RECUPERATOR
THE HEAT EXCHANGER

Belt dryers

Belt dryers are the ideal technology for quickly drying sawdust, shavings and biomass. The material is carried by a perforated belt, where it is exposed to a hot air stream and progressively, uniformly dried. This technology requires huge volumes of fresh air to be heated, in order to absorb and then discharge moisture from the wood. The use of heat recovery units significantly reduces dryer energy consumption, by up to 30%.

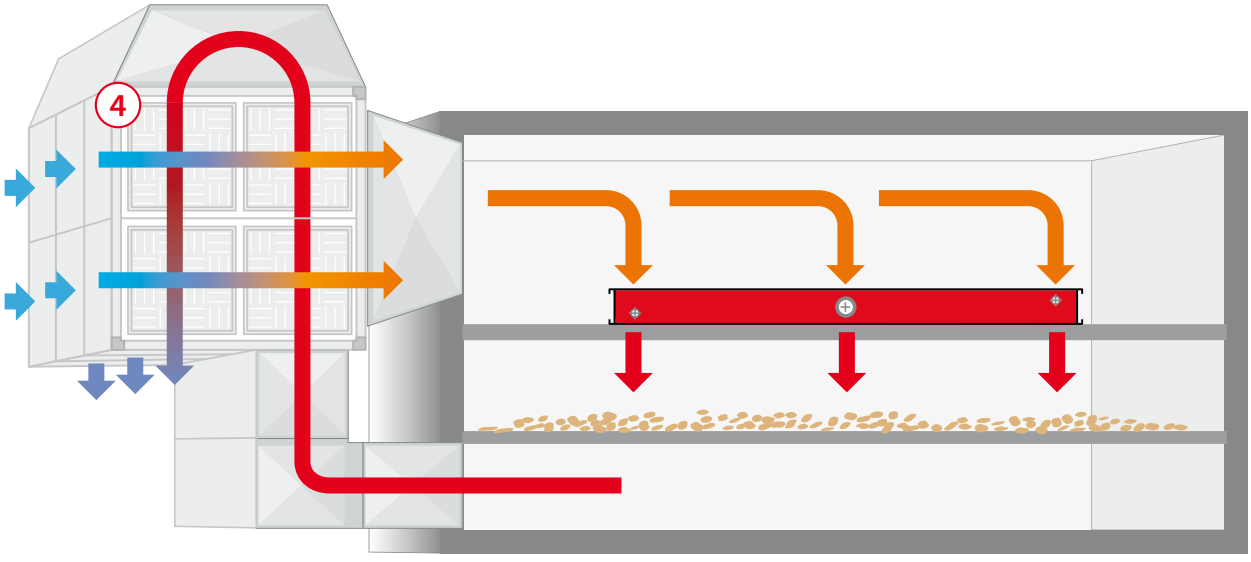
- Continuous and efficient drying
- High-performance, low-maintenance heat recovery
- Corrosion resistance

Plate heat recovery unit

Recovers up to 70% of the heat from the hot and humid air leaving the dryer. Withstands high temperatures, up to 850°C, and resists corrosion from the tannins released by the wood. The choice of a wide fin pitch, GOLD coating and aluminium frame guarantees a long working life without compromising on performance.

Aluminium fin with trapezoidal shape optimised for high performance and low pressure drop.

Aluminium fin with trapezoidal shape and GOLD coating to resist against dirt and corrosion.



Belt dryer with multiple heat recovery units in series and parallel

Condensation dryer solutions

Efficient and sustainable drying with heat pump technology, for lower energy consumption and optimal temperature and humidity control.

- High energy efficiency and lower consumption;
- Precise temperature and humidity control for more uniform and delicate drying;
- Low environmental impact.

The heat pump ensures significant energy savings: with electric heating, 1 kW produces 860 kcal/h, while heat pumps produce between 2000 to 3000 kcal/h with 1 kW. The heat pump uses a cooling coil to remove heat and humidity from the air, condensing the water vapour and expelling it. The recovered heat is then transferred to the heating coil, which generates a flow of hot, dry air, ideal for drying. The air is recirculated and high air change volumes are not needed, as in traditional dryers.

5

Heat pump technologies

High-efficiency solution comprising BLDC compressors, DC inverters, electronic expansion valves and built-in sensors, compatible with natural refrigerants and A3 ready.
The offering is completed by a range of programmable controls and customisable proprietary software for the development of high added value solutions.

6

Extruded aluminium damper

Dampers designed for use in industrial environments, with a robust structure and available in painted galvanised steel, aluminium or stainless steel plate.

7

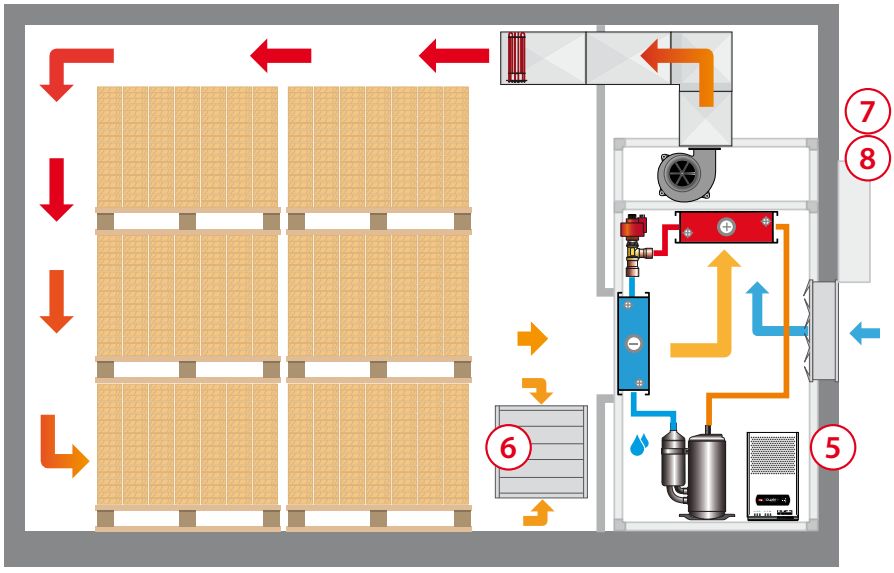
pGDx touch display

4.3" to 15" graphic terminals with flexible connectivity, RJ12, Ethernet and Wi-Fi ports, and resistive or capacitive touchscreens.

8

Electrical panels

Customised electrical panels for drying kilns control and monitoring of the entire process. Available with plastic, painted metal, stainless steel structure, and with different IP ratings. With control buttons, LCD graphic terminals, or touchscreen terminals.



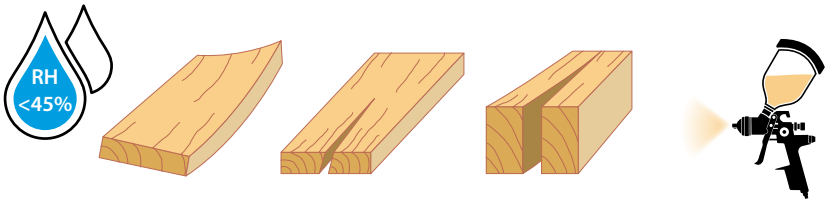
High-efficiency dryer with heat pump

Woodworking solutions

Wood is a living material that exchanges moisture with the environment. Controlling air humidity during woodworking solves problems such as cracking, warping, assembly problems, gluing and painting defects.

No more flaws

For every 1% change in moisture content, wood can expand or shrink by up to 0.3% tangentially and 0.2% radially.



Deformations | Cracks | Adhesion failure | Painting defects

- Less risk of deformation and gluing problems;
- Better paint quality;
- Less dust in the environment and control of electrostatic phenomena that impact machinery.

Humidity control solutions

A wide range of adiabatic and steam humidifiers for humidity control in industrial processes.

humiFog Multizone Touch

- High-pressure adiabatic atomisation for controlling humidity in large industrial spaces, such as warehouses and production areas, with very low energy consumption (4W per l/h).
- Evaporative cooling reduces the thermal loads generated by machinery (690 W per l/h of atomised water), abates suspended dust and limits the formation of electrostatic charges.
- The oil-free pump model allows long maintenance intervals, ideal for 24/7 production.

Application	Air temperature (°C)	Relative humidity (%)
Furniture and carpentry	18 to -22°C	40-55%
Parquetry	18 to -24°C	45-60%
Musical instruments	20 to -22°C	45-55%
Composites (plywood, laminates, etc.)	18 to -25°C	45-60%

Process control and monitoring

Solutions for the control and monitoring of wood drying and processing.

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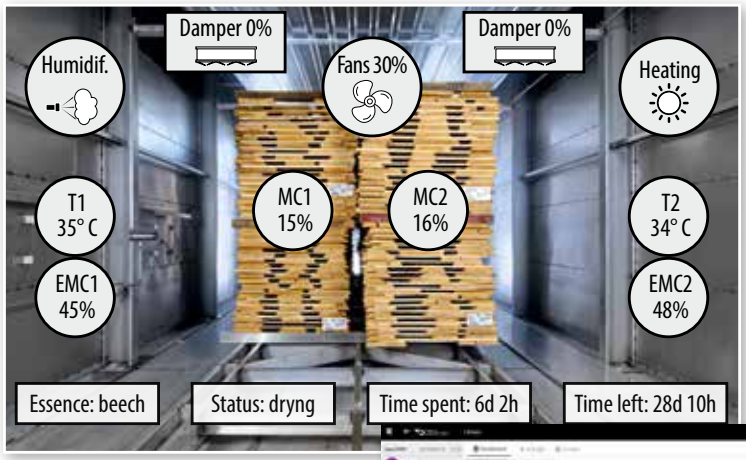
Supervisory system

Full control of the drying process in the cabin and in the plant:

- Simple and intuitive system
- Alarm notification via email and SMS
- Periodic reports
- Scalable local and cloud solution



Control system

MC= wood moisture content

EMC= air humidity

Variable log

Probes and sensors

Sensors for monitoring temperature, humidity and air quality, and for measuring energy consumption.

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