



Energy Efficiency Solutions

Efficient solutions for active space cooling

Preventive measures (installation of sun protectors, etc.) are sometimes enough to keep a hotel cool and comfortable in summer. But the installation of an active space cooling solution may be necessary if your hotel still has cooling needs in summer.

Because air-cooling systems may have a strong impact on guests' comfort and on your electricity bill, it is necessary to choose them carefully.

What types of air-cooling systems exist?

- Air conditioners (AC): these systems aim to provide a building indoor environment that remains relatively constant despite changes in external weather conditions or in internal heat loads. Some systems are air-cooling systems only, while others can be used to heat space, stabilize humidity and ventilate in addition to space cooling.
- Reversible heat pump systems: heat pumps systems are primarily used for space heating but reversible ones can also be used to cool indoor spaces. Contrary to air-conditioners, they can reduce the inside temperature by only a few degrees.

Related criteria of the EU Eco-label:

- The energy efficiency of air conditioning systems is dealt with in criterion #4 (mandatory) and in criterion #40 (optional).
- General maintenance and servicing of air conditioning systems is dealt with in criterion #23 (mandatory).
- Use of heat pump is dealt with in criterion #36 (optional)



Indoor unit of a split air-conditioner



What are the main solutions available?

Solution type	Main solutions available	Advantages / drawbacks
<p><u>Individual AC systems</u></p> <p>(the air of the room is cooled by passing through an evaporator located in the room: they are called "direct expansion" systems)</p>	<ul style="list-style-type: none"> Standalone systems (include the condenser and the evaporator in the same box),  <ul style="list-style-type: none"> Split systems (the evaporative units are placed in the rooms to be cooled; the condenser is placed outside the building) 	<p><i>Drawbacks</i></p> <ul style="list-style-type: none"> Must be installed in each room that needs to be cooled Produce cool air jets (not so comfortable) Tendency to air-drying <p><i>Advantages</i></p> <ul style="list-style-type: none"> Easy to install (generally) VRV (*) split systems offer good comfort (varying cooling power) but require suspended ceiling (* Variable Refrigerant Volume)
<p><u>Central AC with a water network used for cooling</u></p>	<p>Cold water is produced in a water chiller plant (or may come partially from a naturally cold source like ground water, lake) and is distributed by a water network.</p> <p>Possible emitters include:</p> <ul style="list-style-type: none"> - terminal units functioning at low temperature (7-12 °C): fan coil units, air processing units, - emitters functioning at moderate temperature (15-18 °C): ceiling panels, radiant floors... <p>NB/ A separate air network provides fresh air.</p>	<p><i>Advantages</i></p> <ul style="list-style-type: none"> Offer good comfort (generally) Thermal and ventilation functions are separated (provides good flexibility) Guest rooms can adjust cooling on their own (with fan coil units) <p><i>Drawbacks</i></p> <ul style="list-style-type: none"> May be difficult to retrofit Radiant panels have limited cooling power & are not adapted to guest rooms
<p><u>Central AC with an air network used for cooling</u></p>	<p>Air is treated in a central plant and is distributed by air ducts.</p> <ul style="list-style-type: none"> Constant air volume systems: pulsed air flow is constant and temperature of the blown air can be adjusted, Variable Air Volume (VAV) systems: temperature of blown air is constant but pulsed airflow can be adjusted. 	<p><i>Advantages</i></p> <ul style="list-style-type: none"> Produce temperate air jets (blown air mixed with new air coming from outside and air from inside the rooms) Provides new fresh air (but the airflow can be adjusted only with VAV systems) <p><i>Drawbacks</i></p> <ul style="list-style-type: none"> Difficult to retrofit (bulky air ducts and air-handling unit) The ventilators may consume a lot of electricity <p><i>these drawbacks are reduced quite a bit with VAV systems</i></p>
<p><u>Heating/cooling machines: the case of heat pumps</u></p>	<p>The heat is extracted from the air (air source heat pumps) or from the ground (geothermal heat pumps) and transferred to air or water.</p> <ul style="list-style-type: none"> Main available systems: water-water, air-water, ground-water, air-air, ground-air, water-air. 	<p><i>Advantages</i></p> <ul style="list-style-type: none"> Use of renewable energies Possibility of free-cooling with geothermal systems ("geocooling") <p><i>Drawbacks</i></p> <ul style="list-style-type: none"> Geothermal systems are difficult to retrofit





General recommendations about space-cooling systems

Central systems that use a water network for cooling are well suited to zoned heating/cooling and they generally provide good comfort. In addition, they offer good flexibility as regards ventilation and heating/cooling and may be not too difficult to install in an existing building.

“All-air” central systems generally offer good comfort since the difference in temperature between the blown air and the air inside the rooms is limited and air diffusion can be very comfortable. In addition, it allows energy savings: heat recovery can be used in the air handling unit, and free-cooling can be (and should be) practised when the outside air temperature is lower than the inside temperature (typically, at mid-season and at night in summer). But:

- they may be difficult to install in an existing building,
- ventilators may be large electricity consumers depending on the installation design,
- the quantity of fresh air provided by the system exceeds the needs of most hotel rooms (only permanently occupied office rooms require such air renewal).

VAV systems are the most recommended: operating costs are about 20% less than with constant air volume systems, due to better energy efficiency.

If you decide to install a split system, we recommend that you choose a DC inverter system (Digital Courant), because it allows you to adjust the cooling power to the actual needs of the rooms and thus to reduce the electricity consumption.

Standalone systems and window air-conditioners are not recommended because they are not energy efficient and tend to be noisy.

How should I proceed to choose and install a new space cooling system?

The application of a particular type of system depends on a number of factors such as the area to be cooled, the heat loads of the different areas, etc. Given the technical complexity of this solution, we advise you to consult a qualified HVAC design company or installer to choose the right equipment for the specific needs of your hotel.

Whatever the solution, we recommend you pay particular attention to the Energy Efficiency Ratio (EER) of the cooling machine: this ratio describes the energy performance of the system. The Seasonal Energy Efficiency Ratio (SEER) may also be used. The higher the rating the greater the efficiency.

How much maintenance and servicing do a space cooling system require?

Maintenance and servicing of the space cooling system is essential to maintain the energy efficiency of the equipment over time.

Remember, before installing a space cooling system, that reduction of space cooling needs is a top priority for guests' comfort and to keep operating costs reasonable. That is why we recommend the following actions:

- Protect the building from outside heat by upgrading the thermal insulation of the building (loft and wall insulation) and by installing sun protectors on the outside.



- Also, in hot conditions, remember to keep windows, doors and blinds shut.

What alternative solutions to active space cooling are also available?

Fans and ceiling mill-type ventilators can help to keep your guests comfortable when the temperature is high. They may be used as an alternative to air conditioning systems, or as a complementary solution (especially in rooms not equipped with AC systems).

Ventilation on cool nights and evenings can also be a very effective measure to reduce space heating needs. It may be done manually (by opening windows) or through a mechanical system (please refer to solution n°XX).

Finally, it is important to avoid heat coming from electric appliances and lights. So, remember to switch off any unnecessary equipment.



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How much energy can my hotel save by switching to a high efficiency cooling system?

Switching to a high efficiency cooling system can result in as much as 50% in annual savings on space cooling.



Source: Department of Energy, USA.

Link with other solutions in the database

The best way to ensure that buildings are pleasant for guests in summer is to ensure that they have an energy efficient design in the first place. That is why building insulation (solution n°VII), installation of sun protectors (solution n°IX) and outside works to improve summer comfort (solution n°X) should be considered as priority.

As you may want to install a cooling system that ventilates and/or heats space in addition to space cooling, it is recommended to take into account your cooling-ventilation-heating needs all together when you think about replacing your heating equipment (solution n°XVII), ventilation equipment (solution n°XX) or cooling equipment (solution n°XIX).

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