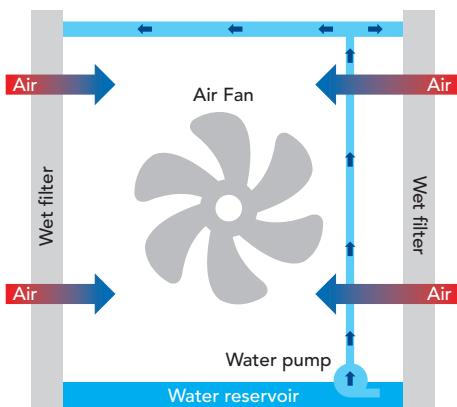


Adiabatic cooling in a metro station – RATP (Paris)

CONCEPT

RATP tested a new adiabatic cooling system in the Bastille metro station to recover the dry and hot air from the platform in order to cool the technical rooms without releasing heat in the adjacent rooms. The adiabatic cooling system consumes much less electricity, and doesn't need refrigerant fluids.



OBJECTIVES

- Recover the dry and hot air from the platform to cool technical rooms;
- Refresh the technical rooms without calorific release in the adjacent rooms;
- Consume less electricity and reduce related CO₂ emissions;
- Reduce dust loading and dry air in the technical rooms;
- Decrease the maintenance cost.

INVESTMENT DESCRIPTION

The heat released by the IT equipment significantly increases the temperature in technical rooms. Above a specific temperature, this equipment stops working properly. As a result, technical rooms need to be ventilated and cooled either through natural or mechanical ventilation. Air conditioning requires expensive maintenance, increases energy use, raises the temperature in the adjacent locations (a metro station for example) and dries the air. They also use refrigerants that can cause GHG emissions through leakage and are often significant energy consumers. RATP used an air-cooled chiller but it proved to be inadequate due to expensive maintenance and high energy consumption. Furthermore, it increased the underground temperature and dried the air.

Adiabatic cooling is a concept that involves decreasing the temperature through evaporative cooling. A circulating pump takes the water to the top of a filter media, which absorbs the water and is moistened. Then a ventilator passes the air through the filter media. The exchange between the air and the water causes the water to evaporate. As the water evaporates, the temperature decreases and outgoing air from the unit becomes cooler and less dry than the incoming air. In cold periods, the cooling works only through mechanical ventilation. In hot periods, the system works through adiabatic cooling and the thermostats control the opening of the water inlet valve and the opening of the circulating water pump.

RATP tested a new adiabatic cooling system in the Bastille metro station to recover the dry and hot air from the platform in order to cool the technical rooms without releasing heat in the adjacent rooms. The adiabatic cooling system consumes much less electricity, has reduced dust loading in the technical rooms and its maintenance is more economical.

SUPPLIER

Adiabatic cooling: **FORET**

COST AND FUNDING

The whole system was ordered at a cost of €84,000. The lifetime of the system is 20 years.

Results	
Investment costs (€)	€84,000
Energy savings (%)	90%
Annual energy savings (kWh)	114,000 kWh
Annual CO ₂ savings (TCO ₂)	9 TCO ₂

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RESULTS

The implementation of the adiabatic cooling system was a real success. The electricity and carbon emissions have been reduced by 90% compared to the classical air conditioning system, enabling a maximal temperature of 25°C in the technical rooms.

LESSONS LEARNED

This investment enabled RATP to implement an adiabatic cooling system for the first time in a metro station. An adiabatic cooling system can only be used to cool technical rooms when the air coming inside the system has specific characteristics of relative humidity and temperature. The air temperature in the platform of the line 8 in Bastille station is 28°C and the relative humidity is 30%. RATP would like to extend this experiment and integrate this solution in the panel of the engineering solutions of the RATP group. This integration must be executed together with support measures, awareness and training programs for the team manager, engineers and maintenance staff.



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