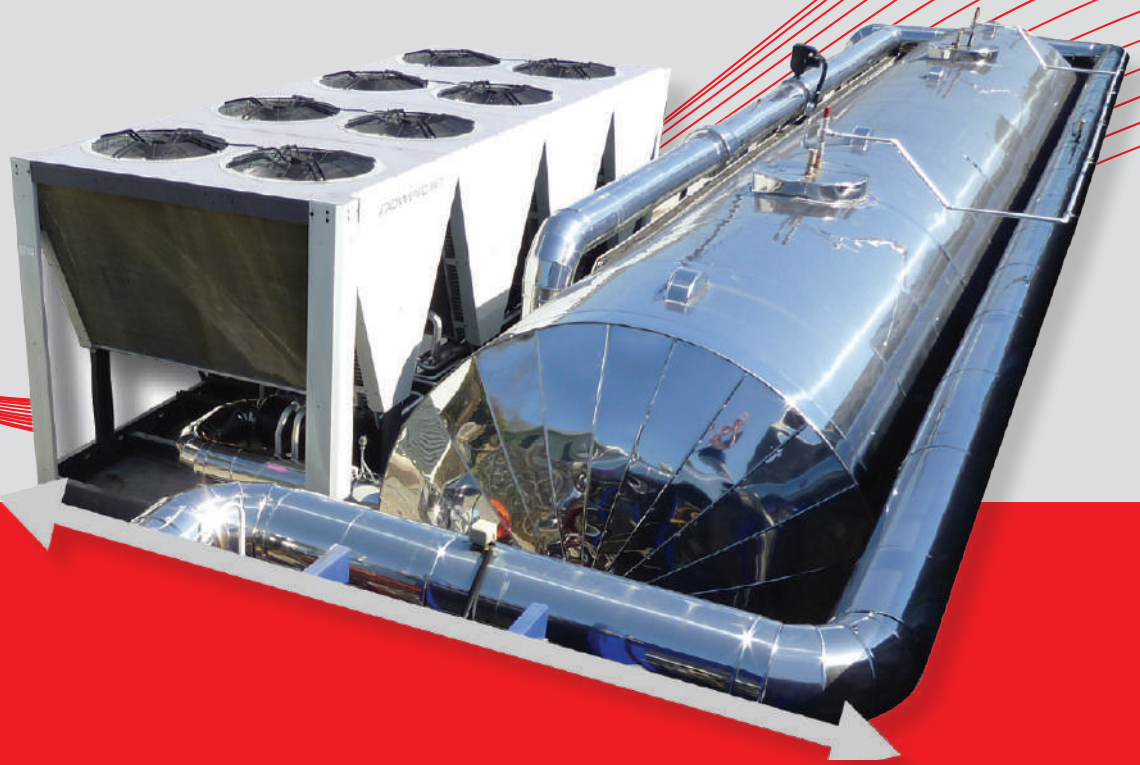


THERMAL ENERGY STORAGE

**ENERGY DEMAND
MANAGEMENT
TO OPTIMISE HVAC
PERFORMANCE**



A Carrier Company



THERMAL ENERGY STORAGE (TES)

SMART ENERGY DEMAND MANAGEMENT

In building and industrial processes, half of energy consumed is thermal energy, and demand can vary greatly from day to night, from one day to the next, and from one season to another. Managing thermal energy production can efficiently reduce an installation's costs and lower its environmental impact.

Reasons for installing a Thermal Energy Storage system

Most air conditioning systems are sized to meet the maximum level of demand that is expected, even if those peak periods are short-lived. Cooling, for example, may only last a few days a year, and may also vary greatly over the course of a single day.

Rather than installing a large system that will only run for a short time period, it's possible to put into place a system that meets cooling needs most of the time, and stores unused thermal energy that is brought back into service when it's needed.

Shift electricity consumption from peak to off-peak hours

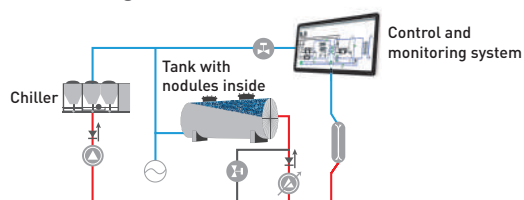
By storing thermal energy during the night and releasing it during the day, the Thermal Energy Storage system consumes electricity at lowest prices and avoids peak times. By spreading thermal energy production over 24 hours, this solution can reduce chiller capacity by 30 to 70%*. Overall energy demand is smoothed out and peak demand is greatly reduced, with all the benefits that are accrued as a result:

- the environment, reduced energy consumption and reduced CO₂ emissions
- the company, reduced costs
- increasing the overall efficiency of the installed energy systems

Optimisation of the HVAC installation design & operation

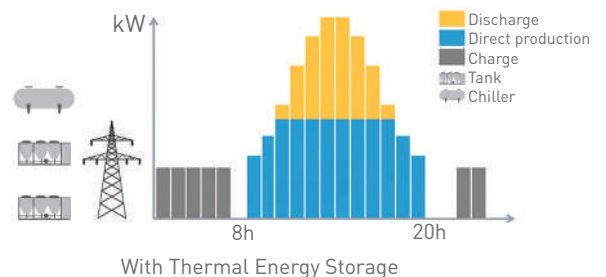
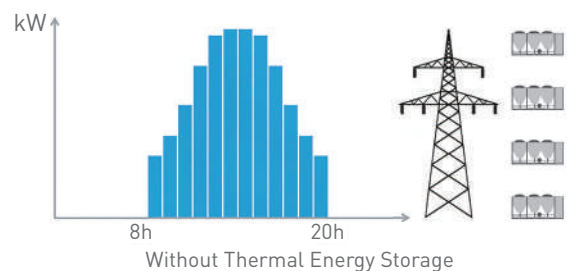
The TES system along with your chillers is composed of one or several tanks filled with spherical elements called nodules that contain the Phase Change Materials (PCM).

The use of PCM in nodules provides very high energy density and power exchange.



1 Source: World Business Council for sustainable development report
 */***Source: Measured differences between equivalent systems designed with and without TES
 **TEWI: Total Equivalent Warming Impact

Histogram of a building's daily cooling needs and its electricity consumption profile



CIAT's TES solutions can reach a Total Equivalent Warming Impact (TEWI**) of between 15 and 40%*** compared to systems without TES.

FOR HVAC SYSTEMS WITH PEAK COOLING DEMAND >500KW



Nodules
 Core TES Technology
 Encapsulation of PCM

Reliability
 Competitiveness

PCM Expertise

- Formulation, nucleation, characterisation, durability, recyclability
- Packaging and encapsulation
- Envelope materials – compatibility ageing, fatigue
- Industrial manufacturing process

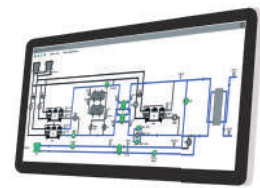


FULL CONTROL FOR ENERGY PRODUCTION WITH TES

CIAT's TES systems come complete with a monitoring and control system to maximise energy efficiency and reduce operating costs.

Control and monitoring to optimise energy use

The control and monitoring system optimises the operation of the installation. It helps contractors and owners to optimise energy consumption, lower CO₂ and greenhouse gas emissions and reduce operating costs.



Controls

- Automatic management of operating modes
- Equipment regulation
- Optimisation of stored energy use

Auto-Adaptive Module

- Daily optimisation
- Predictive calculation of the daily cooling demand
- Permanent operating adaptation

Monitoring

- Local and remote monitoring
- Alarm notification
- Real-time view of operating parameters

- + View synoptic in real-time
- + View and download trends
- + Record operating data
- + Monthly and annual reports

Smart-Grid ready to enhance efficiency

By shutting down electricity-hungry energy producers on demand and forcing the discharge of the system, the TES system regulates equipment to respond to peak electricity alerts on the power grid. This solution can also be combined with renewable energy (wind turbines, photovoltaics).



WORLDWIDE PLAYER IN THERMAL ENERGY STORAGE SYSTEM VENCE CLIMATE CONTROL SYSTEMS CENTER OF EXCELLENCE

Expert in smart services and TES for energy management.

CIAT engineers provide daily support

At the Vence Center of Excellence for Climate Control Systems, our engineers focus on developing and offering technical support for smart services and designing, engineering and implementing HVAC systems with storage solutions.

Their know-how is proven and unique with indepth knowledge in automation (heating and cooling). The Vence center works closely with Europe's leading science park located in Sophia-Antipolis, in the south of France. The team is frequently involved in major European research and innovation projects.





HEALTHCARE



Main Benefits

- Avoid electrical overload during winter that cost about 10 000€ / year before
- Cooling capacity x3 during peak season
- -35% amount of refrigerant used
- Continuous support throughout service

LOUIS PASTEUR HOSPITAL

Dole, France

The Louis Pasteur hospital staff is acutely aware of sustainable development and environmental protection. They took advantage of refurbishing and expanding their cooling production system to improve its energy efficiency and reduce greenhouse gas emissions.

A TES solution met their targeted energy performance criteria, provided the necessary flexibility and met all cooling needs.

CIAT's answer:

Nominal capacity of the cooling plant: 600 kW
TES volume: 30M³

Installed equipment:

- 1 Hydrociat LW 1800 BX chiller (332 kW)
- 1 Dynaciat Power LG 1400 chiller (330 kW)
- 1 PWB 45-1 1/189 heat exchanger (700 kW)
- 2 Europa air-cooled condensers for free cooling
- 1 storage tank with AC.00 nodules
- Control and monitoring system to optimise the solution



OFFICES



Main Benefits

- Shaving of installes capacity
- -30% of electricity power
- Secured cooling production system
- Continuous support throughout service

MAURITIUS COMMERCIAL BANK

Ebene, Mauritius

The Mauritius Commercial Bank (MCB), located on the island of Mauritius, requires continuous air conditioning year-round. Electricity supply is critical due to power cuts and has high production and transmission costs, and the MCB needed to reduce its energy costs.

A TES solution met their goals for energy optimisation and to compensate for intermittencies of electrical supply.

CIAT's answer:

Nominal capacity of the cooling plant: 1,500 kW
TES volume: 96M³

Installed equipment:

- 1 Powerciat LX chiller (1080 kW)
- 3 storage tanks with AC.00 nodules
- Control and monitoring system to optimise the solution



www.ciat.com