

2018

EeB PPP Promising Technologies

HVAC and lighting



ENERGY EFFICIENT BUILDINGS
AN ECTP COMMITTEE FOR INNOVATIVE BUILT ENVIRONMENT



Comfort eye

Infrared comfort sensor for indoor environmental monitoring



The Comfort Eye is an innovative comfort sensor equipped with a low-cost IR sensor, installed on the ceiling or wall and capable of motorized pan and tilt to measure the indoor surfaces temperature. A central unit manages the IR scanning process, calculates the mean radiant temperature and finally the PMV comfort index (according to ISO 7730) using on board sensors.

The core distinctive and innovative elements that the Comfort Eye introduces are:

- Multi-point thermal comfort measurement with IR scanning device
- More accurate comfort assessment
- Low cost system compared to traditional monitoring solution
- Plug & Play device

The Comfort Eye can be used for short term IEQ monitoring or for permanent monitoring and integration with control systems. The multipoint comfort measurement allows optimal HVAC management strategies to provide heat/cool where needed for an improved energy efficiency with the maximum comfort and well-being. This technology can be used in both new constructions and renovation/retrofitting projects. Comfort Eye could be a Plug & Play device or integrated with existing BMS solutions; interoperability features are ensured by standard protocols (local and cloud). The technical developments will be completed in less than 1 year.

- Multi-point thermal comfort measurement with IR scanning device
 - More accurate comfort assessment
 - Low cost system compared to traditional monitoring solution
 - Plug & Play device
- Technical completion: less than 1 year
 - Can be used in new constructions
 - Can be used in renovation/ retro-fitting
 - Compatible with existing solutions

Project: CETIEB, www.cetieb.eu

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Freescoc HVAC solar air conditioning syst

Façade integrated solar adsorption cooling system for air ventilation



With increasing focus on thermal comfort and indoor air quality, the last decades have seen the growing of the ventilation and space cooling market in Europe. This increased popularity has boosted energy consumption for the cooling of ventilation air.

FREESCOO is an indirect evaporative cooling system which runs almost free of energy. When plugged with solar thermal systems, FREESCOO substitutes mechanical cooling with water evaporation. The system only consumes a small amount of electricity for ventilation and water for the humidification process.

During the humidification process, ventilation air gets cooled into comfort-level temperatures. In order to keep moisture levels within reasonable levels, the incoming air is dried out by means of an adsorption process.

The key innovation in FREESCOO is its system with fixed adsorption pads, which allow for larger quantities of adsorption material to be incorporated in the system, thus allowing for lower re-generation temperatures.

FREESCOO is meant to be installed jointly with solar systems in order to obtain its re-generation heat free of charge from the sun. In fact, FREESCOO provides a set of packed systems where the core adsorption and indirect evaporative cooling system is incorporated within a solar collector array.

Within h2020 project Zero+, FREESCOO has developed a compact unit system for de-centralized ventilation systems, which can be integrated with any source of heat. Most performing when coupled with solar systems, the

system is also meant to operate when coupled to heating systems in buildings, thus providing de-centralised cooling while taking profit of existing heating systems for regeneration and allowing the use of solar or other renewable energy sources for heating and cooling at the same time.

- **Open loop adsorption system with increased de-humidification capacity**
 - **In-direct evaporative cooling**
 - **Lower operating costs than mechanical cooling**
 - **Low temperature requirements for heat source in comparison to other thermally driven systems**
 - **Centralized and de-centralised system**
 - **Can be used also for heating**
- Technical completion: between 1 and 2 years
 - Can be used in new constructions
 - Can be used in renovation/ retro-fitting
 - Compatible with existing solutions

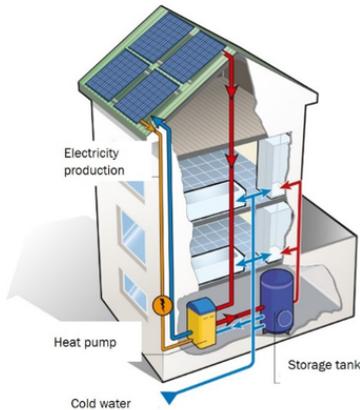
Project: ZERO-PLUS, <http://zeroplus.org>

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Heliopacsystme + PV/T solar collectors combined with water-to-water heat pump

PVT sourced Heat Pump for Domestic Hot Water production



HELIOPAC is a company focused on solar-powered heat pump systems. HELIOPACSYSTEM+ compatibilizes a water-source heat pump system with hybrid PhotoVoltaic-Thermal (PVT) solar thermal system for the production of Domestic Hot Water (DHW) in buildings.

With the progressive construction and retrofitting of buildings to meet Nearly Zero Energy Building performance levels in Europe, DHW preparation loads in the energy consumption in buildings are expected to increase its relative relevance in building energy consumption. Nowadays a niche market, specific appliances for sustainable production of DHW will go mainstream.

HELIOPACSYSTEM+ matches the expertise of HELIOPAC in heat pumps for DHW preparation with innovative PVT collectors, which provide sustainable low grade heat and electricity. This sustainable energy feeds the heat pump, which pumps heat from the low temperature solar feed to DHW temperature, and consumes the produced electricity. When correctly sized, the system can run virtually free of non-renewable energy sources.

HELIOPACSYSTEM+ also integrates DHW storage, allowing for the de-coupling of production and consumption cycles, thus maximising solar output and the carbon-free share of DHW.

For the successful integration of the system into a building, two factors need to be considered:

- Availability of solar radiation all-year round. The system is meant for the daily production of DHW, thus solar heat needs to be available on a daily basis.
- Winter climate severity. The hybrid PVT+Heat Pump system proposed is technically coherent with buildings with low space heating loads, which do not require of centralised heat production for space heating. Also, PVT systems are unglazed solar collectors which perform best with mild ambient temperature.

The aforementioned factors are achieved in most South-European climates and warm-temperate climates in the Atlantic coast of Europe and British Islands. Together, these countries provide a vast market of ca. 300 Million Inhabitants.

The system is compatible with conventional DHW distribution systems, and collector surface can be adapted to the available space in the building envelope.

- **Unique PVT system for DHW production**
- **Up to 90% of renewable DHW fraction**
- **Energy conversion & storage system to maximise solar input**
- **Low temperature operation, even without solar radiation**

- Technical completion: between 1 and 2 years
- Can be used in new constructions
- Can be used in renovation/ retro-fitting
- Compatible with existing solutions

Project: SCORES, <http://www.scores-project.eu>

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Improved sorption collector

Modular sorption-integrated solar collector producing heating and cooling directly from the collector



SaltX Technology (formerly ClimateWell) is a patented triple-state absorption technology with thermal heat-pump component directly integrated into solar thermal collectors to provide heating during winter, cooling during summer and sanitary hot water all year-round, directly from the collector. The SunCool solar collector is the first in the world with combined heating, cooling and energy storage, delivering twice as much energy compared to today's state-of-the-art solar collectors.

The core distinctive and innovative elements that the SaltX Technology introduces are:

- Integration of the sorption heat pump directly into the SunCool collector.
- Highly modular design.
- Good system performance irrespective of system size.
- Plug and play system kits that can be developed.

The SaltX Technology is an absorption chiller and a sorption heat pump fully integrated into a thermal collector that translates into a significant reduction of power consumption and carbon emissions. This triple-state absorption technology allows the system to be independent from electricity thus improving the energy efficiency for the building, whilst the need for external equipment is minimised and the installation efforts are significantly reduced. The central premise of the innovation is that cost-effective pre-engineered solar heating and cooling system kits are developed with SunCool collector and standard solar thermal system components (eg. pumps, valves, water stores, etc.). For increased market penetration of solar cooling, small, medium, and large-scale solar thermal

cooling kits with plug-and-play functionality are necessary. These SunCool collector systems can be integrated with solar photovoltaic electricity, combined heat and power (CHP) units and/or bidirectional thermal networks.

Thus, allowing for year-round renewable energy production possibilities with ample storage capacity to mitigate the intermittent nature of solar energy availability. It is possible to provide energy system developers and energy service providers a solar heating and cooling system that is easy to deploy and integrate into their present infrastructure (i.e. retrofit) as well as for future system developments (i.e. new builds).

- **Integration of the sorption heat pump directly into the collector**
 - **Highly modular design**
 - **Good system performance irrespective of system size**
 - **Plug and play system kits can be developed**
- Technical completion: less than 1 year
 - Can be used in new constructions
 - Can be used in renovation/ retro-fitting
 - Compatible with existing solutions

Project: A2PBEER, Demonstrating existing and innovative retrofitting solutions in public buildings and districts,
www.a2pbeer.eu/technical-solution/thermal-network

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This technology brochure highlights the highly promising innovations from selected co-funded European projects under the 7th Framework Program (FP7) and the 8th Framework Program (H2020).

The Energy-Efficient Buildings (EeB) Public Private Partnership (PPP) is a joint initiative of the European Commission (EC) and the Energy Efficient Buildings Committee of the European Construction Technology Platform (ECTP).

This initiative aims at promoting research on new methods and technologies to reduce the energy footprint and CO₂ emissions related to new and retrofitted buildings across Europe.

