CESME

Combined GeoExchange Energy & Water System

Presented by the Region of Central Macedonia

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Brief Description of Good Practice
Design and Implementation of a "combined energy & water system" for 5 Hotel & Spa, by SYCHEM SA.* *The combined system uses sea water and electrical energy to provide:* • *Space cooling & heating;* • *Underflor heating;* • *Domestic water heating;* • *Pool's & spa's heating & cooling;* • *Domestic water production (reverse osmosis desalination);* • *Sea water supply for Thalassotherapy Center;* • *Sea water & brackish water supply for pools re-filling;* • *Heat rejection for hotel's centralized refrigeration systems.* *The system's innovation lies into the joint use of the mechanical equipment and resources (sea water, electrical energy, reclaimed heat) for several combined uses, under the control of a sophisticated Building Energy Management System (BEMS).* *The main synergies of the combined system are:* ✓ *Extensive in-series reuse of the sea water by water-source chillers, water-source heat pumps, desalination plant, centralized refrigeration, thalassotherapy, pools. The route of the sea water is controlled according to the specific temperature requirements of each sub-system. The result of sea water reuse is the substantial reduction of sea water intake infrastructure and pumping energy.* ✓ *Reclaim of waste heat by water-source chillers for pool's heating and underfloor heating.* ✓ *Reclaim of waste cool by water-source heat pumps for space cooling.* ✓ *Use of thermal springs for pool's heating.* *Moreover, all the equipment used is of the highest energy efficiency standards and is dynamically regulated to further enhance the already very high efficiency of the innovative combined design.*
Problems/challenges and how they were overcome
The biggest challenges were the sea water intake and the BEMS control system. *The sea water intake should provide clean sea water of low temperature with minimal solids*

content. The solution given was the construction of sea water wells into the breakwater of the marina. The wells were designed with gradual granulometry of the surrounding aggregates to act as a filter.
The implementation of the BEMS control system required a lot of effort due to the complexity of the several operating modes of the combined system. The control algorithms were developed exclusively for the project. The BEMS system is constantly monitored, de-bugged, re-commissioned and updated throughout the first 2 months of operation.

Impact from Good Practice

The system is still in trial operation (operates from June 2016), so the energy & water consumption data are not yet reliable.
The energy benefit of the "Seawater GeoExchange system" as opposed to conventional systems of air-cooled chillers & gas-heater, is estimated to 216.000€ annually.
The reduction in greenhouse gas emissions is estimated to be equivalent to 632 tons of CO2 annually.

Moreover, the "combined energy & water system" is entirely hidden in the basement. No outdoor units are required, thus providing long-term corrosion-free operation & year-round energy efficiency without any noise.

Lessons learnt from the Good Practice

The successful implementation of efficient electromechanical systems requires the close collaboration of the developer, architect and MEP engineers from the early stages of the design.

Recommendation you want to stand

For more information

www.sychem.gr

www.miraggio.gr