

Sheet No: 1

Country: Greece

End User: Mevgal Dairy



View of collectors filed in MEVGAL plant



One collectors row in MEVGAL solar plant

General Presentation

The project regards a TPF action in “Mevgal S.A.” industry for a solar thermal application combined with a heat recovery measure.

Mevgal S.A. is a dairy industry situated in Northern Greece (between Thessaloniki and Giannitsa).

The heating requirements (mainly for pasteurisation and cleaning) are covered by a steam network. The steam boilers are running on heavy oil and are fed by cold water; daily water requirements are about 75 m³.

Technical Aspects

The total collectors area is 727m². A combination of three collectors types has been used: selective flat plate (403m²), black painted flat plate (216m²) and 108m² of CPC (Compound Parabolic Concentrators).

The heat produced by the collectors’ filed is used to preheat the water feeding the steam boiler. Two accumulators are used with a total volume of 10 m³.

The mean annual value for the total solar gain is about 270 MWh.

The solar plant is only a part of an installation which includes a heat recovery system from the steam boilers blow-down.

Thermal energy savings are split as follows: 30% from solar and 70% from the blow-down heat recovery system.

Contractual aspects

The project was financed (with a TPF scheme) in the frame of a national programme (Operational Programme of Energy 1994 – 1999) and CRES was the contractor of the project. The bodies of project implementation were CRES and MEVGAL S.A. The system is in operation from 1999. Subcontractor for the installation of the whole system was the company Intersolar S.A.

The operation and maintenance of the system has been arranged by a private agreement between CRES and MEVGAL S.A. Based on this agreement, CRES has the responsibility of system’s monitoring, operation, service and energy measurements. Once the payback period has been completed, the system will become exclusive property of the End-User. The contract agreement sets the kWh_{th} price to be equal to the cost of the kWh_{th} produced by the cheapest conventional fuel available (a continuously updated value). The total TPF investment for the whole application (solar plant and heat recovery measure), was about 130000 €. The mean annual energy savings are about 900 MWh and the price for each MWh equal to 25 € (in year 2005).

Source: CRES internal reports, G. Kanavakis (MEVGAL project’s responsible).

Sheet No: 2**Country: Italy****End User: Melegnano municipality**

View of collectors filed at the municipal swimming pool of Melegnano (MI)



Collectors on the roof during the installation phase

General Presentation

The solar plant of the Melegnano (MI) municipal swimming sporting center has been installed in March 2000. The center is active all the year and has about 90'000 visitors per year; its thermal energy need is characterized by a low temperature level and a continuous demand during the whole year.

The design of the plant has been carried out through a cooperation among the research institute Ambiente Italia S.r.l. and a planning office, Sergio Colombo & c. S.a.s. In the first operation phase it has been monitored by the researchers of the Energy studies department of Politecnico di Milano.

Technical aspects

The collector field accounts 200 m² of flat plate collectors and provides domestic hot water to the showers and heat to the two swimming pools (indoor and open air) operating alternatively during the year. The plant has been designed according to the principles of the "Large scale" plants. The collectors are grouped in modules of 12,5 m² each and a low flow strategy has been implemented (10-14 l/m² h). Thanks to these applications, the hydraulic circuit results simplified and the times of installation was very short (3 hours for the collectors, 1 day for the complete plant). The plant includes two storage tanks (for sanitary hot water) of 5 m³ each, two external heat exchangers (separate, for DHW and swimming pools heating). Originally along with the plant a (sophisticated) system for remote control has been installed. A gas boiler is used as back-up. The plant thermal energy production is about 125 MWh/year, which cover about 80% of DHW and 100% of the swimming pools heating demand.

Contractual aspects

The plant has been realized by the Melegnano Municipality, which holds the property. The total cost has been of about 220 million of Lire (about 115'000 €), that correspond to a unitary cost of 575 €/m². A contribution of 40% on the plant's total cost has been obtained by the European Commission through the SAVE program. The energy yield of the plant has been guaranteed through a "guarantee of the solar result" contract. The company which installed the plant would have not obtained the complete payment if the plant thermal energy production had not exceeded the foreseen limit of 500 kWh/m² for year, in the first operation phase.

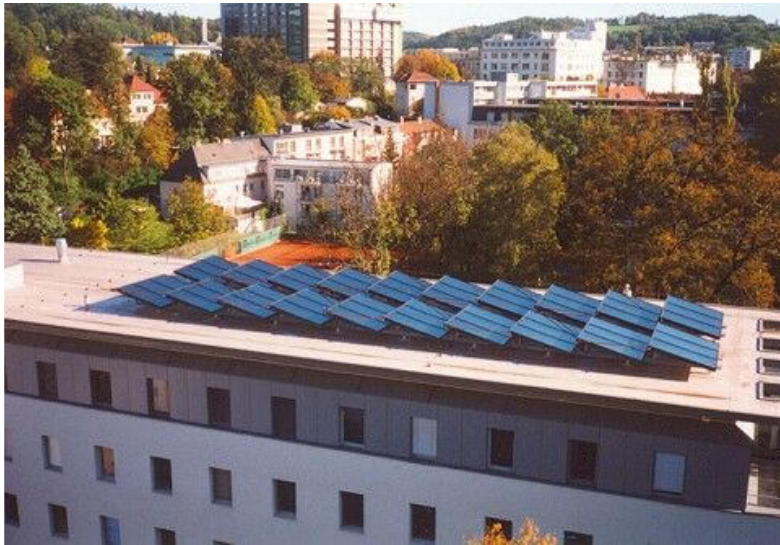
At present the plant is managed by MEA (Melegnano Energia Ambiente, ex municipal service company) which sells the heat to the Municipality in the framework of the general "Energy service" contract.

Source: Personal communication with the CO of MEA

Sheet No: 3

Country: Austria

End User: Verein Studentenheim



General Presentation

The Friedrich Schiller dormitory has been renovated and enlarged with an extension in autumn 2001. The target was to reduce energy costs and costs of operation with the installation of a solar plant with 116 m² collector area. The solar plant prepares the domestic hot water with support of the district heating net. In sum 103 dormitory rooms (20 new built and 83 renovated rooms) with 72 washrooms are connected to a central domestic hot water system.

Technical Aspects

Measures:

- Renovation and extension of the dormitory
- Third party financing model
- Design and installation of the solar plant
- Installation of the thermo technical equipment incl. domestic hot water system
- Operation management
- Implementation of an energy controlling system

Results:

- Guaranteed annual solar yield: 301 kWh/m² with an annual domestic hot water use of 819 m³ (with 55 C°).
- Investment costs: 93430 Euro
- Annual contracting rate: 2538 Euro excl. VAT
- Inception of contract: 01.09.2001
- Expiration of contract: 31.08.2016
- Duration of contract: 15 years
- Reduction of CO₂ emissions per year: 9 t
- Fixed hot water price: 1,438 Euro/m³ (excl. VAT)

Contractual aspects

The ESCO assumes operation management, service and maintenance of the plant parts inserted by the ESCO. The financing of the solar plant has been carried out by the management of the dormitory, the contractor did not pre-finance the plant. The solar yield is guaranteed and a measurement concept for account and providing evidence of the solar yield was arranged. The annual base price is the payment for the following benefits of the contractor: technical operation management, implementation and operation of an energy controlling system, guarantee etc.

The energy price includes the consumption-bound costs (district heat and electricity).

Source: Grazer Energieagentur GmbH, Kaiserfeldgasse 13, A-8010 Graz, Tel. 0316/811848-0, Email: office@grazer-ea.at

Sheet No: 4

Country: Austria

End User: City of Graz



General Presentation

The solar plant at the “Arnold Schwarzenegger Stadium” Graz (Austria) was put into operation in June 2002 and can be considered as the pilot project of feeding solar thermal energy directly into a district heating system. From the technical point of view, the main reason for the construction of the solar system was to develop and optimise the system for feeding solar energy into an urban district heating net. As a result, this solar plant is Europe’s premiere for solar district heating.

Technical Aspects

The solar collectors were mounted on a steel substructure on the roof of the skating hall of the Arnold Schwarzenegger Stadium in Graz. The collector area of 1407 m² is arranged in 11 rows, each with 9 collectors in series. The collectors are 14.3 m² large scale flat plate collectors of the type “Gluatmugl”. These collectors are especially designed for high temperature use, which means that they have increased insulation in order to lower heat losses below approx. 3.0 W/m²*K. The gained solar energy output reaches about 560 - 600 MWh per year (Graz has a yearly solar radiation of 1130 kWh/m²).

The district heating net in Graz has a minimum consumption of 10 MW also in summertime, and this solar plant reaches a maximum output of about 800 kW. The solar energy is directly transmitted to the heating net by an external heat exchanger. Large storage tanks are not necessary due to the constant energy consumption. Concerning CO₂-emissions, this plant saves about 250 tons CO₂ per year compared with an oil fired boiler with a total efficiency of 70 %.

Contractual aspects

The plant is operated and financed via a third party financing model. This pilot project is moreover supported by the city of Graz, the Steirische Wirtschaftsförderung and the Kommunalkredit Austria. The project was developed in collaboration of the following 3 partners:

- S.O.L.I.D. Gesellschaft für Solarinstallation & Design mbH
- nahwaerme.at Energiecontracting GmbH & Co KG
- ÖkoTech Produktionsgesellschaft für Umwelttechnik mbH

S.O.L.I.D. was responsible for the design and the construction of the plant. The company nahwaerme.at took over the financing and operation of the plant by a third party financing concept. The collectors were produced and mounted by the company ÖkoTech (Graz).

As this project is based on a third party financing model, the operating company nahwaerme.at took over the total costs of construction including the integration in the district heating net. The operating costs of the solar plant (e.g. maintenance, power etc.) are also taken over by the operating company. The duration of the contract is 15 years with an option of prolongation.

Source: nahwaerme.at