" SOLARIS" PROJECT - A MODERN TECHNOLOGY FOR INTEGRATION OF COLD/WARM, SOLAR, HEAT PUMPS AND ENERGY EFFICIENCY CONCEPTS IN BUILDINGS

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The main aim of this project is to implement new concepts regarding the quality of living comfort in the context of the integration into the community of the new category of houses equipped with modern technology and to give technical and technological ideas and solutions which can lead to a energy efficient house.

The main technologies elaborated and implemented in this project are: Solar thermal heating and cooling of the houses; Geothermal heat pumps; Other passive solutions to increase the energy efficiency; Photovoltaic energy generation in buildings

Keywords: heat pumps, solar thermal systems, PV grid connected systems.

1. Introduction

Some important parameters and performances of the installed systems are presented:

Performance Ratio and efficiency of photovoltaic system

Coefficient of performance for the heating components and system

Solar thermal collector efficiency

2. Results

From the general objectives in the performed work the following aspects have to be mentioned:

Advanced methods to rehabilitate the constructions, in accordance with the sustainable development and European integration;

Procedures, technologies, materials and equipments to ensure the quality regarding the functionality, safety and comfort of the constructions.

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The integration of the active solar systems into the buildings offers advantageous costs and represents an attractive concept for the areas with a high density of the population. Installed on buildings's surfaces, the solar systems give the possibility to combine the electric or thermal energy production with other functions of the building, replacing the traditional construction elements and adding to the building a new architectural value.

Beside using the new materials integrated in sandwich-type structures, with insulating qualities, or thermal properties, according to the climatic area where they are used, one of the tendencies of the energy consumption efficiency increase is using the present techniques in the domain of *Artificial Intelligence* (AI).

The projects developed in this field present a high level of novelty and complexity, the main specific elements of which are the following:

Energy efficiency of the construction to be higher than 50%;

Extended use of the solar energy, both passive (through walls, openings, glass house) and active (through solar-thermal and solar-electric converters) to increase the thermal comfort and of the process of living;

The structural elements have been designed in such way to allow standardization according to other existent construction elements (windows, doors, interior panels etc);

Handling the energy efficiency consumptions of the building;

Extending the use of *AI* elements use to control the window blinds, energy consumptions monitoring, command/verification of the state of the user driving elements by using GSM;

Implementing the new defining concepts for the *„intelligent house"* including the one regarding the community integration;

Using heat pumps as clean and efficient contribution to the energy consumption.

The diagram of the solar heating system for hot water production and floor heating using a heat pump is given in Fig. 1. The system has been installed at NESL – Agigea Test Site Facility, for the Ecological House.

From the preliminary economical analysis of the HEAT PUMP system to be installed at the Ecological House in Agigea resulted an economy compared to a system using GPL heating system and also compared to an oil based heating system, over 10 years of operation.

Calculated values of heat pump parameters are:

- Caloric Power = 8,26 kW
- Electric Power = 1,86 kW
- And COP = 4,45
- Parameters of the PV system:
- Performance Ratio = 75%

- PV Power = 600 W
- Inverter SB700 efficiency = 95%
- Solar thermal average collector efficiency: 60%

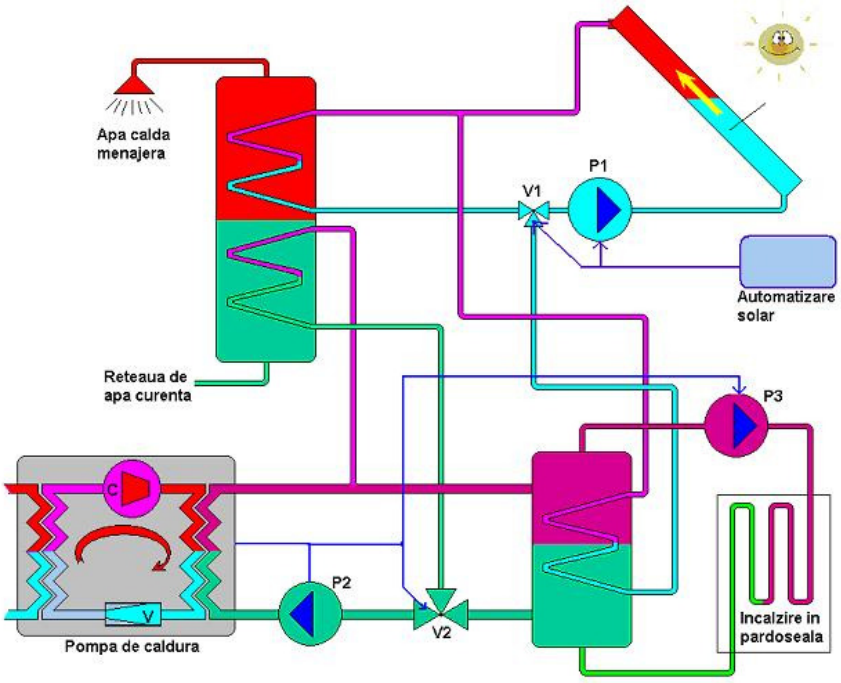

Fig. 1. Tandem system solar/heat pump: hot water and floor heating

Fig 2. Floor heating system. Polystyrene sheet.

Fig 3. Heat pump. Source distribution system.

3. Conclusions

The management system of the intelligent house ensures the optimization of the consumptions, the functionality efficiency, reserves usage, energy conversion and informational and communication integration. The ecological and functional integration of the house in the environment creates an important advantage, through the permanent control of the integration parameters and through their permanent perfectioning.

The intelligent house opens the way of elaboration of standardization applications in the field, with remarkable economic benefits, in permanent perfectibility conditions.

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