

Optimize energy supply and energy use in DTU-Solar Decathlon House, with emphasis on benefits of using PVT compared to PV

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ABSTRACT

It is useless begin with a list of numbers telling how much energy our society uses, how many tons of CO₂ produced every second to try and scare society and hope that everything suddenly change. People won't change anything themselves if they won't really want it. And the message of our project is to build an efficient, inexpensive and friendly house with sexy design which people simply will want.

The Solar Decathlon Europe is an international competition organized by the Ministry of Housing of the Government of Spain. During the final phase of the competition each of 20 university teams assembles their house in Madrid in Spain, where the houses are open to the general public, while undergoing the ten contests of the competition, reason for which this event is called Decathlon.

Apropos. Key purpose of this Master thesis is to optimize energy flows, decrease energy use in the building and utilize produced energy the most efficient way. The optimal energy solution must be found with a respect both to competition rules but also to live of the house after the competition.

In the Solar Decathlon house the only energy source is the sun. But there are several sources of energy use (heat pump, fans, pumps, lighting, dishwashing, cooking, washing, etc). There is often a mitchmach between the time of energy demand and supply. The project will optimize energy balance through test of PV and PVT, theoretical calculations, energy certification of the house and measurements on the built Solar Decathlon house at DTU campus.

A strong emphasis is paid to innovative and astonishes Scandinavian design for equipment consuming energy. ASKO HWC appliances use heat instead of electricity as a main source of energy. These brand new products can save up to 85% of electricity meanwhile the free heat is generated in solar thermal panels.

Seldom used PV-T technology establishes positive electrical energy balance with surplus higher than 10kWh per 12 days. Significant growth of efficiency of electricity generation is caused by cooling the cells to optimal temperature by system of embedded pipes on the backside of photovoltaic panels.

To increase the energy autonomy of the Fold house a concept using electro-mobile as a battery backup is developing in collaboration with several companies.

Low pressure losses thermal part with Tichelmann connection is using drain back tank system. This clever combination allows usage the same system with a ordinary water without any chemicals without concern of boiling or freezing risk in any climates around the world. Low energy consumption and environmental friendliness behavior is like a extra bonus.

The DTU is first time participating Solar Decathlon competition thus it is big challenge for each team member same as for associated companies and sponsors. Keep your fingers crossed...

REFERENCES

Solar Decathlon Europe, (2012), *Solar Decathlon Europe 2012 Rules V.4.0* . Madrid