

Partners

- DTU Compute
- DTU Byg
- Eurisco
- Flexgrid
- Novasol

Background

Heat losses from houses with swimming pools are relatively large. A large amount of energy is used for heating of swimming pools to comfort levels in many vacation houses. The temperature requirement for swimming pools is relatively low and can easily be reached with simple unglazed solar thermal collectors. The unglazed collectors are of relatively low cost and a heating system for pools with solar collectors can potentially be simple. There is therefore a potential of short payback periods of pool heating systems resulting in large energy savings over the lifetime of the pool heating system.

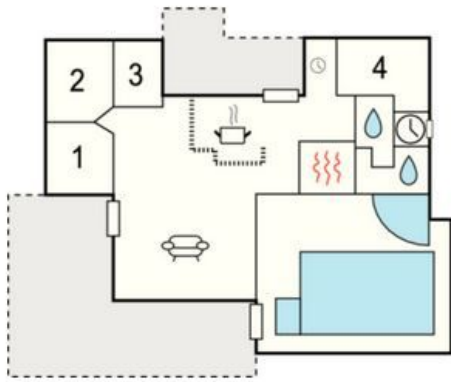
Possibilities of installing solar heating systems for indoor swimming pools are to be investigated.

Connection with CITIES WP's

- WP5: Control of the integrated system
- WP3: Buildings demand and flexibility with respect to local prosumption and flexibility
- WP1: User behavior, load profiles

Description

The considered summer house is located at Ørnebjergvej 34, Saltum in Northern Jutland. It contains a swimming pool with a surface area of 17 m² and a volume of 22 m³. The summer house is shown on the next page. The swimming pool is heated to obtain a comfortable temperature of 27 to 30 degrees.



- | | | |
|---------------------|-----------------|-------------------|
| 1. sal | 2. sal | Aktivetsrum |
| Carport | Dør | Fitness |
| Ikke til rådighed | Kælder | Køkken |
| Nord | Sauna / dampbad | 1, 2, Soveværelse |
| Spa | Stue | Stueplan |
| Swimmingpool | Terrasse | Terrasse / altan |
| Toilet og/eller bad | Trappe | |

Generally swimming pools have high heat losses due to the surface being exposed and evaporation is occurring. The air temperature is typically kept 2-3 degrees above the water temperature, to limit the heat evaporation. The pool at Ørnebjergvej is currently heated by an air to water heat pump. The heating requirements for the swimming pool will be estimated by theoretical calculations.

A number of low cost solar collectors suitable for pool heating will be identified and their potential for heating the pool elucidated. The energy savings achieved by the solar heating system will be determined. The installation cost of the solar pool heating system will be estimated and the possible economical saving will be presented.

Further the water volume of the pool can work as a heat storage for the house offering the possibility to utilize low cost electricity. In this way the cost for heating the house and the swimming pool can be reduced. Calculations will elucidate the potential cost reduction.

Available data

The total energy consumption of the summer house is currently being monitored. The energy use for heating the swimming pool is not monitored directly.

Methodology

Heating requirements for the pool

A literature study will elucidate the dominating heat loss mechanisms of swimming pools. Simulation software or calculations will be used to determine heating requirements for the pool.

Calculation models

A model of the pool environment of the case and a solar heating system for heating the pool water will be developed in the software Polysun. Gains from different solar collectors to heating the pool will be presented for relevant periods which match the use profile of the house. Calculations will determine the energy savings achieved by the solar heating system.

Solar collectors on the market

Commercial products for solar pool heating will be identified and the cost of the system will be related to the demands in the case and analysed to identify the potential for energy savings.

Installations and control

General recommendations for installation of solar collectors for pool heating are given. These include how the collectors can be installed, surface area, orientation, tilt, shading etc. Specific

recommendation for an installation for the case house is given. A simple control strategy for the solar pool heating system will be given and suggestion for control of solar heating system. Advantages of using swimming pools as heat storage will also be presented.

Cost and system economy

The cost of the solar heating system will be estimated and payback periods calculated.

System combinations

The possibilities of combining the solar pool heating system with other energy efficient or renewable energy technologies will be elucidated. Possibilities of using solar collectors for cooling purposes will briefly be presented.

Deliverables

- Report showing the economical picture
- Research report with findings

Time schedule

October 2016 to December 2016