

Energy self-sufficient, environmentally friendly sauna system based on hybrid heat and steam storage system

- Energy self-sufficient and efficient
- Environmentally friendly, climate-neutral and durable
- Pressurized water tank as energy storage system, which balances, stores and accumulates fluctuations in solar energy
- Sauna operation all year round at any time of day or night, independent of solar energy
- Generation and maintenance of high temperatures and steam volumes, without a sauna heater
- Sauna World: steam can be entered at any time and place, by sculptures or illuminated water columns

Fields of application

Operation of an energy self-sufficient and environmentally friendly sauna, whereby the energy required for the generation of heat and steam is provided by renewable energy sources. The sauna system is equipped with an energy storage system which accumulates and stores the energy provided by renewable energy sources at staggered intervals. It is thus possible to provide high quantities of heat and steam at any time for the treatment of the cabin air. This also applies in particular to Finnish saunas.

Background

It is well known that the operation of a sauna consumes a lot of energy to produce steam and heat. In conventional saunas, energy efficiency is usually increased by improved thermal insulation and/or more efficient sauna heaters. This helps reduce the amount of energy required for sauna operation. However, the electricity still needed to run the sauna is largely provided by conventional power plants using fossil fuels. And this form of power generation is harmful to the climate.

Contact

Dr. Frank Schlotter
TLB GmbH
Ettlinger Straße 25
76137 Karlsruhe | Germany
Phone +49 721-79004-0
schlotter@tlb.de | www.tlb.de

Development Status

TRL4 - Proof of function

Patent Situation

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Service

Technologie-Lizenz-Büro GmbH has been entrusted with exploiting this technology and assisting companies in obtaining licenses.

Problem

Another approach is to use renewable energy sources. However, these alternatives are subject to temporal fluctuations, with electricity from renewable energy sources usually not available or not sufficiently available during the operation of the sauna system. Using electrical energy storage systems such as batteries would also not help solve the problem, as they are cost-intensive and neither particularly sustainable nor environmentally friendly. In addition, the combination of energy conversion in the photovoltaic module, then storage in a battery and finally conversion into heat would result in lower overall efficiency compared to a thermal energy storage solution.

Solution

Scientists at the University of Stuttgart have now developed an innovative operating concept for a sauna system that avoids the current disadvantages. It thus actually allows for sustainable and environmentally friendly sauna operation that is self-sufficient, especially in terms of energy. The essential core of this technology is a pressurized water tank used as energy storage system, which is thermally charged via solar thermal vacuum collectors. Within the energy storage system, the heated water (now storage fluid) occupies the proportionally largest volume, above which is a saturated vapor phase in equilibrium with the liquid phase. From this phase, steam can be taken by means of piping and released into the sauna cabin at any point, anytime. For thermal heating of the cabin air, water is taken from the heated, liquid phase of the energy storage system and fed into a heat exchanger integrated into the wall. Cold sauna room air is led upwards from below through the counterflow heat exchanger. It heats during the process and, after passing through the heat exchanger, enters the sauna room again to heat it up to the desired temperature. Electricity required to control the system and pump operation is provided by a photovoltaic system in combination with a small-capacity battery.