

Solar heat for Walheim

SolNahWal – Feasibility study for a fourth-generation heating network system („Heating network systems 4.0“) at Aachen-Walheim



The effects of climate change are also becoming increasingly noticeable in Central Europe. In Germany, there is still a major lack of action regarding the implementation of measures to reduce the relevant emissions, particularly from heating buildings. So far, only 17 % of thermal energy requirements are covered by renewable energies. Solar heat has only played a subordinate role to date. The starting point of the project is the proposal of a citizens' initiative from the Aachen district of Walheim to realize a solar local heating supply with an underground heat storage tank within a disused quarry. Danish solar thermal projects that have been realized in the last 10 years are considered to be a model.

A large proportion of the heat generated in the Walheim district is to be provided by solar energy. In order to be able to supply the solar heat generated in the summer to end consumers in the fall and winter, a large long-term heat storage system is required. Several variants with different system technologies were initially investigated, which differed from one another in terms of their solar coverage rate. The innovative and favored solution is a heat supply concept based on complete heat generation from solar thermal energy and in which the peak heat load in winter is generated without peak load firing. The solar heat generated is preferably stored temporarily in

the daily heat storage tank (250 m³) in order to be able to provide the necessary amount of heat at any time when the heat demand in the supply network changes.

In spring, the solar-generated heat is already sufficient to exceed the maximum storage capacity of this short-term storage tank. In this case, the solar-generated heat is transferred to the parallel underground heat storage tank (50,000 m³). Heat is usually fed into this storage tank until the end of September. From this point onwards, heat begins to be discharged from the ground heat storage tank due to the falling outside temperature.



Example of long-term heat storage under construction in Denmark.

The temperature level in the network is maintained at the supply and return temperatures of 70/40 °C throughout the year. The network thus corresponds to a low-temperature network. Based on the amount of heat to be released in winter, the underground heat storage tank is designed for an annual heat supply of approx. 6.0 million kWh, which is the basis for the choice of a storage tank size of approx. 50,000 m³.

The heat is mainly generated by solar thermal energy. Three different types of collector are available for this purpose – flat-plate, tubular and parabolic trough collectors, which have been examined with regard to their properties.

A so-called “high-temperature heat pump”, which achieves a heating temperature above 60 °C on the output side, is to be used for the heating network in Walheim. For this purpose, an innovative unit with a new heat pump principle was included as an alternative to piston heat pumps, which converts mechanical rotational energy into thermal energy.

Project overview

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