

SOLAR COMPLETEET – The innovative heating solution

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Introduction

Heat pumps and thermal solar energy have a high acceptance as an environment-friendly heating system. Solar COMPLETEET is *the* solar innovation, a unique complete heating system for family houses. Solar COMPLETEET combines an air heat pump with a thermal solar collector, which is linked by the common brine circuit from the air heat exchanger and the solar collector. The thermal solar collector heats the brine from the air heat exchanger additional free before entering the evaporator from the heat pump. In this way, the COP of the heat pump is increased. This combination sets new standards with respect to technology and esthetics. It increases the efficiency of the air heat pump on a COP > 4 per year and the solar yield by approx. 25% in comparison to previous solar systems. This is a distinguished investment in the future, which amortizes itself after few years already.

Solar COMPLETEET is the main heating system for the whole house without any additional conventional heating (oil, gas, biomass, district heating etc.). The heating capacity from the heat source Solar COMPLETEET and the heat consuming building have to be coordinated well. Highly professional technicians of SONNENKRAFT will do this coordination and support.

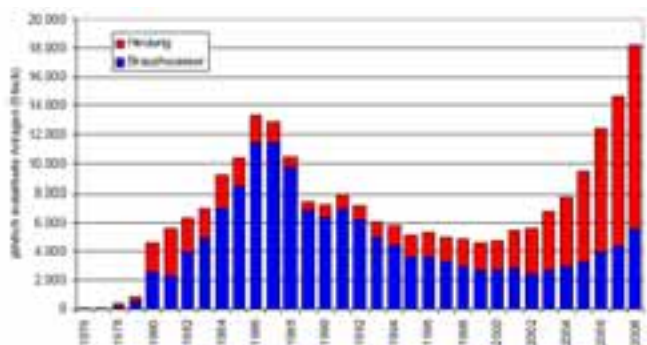
1 Development of the market

Environmental awareness in energy production and increasing energy costs are apparently leading to a conflict. Previous solar systems and heat pumps caused high investment costs. Until now, there was no coordination respectively a communication between two independent device controls. Furthermore, a trade-off referring the utilization of low return temperature existed.

In the past the development of the solar and market illustrated huge growth rates. Especially the use of heat pumps for heating systems has obviously been increased.

This leads to the assumption that heat pumps and thermal solar energy find a great acceptance at the end customer as renewable heating systems. Due to the fact, that the quality of new buildings in Europe is rising, the heating demand of these houses is not as high as 20 years ago. Many houses in Central Europe are built today on a „passive house standard“. A house in this quality has a lower heating demand than energy demand for hot water preparing. In the next years, most of the new built houses will meet demands of a „low energy house“. This means that the maximum heating demand will be between 5 and 10 kW for a one family house.

Until now, a trade-off in the combination of heat pumps and solar thermal energy still existed, but they are very complex and have no common device control strategy and no common communication as well. However, both energy sources complement one another especially at operating in low temperature heating systems.



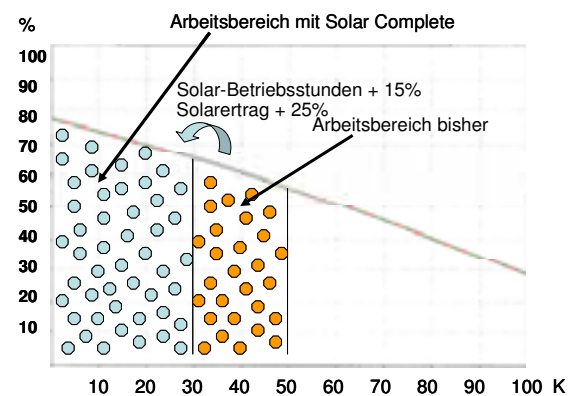
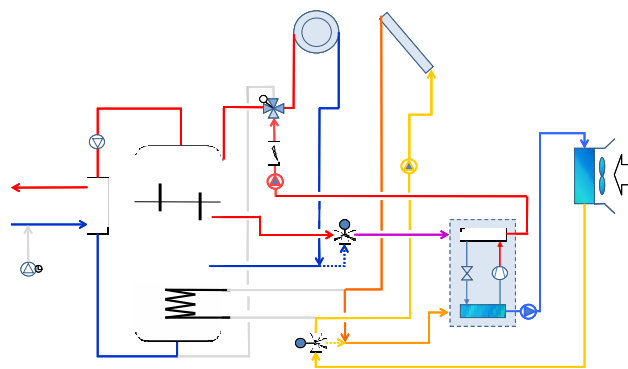
2 System innovation - Solar COMPLETE

Due to these complex requirements (see above), R&D teams of DANFOSS and SONNENKRAFT have developed the system solution Solar COMPLETE. It combines an air heat pump with the solar thermal energy. This makes use of both - an air/water heat pump and a solar plant that is connected via the common brine circuit to each other. The brine of the air heat exchanger (outdoor unit) will be brought via the solar panels to a higher temperature level before entering the heat pump. By the warming of the temperature, the COP of the heat pump is improved.

In the past solar plants could only be used if the temperature at the collector was higher than the minimum temperature in the backup tank. As Solar COMPLETE is using the common brine circuit, the temperature of the collector could even be used in the range of the outdoor temperature. Thus a higher degree of efficiency can be reached especially in winter. Through this system, the annual average of operating hours is increased up to 15% and solar output by 25%.

Another USP of this system is that the physically required process of de-icing the outdoor unit is driven by environment-friendly solar thermal energy. As solar energy is almost produced without any electrical energy, a lot of power is saved. To save even more electricity all pumps used in the system are A-rated high efficiency pumps.

To raise the acceptability of the system in densely populated areas the outdoor unit is noise optimized.



This combination is a new highlight in relation to technique and esthetics. Solar COMPLETE increases the COP per year of an air/water heat pump > 4 and the solar output by 25% in respect to conventional systems. This is an investment into the future that amortizes after a few years.

2.1 Solar COMPLETE is complete because of:

- No space has to be wasted for storing wood or pellets as in conventional solid fuel systems. Furthermore, no chimney is required for a conventional boiler.
- Expensive connection fees for systems based on gas or district heating must not be paid.
- Earth movement and long lasting permissions for installing a ground heat pump are not required.
- The complete system (heat pump, solar plant and the heating circuit) is operated and monitored by one device control.
- De-icing of the outdoor unit is done by solar energy.
- The preparation of warm water is done accordingly to ÖNORM B 5019 by a fresh water module that guarantees a perfect hygienic water quality.
- The annual performance of the heat pump could be improved up to 5 if the collector surface is extended. As the annual COP is higher than a conventional heat pump, subsidies for the system are guaranteed.

