

SPORTSOLAR & SOLARBOOSTER

Concept

Being in winter

a skating rink with waste heat recovery

Being in summer mode

a solar & heat pump system



**Sports Center
Kolobrzeg / Kohlberg
(Poland)**

The city Kolobrzeg with about 25,000 residents has additionally about 25,000 in the spa facilities, and furthermore in summer 60 000 visitors per day. Therefore, Kolobrzeg has its sports facilities for its residents and guests developed continuously. The first extension part was in 2000 the indoor



swimming pool with the conference center. 2005, decided the city, to expand the sports complex by a sports hall (especially for front archery, a sport in Kolobrzeg is a leader), a sports grounds and an ice-skating.

The concept of SOLKAV, of a **sports ground in tartan style; which can be used in summer as a sports field** and in the **winter as a skating rink**, convinced.



Especially the fact to use the waste **heat of the ice rink** in the indoor pools and after the ice season, to use the sport ground field for **solar heating** of the pool for energy.



The **skating rink in winter operation is energetically neutral**, as the waste heat significant part of the related district replaced one. (Complete the energy for the swimming pool and a large part of the warm water). In **summer operation, the hot water pool and the heated** - and about **75% of the energy** of the solar system or in combination with the heat pump provides economical.

The project was the **European Union** with a third of the investment support.

The sports complex Kolobrzeg has following data:

- 600 m² indoor pool area (including whirlpool) with three filter circuits
- 30 m² shower water demand per day.
- 800 m² heated indoor swimming pool rooms
- 2500 m² other areas of the complex
- 2.2 million kWh consumption pa district heating
- Heating cost per kWh from 4.5 cents (2007)

Solkav alternative energy systems, heat pump here has a **combination of solar absorber system and** rebuilds, which following characteristics:

Technical data of the system are:

- 1,800 m² solar absorber sports facility
- 3,200 m² solar sports ground (without absorber surface)
- 660 kW cooling capacity at -15 ° and 47 ° evaporation condensation
- using a redundant 3 screw system with three independent cooling circuits.
- 1,000 KW heat output in the summer fashion (about 0 ° and 47 ° evaporation condensation)
- Double Pump Station at 180 cubic meters glycol-water mixture flow
- Storage tanks with 10 m³ capacity
- Installation in a separate container technology
- Remote Control-enabled controller, which enables online recruitment and diagnosis

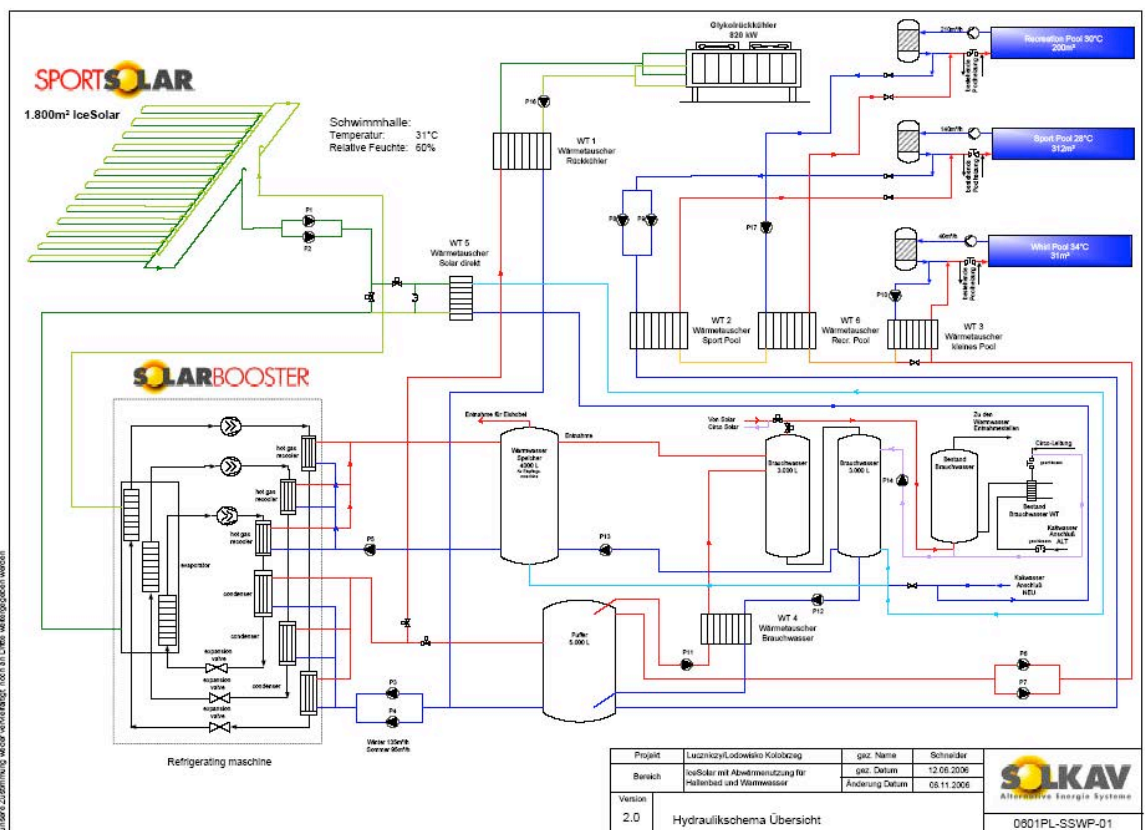
The **specific requirements for refrigeration** is the climatic situation of Kolobrzeg with warm winters, a lot of winter rain and wind loads averaging 25 km / h and wind peaks for hours of 60-80 km / h. Although the installation is on an open field and thus very susceptible to wind the Ice surface survived all circumstances.

Summer mode:

- If the solar absorber used around the Clock:
 - As a solar energy source when the sunlight is sufficient
 - The air source heat exchanger, combined with absorption of diffuse radiation
- The heat pump increases the heat of the primary energy absorber to bath water flow level (about 45 °). Hot water is heated up partially. As distribution device to the various purchasers a buffer system was built. As refrigerant R-134a is used, the COP's good to about 50 ° to ensure for example: evaporation: 0 °; condensation: 47 °; condenser outlet: 42 °; heating level-COP: 4,0.

Winter mode:

- The absorber surface converts to be the ice surface. The ice quality is excellent and the ice hockey league approved recognized. (See above).
- The waste heat used as follows:
 - Warming of the three indoor pools
 - Shower water heat up to about 42 °
 - Provision of the ice surface processing water
- Disposing of surplus heat by an air capacitor with about 800 kW heat output.



The whole installation consist of:



The SPORT SOLAR floor is made from

- EPDM (<pure, no <recycled material) - PU mixture constructed permeable built in two layers -
 - Layer 1: black and absorber tube cover -
 - Layer 2: in color (in the present case: grün - schwarz -green - black
- Construction about 18 mm in total
- Underbody: 10 cm; gravel layer of insulation and then water permeable asphalt

Ice & Solar field



In the final state the system is filled with glycol / water mixture.

Finally is installed in Kolobrzeg

- 1.800m² Solkav Sport Solar Absorber -
- further 3,200 m² Solar Sports Solkav without absorber -
- Collecting piping according to Tichelmann standard
- DA diameter PE 220 -
- Operating pressure in the system: 0.8 - 1.2 bar -
- On the surface, and then glued in layers

Technology Container



The technology is installed

- in a container with a
 - Floor area of about 60 meters -
 - and a height of about 5 meters housed -
- The connection into the swimming pools is done with separate heat exchangers with 3 ° Δt.
- Between the container and the art indoor running underground optical cables

Compressor system SK 800



Compressor system SK 800

- 660 kW cooling capacity at -15 °
- evaporation and condensation at 47 ° -
- using a redundant 3-screw compressor system with three independent cooling circuits -
- 1200 KW thermal power in summer fashion
 - (At 0 ° evaporation and 47° C condensation COP >>> 4.0)

Controller





SOLKAV 3000,

- regulates the entire system -
- with remote control function
- (Optional visualization module is also a possible)
- Cabinet system with all necessary safety equipment and CE Approvals -
- The controller was programmed by Solkav; between "summer" and winter is by remote-control switch -

Pumps, heat exchangers



Centrifugal pumps and stainless steel plate heat exchanger

- All heat exchangers and pumps are water quality and quality consistency glycol run in -
- The heat exchangers are designed for low Δt (4 °) -
- The entire hydraulic design was ready and prepared Solkav made by -

Buffer - and hot water storage system



The waste heat in the Ice operation mode

- is collected in puffer tanks and than distributed into the pools
- preheats the hot water in cascade mode.

In Solar & heat pump operation, the solar or heat pump energy is distributed by the same system. The energy is not waste heat but produced "extra" for the heat use.



For the sports solar surface and the Solar Heat pump combination SOLKAV has to patents in place.



The installation supplies in summer mode

- Heat for the indoor pool completely –

- Shower water directly and in combination with the heat pump.

In winter mode the installation heat up with the waste heat

- the indoor pool water more or less completely
- the shower water partially
- the hot water for making ice (about 50 °)

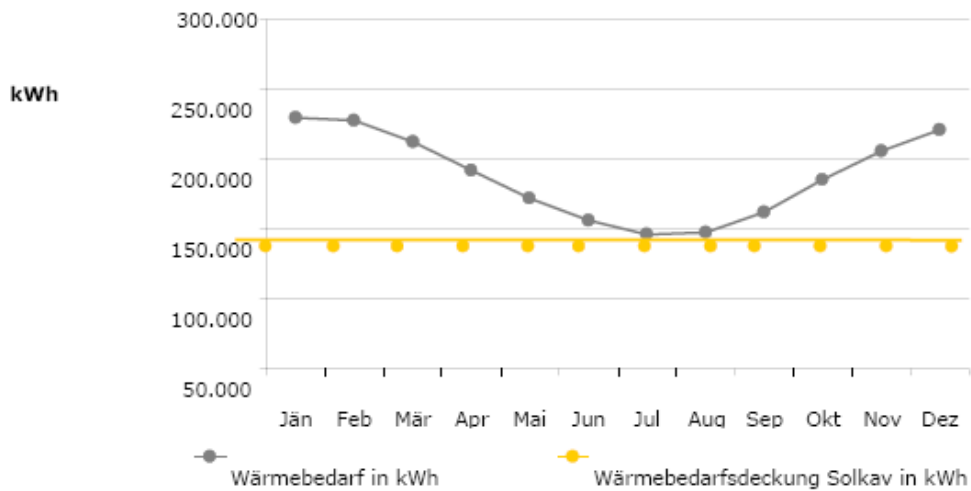
The excess heat is disposed by a roof condensor. Considerations, the football field next door in the winter to keep playable (to heat) are in progress.

A possible outdoor pool could also be additionally (solar) heated without problems.

The installation covers an **annual average of** about **55%** of the **heat** need of the whole Indoor pool area. A **90%** coverage can be achieved in the peak month like July and June (In "Ice month" still about **40% - 45%** of the heat needs are covered. (see chart below).

Heat Demand of the indoor pool Kolobrzeg and supply from SOLKAV system:

**Wärmebedarf und solargestützte Bedarfsdeckung
Anlage Kolobrzeg**



The district heating demand is reduced by 45%. Kolobrzeg saves on energy costs p.a. **approx 17,000 EUR** and **operates in addition** to the energy savings a skating rink **without additional energy demand**.

The system is very well accepted visitor side and comes to about 35,000 Ice Rink guests per annum

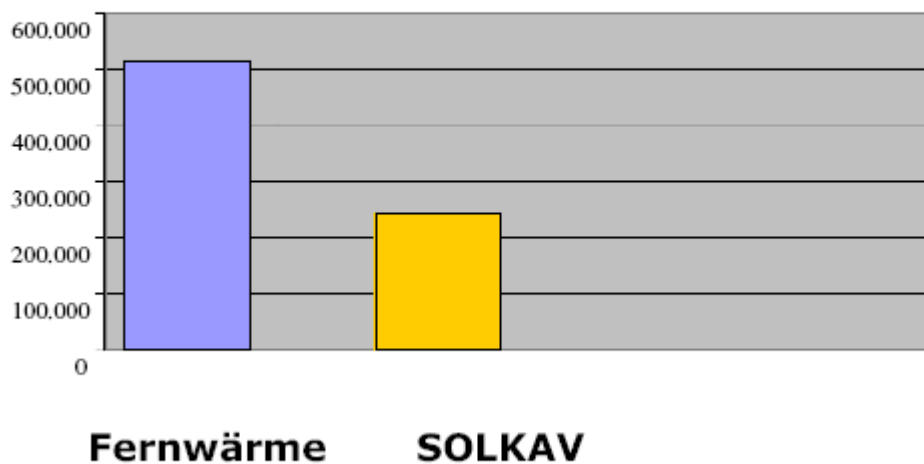
During the summer of sporting facilities available:

- Tennis
- Badminton
- Basketball and
- Football

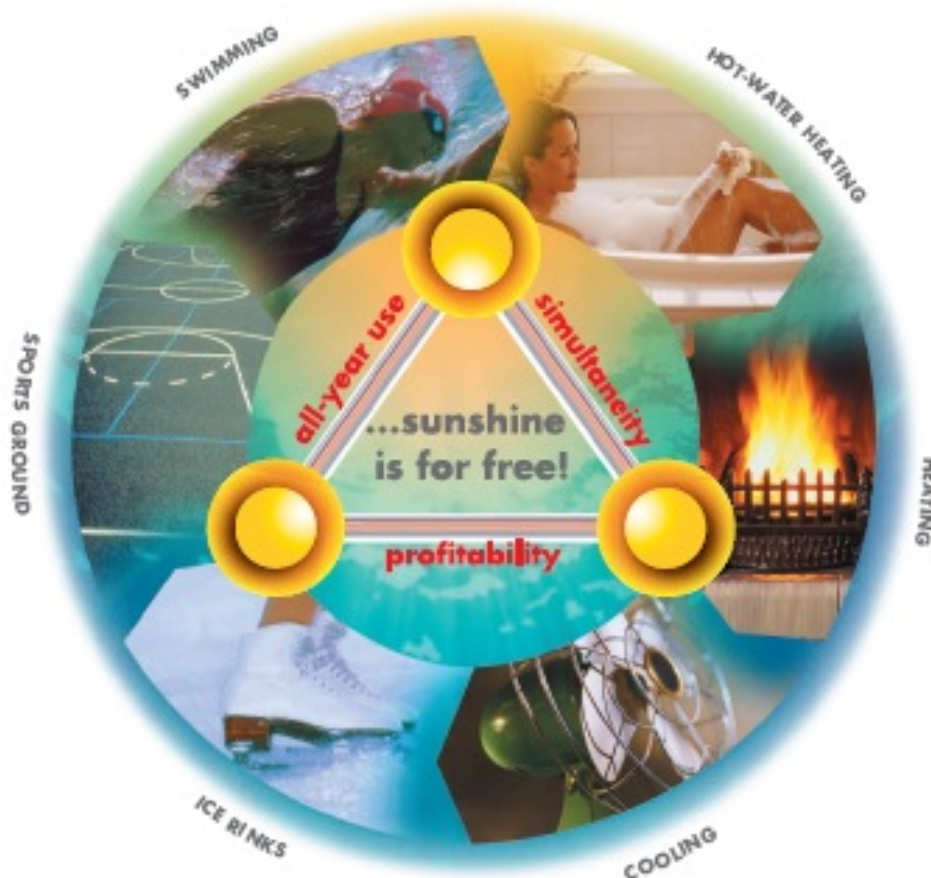
The system also significantly reduces the **emissions of CO²**, the city Kolobrzeg. Giving the district heating plant is heated calorically, is the **Co² emission relation** between electric energy and district heating at 1:2. The average heating level-COP is 4.0.

This reduces any thermal unit, supplied with the solar heat pump station, the **CO² emissions to the extent of the supply by 50%**.

kg CO² VERBRAUCH p.a.



„All In One“ Energy Concept



Our „All In One“ energy concept transforms any single solution (swimming pool, ice skating, heating, etc.) into an integrated **economical investment**. The systematic and simultaneous use of “waste energy” covers your all-year requirement for thermic energy (heating, air conditioning, hot water, etc.). Then the sun really shines **for free**.

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