



Solar Process Heat Installation

Hofmuehl brewery in Eichstaett, Germany

Company description

The Hofmuehl brewery is located in Eichstaett, Germany. It is a medium-sized, privately owned company with a very long tradition, since it was founded in 1492. The brewery produces with currently 63 employees about 80,000 hl (8,000 m³) beer per year, two thirds of that within the summer months. The energy demand for heat generation is 2.2 MWh/year, the electricity consumption is 0.85 MWh/year. The company runs a hot water supply network fed by a conventional oil water heater.



Picture 1: Location of the brewery below a castle in Eichstaett, Germany. The blue evacuated tubes are clearly visible at the right bottom side of the picture. Source: M. Wutzler, TU Chemnitz

Reasons for installation

The company had already worked on the reduction of its energy demand for more than ten years, before the solar thermal plant was installed. Together with the company Kronos AG, Hofmuehl developed a new, environmentally friendly brewing process.

This new process reduces the primary energy demand of the brewing by 60 %.

In the food sector customers usually show a high interest not only in the quality of the products itself, but also in the sustainability of the production. The company is selling one of its products with the label "Solarbier" (meaning "sun brewed beer"), which is only given to companies making sure that this product is completely produced by renewable energies. At the background of solar brewing as a unique selling proposition, among others the possibility to get this "Solarbier"-label was one of the main motivations of Hofmuehl to install the solar thermal plant.

But also from a technical perspective, breweries are among the most promising candidates for solar process heat since, as explained above, two thirds of the heat demand occur within the summer months. Furthermore, at least in SME breweries, the brewing process itself or e.g. the bottle washing can be adapted to the solar gains to a certain extent, since these processes anyway require lots of manual work.

Technical description of solar thermal installation

After previous testing of the frost-protection of the collector field, the system started full operation in July 2009. The collector field of the solar plant consists of 736 m² evacuated tube collectors with CPC reflectors (compound parabolic concentrator) and two outside mounted solar buffer storage tanks with a volume of 55 m³ each, isolated with 50 mm mineral wool.

The collector field is orientated 52° out of the south direction towards east and the collectors have a slope of 23° or 26° respectively. The three processes supported are bottle washing (temperature > 86 °C), heating of brewing water (between 80 °C and 60 °C) and heating of the production site itself (above 50 °C).

The system is a pure water system, meaning that the solar loop is run without glycol, which has additionally to technical advantages also the benefit of reduced environmental impact and lower electricity consumption in normal operation mode. On the other hand, in winter the solar loop has to transport heat from the storages to the collector to ensure anti-freezing protection of the solar field.

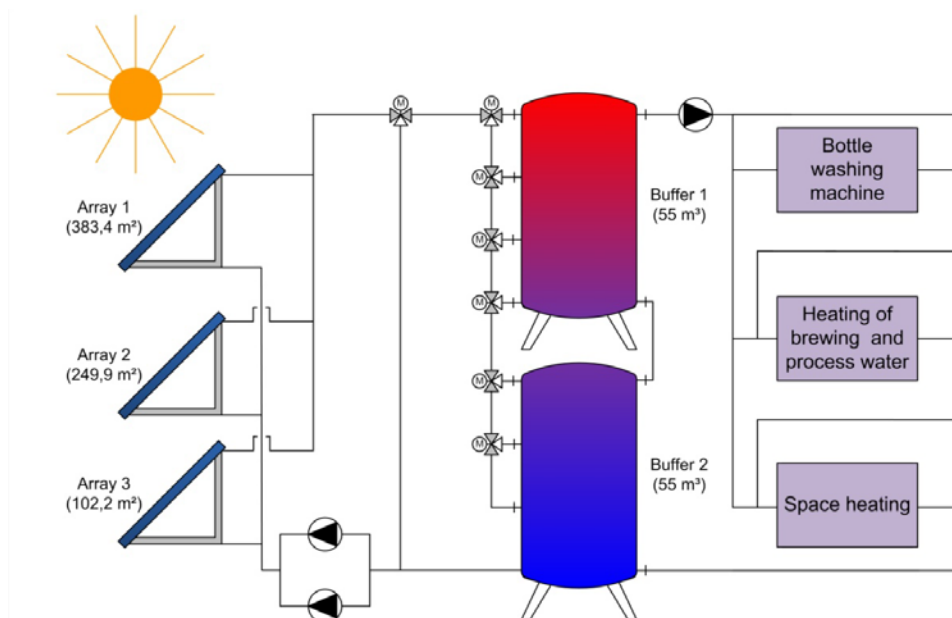


Fig. 1: System design scheme of the installation (simplified). The industrial processes are usually connected in series to make good use of the generated heat and to maintain the stratification in the storages. Source: M. Wutzler, TU Chemnitz

The overall costs for the whole installation were ca. 1.4 Mio Euro. The German Federal Ministry for the Environment, Nature Conservation and Nuclear Safety funded the project within the program "Solarthermie 2000 plus" with a grant of 50 %, so that investment costs of 740,000 Euro remained for the brewery. The installation is monitored by TU Chemnitz, Germany.

Results & conclusions

As shown in fig. 4, the stratified loading of the serially connected storages is ensured by motor-driven valves. On the discharging side the system offers the possibility to use the return flow of one process (e.g. the bottle washing) as an inlet of the next process (heating of brewing water). This concept ensures a high energetic use of the generated heat and preserves the stratification within the storages.

Since the collector loop is operated with pure water, an active freezing protection is necessary. Hot water has to be pumped from the storages to the collector field when the temperature in the field gets too low. For the freezing protection, in the winter 2010/2011 no additional heating of the buffer storages was needed. That means that the energy from the storages used for freezing protection was completely generated by the collectors during the day. Using this energy for freezing protection was non-hazardous in this case, since in winter the storages did not reach a temperature level at which a process could have been supported. This way the anti-freezing protection quite likely did not lead to higher thermal losses of the system.

Pictures



Picture 2: A part of the collector field. The two solar buffer storages are located on the right side of the building, directly beside the high storages for raw material. Source: M. Wutzler, TU Chemnitz



Picture 3: A part of the collector field. View from the direction of the solar buffer storage tanks. Source: M. Wutzler, TU Chemnitz