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BADEN-WÜRTTEMBERG

100 Pioneers for Efficient Resource Management

Examples of excellence in Baden-Württemberg from all parts of industry

**Best practice case of
WERMA Signaltechnik GmbH + Co. KG**

WERMA Signaltechnik
GmbH + Co. KG
Rietheim-Weilheim

Consistent, sustainable use of process heat

WERMA Signaltechnik GmbH + Co. KG, Rietheim-Weilheim

Technology/Process Technology:

Mechatronics, manufacture of electronics and plastics

Measure:

Intelligent scheme for process heat utilisation in new factory buildings

Background and objectives

WERMA Signaltechnik is one of the world's leading manufacturers of optical and audible signalling devices. As a result of its successful corporate development, the company decided to expand its production capacity. When planning this new factory, the existing processes and procedures were first critically scrutinised as part of a productivity analysis and the possibilities for future optimisation were laid out. The increase in production space allows for the production of additional new and innovative products and establishes a basis for further increases in productivity.

The planning revolved around the flexible use of the new premises and the development of a completely new energy policy. The aim is to consistently and continuously re-use the waste heat generated during production, which accumulates both in the water circulation systems and in the ambient air.

Challenge

The new factory was to be connected directly to the existing buildings with a seamless continuity of the existing integrated factory principle, i.e. short logistics routes despite the considerably larger areas.

From the very beginning, WERMA pursued the vision of operating the new factory without heating systems that rely on fossil fuels. Owing to the building technology already installed in the existing facilities, it was not previously possible to store and use the waste heat which is primarily generated by the plastic injection moulding machines.

The new and existing building technology had to be closely linked and networked in

order to use the waste heat. The cooling capacity for the various processes, such as tool and hydraulic cooling as well as room cooling for electronic processes, was also to be generated from the waste heat. In order to guarantee the use of waste heat present in the ambient air, particularly the heat released by the injection moulding units, it was essential to completely redesign the heat recovery of the new ventilation systems.

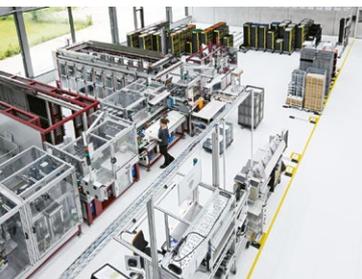
Idea

The heating, cooling and building technologies were to be designed in such a way as to achieve the most efficient overall use of electrical energy required to operate the processes. The waste heat generated in the production process was to be stored and used as heating or cooling energy as required. The temperature differences between day and night as well as weekly fluctuations were also to be taken into account.

Implementation

WERMA already communicated concrete ideas and expectations for sustainable design concepts for the new 4,100 m² factory building when selecting the planning offices for the building technology. These ideas had to be of utmost importance to all involved parties. The implementation was carried out in collaboration with the planning office K+P GmbH & Co. KG from Tuttlingen.

The two process cooling circuits for tool and hydraulic cooling of machines with temperatures of 17 °C and 27 °C are supplied via water tanks with a volume of 40 m³ each. The heat bound up in these circuits is transformed to a higher temperature level by heat pumps and stored in large water buffer tanks



Highly automated assembly of signal elements

Picture on the right: Media distributor directly on the machine (cooling, compressed air, power, data, exhaust, signalling)



Störung
Kein Auftrag
Rüsten
Betrieb
Maschine

Behälter leeren
Vare fertig
Logistik

PLY

PCE

Labotec

Lab



Storage system for cold (left) and heat (right)

(heating 16 m³, cooling 12 m³). The respective buffer storage tanks are used depending on heating or cooling requirements. Since the reversible heat pumps can generate both heat and cold, a particularly high coefficient of performance is achieved. This coefficient is estimated to be greater than seven. In addition to cooling the processes, the cold water is also needed to cool the electronics production facility that has a high internal heat load and an area of 700 m². The room temperature which may not exceed 24 °C would traditionally have to be maintained by using an elaborate cooling system. This system can now be completely eliminated.

As planned, heat generation using fossil fuels can be largely dispensed with in the new factory. It is only required in the event of a restart of operation, e.g. after Christmas or in extreme temperature conditions. The compre-

hensive storage technology makes it possible to compensate perfectly for the distinctive short-term temperature fluctuations in the region. Each room heating system in the new building and also for the most part in the existing buildings is supplied by the heat storage tanks (50 °C). In addition, WERMA decided to equip an area of approximately 1,000 m² with concrete core activation. This design feature makes it possible to support any heat demand at a low temperature level from 20 to 27 °C, which can usually be supplied directly by the hydraulic cooling circuit.

Until now, it has not been possible to make practical use of the heat bound in the ambient air in the injection moulding production building. Heating of fresh air via the installed heat recovery system (room in room) is very rarely required. It was therefore decided to operate the existing neighbouring building using the same ventilation system and to heat it using the waste heat from the new building. The waste heat from the process-related exhaust equipment is also fed into the heat recovery system. The measures described above were accompanied by a major expansion of the building management system (BMS). This design now supports possible control mechanisms, optimisation of use and ongoing target/actual comparison (monitoring). Finally, the entire new building was equipped with energy-saving LED lighting systems that also adapt automatically to the natural lighting conditions using control technology.

Savings

By investing in the waste heat recovery network and the well-developed heat pump and storage technology adapted to future requirements, investments in further fossil fuel heating systems were completely avoided. WERMA anticipates that the entire new building with a floor space of 4,100 m² can be heated almost all year round by using only the waste heat. This avoids an estimated additional consumption of heating oil of around 30,000 l per year, which corresponds to 78 t of CO₂ emissions. In addition, operation of the former compressor cooling unit can be dispensed with. By avoiding the use of additional cooling systems, for example during peak demand and for cooling in the electronics department, and by using modern LED lighting technology, additional power consumption of up to 100 MWh per year was avoided. Finally, the



40,000 litre cooling tanks for plastic production cooling circuits

intelligent factory planning also allowed production processes to be made even leaner. This has contributed significantly to savings in space and time and to an improvement in the added value and logistics processes in production.

Learning objective

In order to implement a sustainable energy concept and the use of process heat, it is necessary to clarify the requirements for future-oriented building technology very extensively in the run-up to concrete construction planning. It is therefore necessary to involve specialists and partners in the project as early as possible. It was also important to know the current and future company-specific process landscape in detail and to assess the current situation. This involved detailed measurement and evaluation of the amounts of energy involved at the time.

In order to legitimise the higher investment costs for this energy concept, detailed plans were constantly questioned. The expansion of the plant was thoroughly prepared from the very beginning, e.g. the operation of a combined heat and power plant (CHP) and future local heating lines.

WERMA would like to set another positive example for other companies with its own attitude towards sustainability. This is why WERMA participates in events and is happy to take interested parties on a guided tour of the new factory.

Company

WERMA has been developing and manufacturing optical and audible signalling devices for over 65 years. The Swabian company sets standards technologically with its future-oriented innovations. More than 350 employees work at their eight locations worldwide. WERMA signal devices meet the highest quality standards and have won many design awards. They make working environments safe and processes efficient, on machine or plant equipment, in the factory hall or around the building.

WERMA manufactures plastic parts, electronics, tools, devices and systems itself – guaranteed Made in Germany. As a global innovation leader, WERMA invests heavily in the development of new products. With its extensive sales network, the company is present on all international markets.



New plastic production with media stations



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The project "100 Companies for Resource Efficiency" was initiated by the Alliance for Greater Resource Efficiency between the leading trade associations of the state of Baden-Württemberg and the state government. The alliance includes the Ministry for the Environment, Climate and the Energy Sector Baden-Württemberg, the State Association of the Baden-Württemberg Industry (LVI), the Baden-Württemberg Chamber of Industry and Commerce (BWIHK), the Chemical Industry Association of Baden-Württemberg (VCI), the Mechanical Engineering Industry Association (VDMA) for Baden-Württemberg and the Electrical and Electronic Manufacturers' Association (ZVEI), Regional Office of Baden-Württemberg.

The project was carried out jointly by the Institute for Industrial Ecology (INEC) at Pforzheim University and the Baden-Württemberg State Agency for Environmental Technology. The examples presented were carefully examined and selected by a jury of members of the participating alliance partners.

The initiative shows how resource efficiency can be implemented and the benefits associated with it. It supports the previous activities on resource efficiency in the country with concrete, presentable results and brings them to the operational level. This motivates other companies to participate.

The 100 examples of excellence have a strong impact beyond Baden-Württemberg and underline the efficiency of the local economy. The aim is to highlight and present the examples of excellence in a representative, high-profile and exemplary way.

Further information about the project:

www.100betriebe.pure-bw.de

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The pages are an extract from the book

Mario Schmidt, Hannes Spieth, Christian Haubach, Christian Kühne: 100 Pioneers in Efficient Resource Management – Best practice cases from producing companies. Publishing company Springer Spektrum 2019.

www.springer.com/de/book/9783662567449

The work on this project was funded by the Ministry of the Environment, Climate and the Energy Sector Baden-Württemberg (funding number: L75 17001).



Baden-Württemberg

MINISTERIUM FÜR UMWELT, KLIMA UND ENERGIEWIRTSCHAFT