

Cooling system creates heat energy for free

With implementation of a energy management system Goletz achieves high savings

Together with the GWK Gesellschaft Wärme Kältetechnik GmbH, Kierspe, company Walter Goletz GmbH, also based in Kierspe introduced an energy management system and benefits now from high energy savings. The injection moulding company, which works for the automotive, electrical and electronics industry combined the so far two separate plant into one newly built plant in Kierspe in 2008. By installing a new, energy efficient cooling system the company reduced their energy costs by over 100.000 EUR per year. A further objective was the heat recovery: Goletz renounced a heating system and uses the heat of production machines and peripheral units instead. This amounts to an additional annual saving of over 20,000 EUR. The total investment pays off, due to the immense energy savings, after 21 months.

Walter Goletz oHG started with small injection moulding machines up to 250 kN clamping force in 1970. Today 84 employees work for Walter Goletz GmbH in two- and three shift operations. The clamping forces range of 39 injection moulding machines now stretch from 250 to 8000 kN with parts weights from 0.05 g up to 2.5 kg. Five laser machining centres, three tampon printing facilities and a flat bed coating unit complete the machinery equipment. In addition, the processing of network structured and galvanised refined materials, the two components injection moulding, the production of hard-soft connections, the metal insert technology and the metal contact injection, reflect the high demands, placed on functionality and surface quality of the produced parts and assemblies.

In connection with the plant merger in Germany two years ago, Goletz built a new 6,000 m² build-

ing, which is characterised by an innovative building services engineering. The newly installed GWK central re-cooling plant aims to discharge the waste heat, which is generated during manufacture of plastic moulded parts, in an energetically optimised way. The fundamental statement is: the lower the required cold water temperature has to be, the higher the refrigeration system operating costs will be. A re-cooling plant was designed to meet this statement. It provides two different cold water temperatures (2-circuit cooling system: 15 ° C mould circuit and 30 ° C hydraulic circuit; see background box). Another objective was the heat recovery: waste heat of production machines and peripherals is used by the GWK heat recovery system usefully for heating purposes in the form of a floor furnace, thus reducing operational costs. The entire area of the base is used as an area energy storage unit. To heat the floor in the entire manufacturing and storage area, a 23 km long floor heating cable network was installed. A heating and cooling ceiling was installed in the administration building.



Large Windows and domes provide a high proportion of daylight in the new production hall at Goletz

Hendrik Baukloh, head of quality control at Goletz, informs us in an interview extensively about the background and the situation before and after the implementation of the energy efficiency project.

What was the situation before the project was implemented?

Hendrik Baukloh: Originally there were two plants in Kierspe: plant 1 in the Osemundstraße and plant 2 in Börlinghausen. This resulted in high logistical costs. The heating systems were operated with gas and there was a 1-circuit cooling system with energy-intensive chillers for injection moulding machines in each plant.

What was the trigger for your project and which goals did you have in mind?

Baukloh: We had to expand our production and storage capacities, reduce energy costs and reduce logistics. We combined both plants in one with over 6,000 m² and developed an energy-efficient concept to remain competitive in the market. The heating requirements should be covered as completely as possible by heat recovery.

How did you proceed during planning and implementation of the project?

Baukloh: From the first construction planning in January 2008 on, we worked closely with the architect of GWK. A very close cooperation, which used the GWK project study for an optimised cooling system with heat recovery, followed. This was the driving force behind it: the competitive market requires constant thinking about how to reach - through more favourable production processes and improved quality - an advantage over competitors. A measure not to be underestimated is cost reduction, starting with the central cooling system. The GWK project study selects relevant cooling systems and their operational parameters for specific applications and compares the expected

respective operating and investment costs. From the results of the project study the GWK engineers design, calculate and plan complete solutions from one source. This was also the case for us.

How did the measures affect your business?

Baukloh: Generally one can say that the new construction with the energy-saving cooling system reduced energy costs enormously. The total annual electricity consumption decreased from kWh 2.574.900 to kWh 1.689.279, which amounts to a power saving of 885.630 kWh per year (34%) and a reduction in energy costs by 106.275,60 EUR per year. These results were recorded in energy management and read off the electricity meter. Furthermore we now receive heat for free, due to the abdication of a heating system with production heat used instead. Shown in figures we have fuel savings of 74.402 kWh, which equals to saving of EUR 20.478,04. Both savings added, we reach a considerable savings of 126.753,64 EUR per year. Comparing this innovative solution with a conventional solution shows that the energy-efficient cooling system with heat recovery has a share of 58% (73.453,28 EUR) - stated in the energy management reporting - of the total energy savings. Power consumption was reduced in this case from 600.842 kWh to 206.360 kWh, which equates to savings of 66%. Fuel consumption has additionally been reduced completely from 605,000 kWh of gas to 0 kWh.

What is the balance sheet after the first year?

Baukloh: We have achieved considerable energy savings with our new building. The power consumption of the cooling system was reduced by 66%, heating costs were reduced by 100%. This is the balance sheet that we can draw after one year of experience, including all weather conditions. That impressed even sceptics who could not imagine a new building without furnace. The additional

costs of 25,000 EUR arising within the framework of the project have paid for themselves after only two and a half months due to the immense energy cost savings. The total investment is - thanks to the enormous energy savings – paid for after only 21 months. Finally one can say that results obtained correspond with the specifications of the GWK project study. This underlines the competence and experience of GWK, from planning to implementation. The successfully implemented project can surely and safely be transferred to other companies.



In case the outside temperature is lower than the return temperature from the consumer, the warm water is pumped to the Hermeticool units arranged on the roof of the building and emits the absorbed energy into the cold outside air

The central cooling system provides two different cold water temperatures: the 15 ° C-cooling circuit for the mould circuit is accomplished through a water cooled, energy-saving industry cold water set with continuous power regulation and electronic expansion valve. The cooling circuit with 30 ° C for the hydraulics is fed by a GWK hermeticool-hybrid unit including water distribution system for the adiabatic cooling of intake air.

Function of mould circuit 15 ° C: The operating pump pumps the cold water from the cold-water

tank and delivers it to the injection moulding tools. The cooling water removes the heat from the consumers and flows into the warm water tank. The evaporator pump pumps the warm water to the evaporator and the absorbed energy is transferred to the refrigerant. The refrigerant is condensed inside the compressor, and transfers the absorbed energy in the water-cooled condenser to the 30 ° C circuit. Then the cold water flows back into the cold water tank.

In case the outside temperature is lower than the return temperature from the consumer, then the hot water is pumped to the outside (free cooler on the roof of the building) arranged hermeticool unit and the absorbed energy is released to the cold air. Depending on outside temperatures, the hermeticool unit takes over the complete or partial cooling function. Only if the outside temperature exceeds the return flow temperature from the consumer, the chiller plant is necessary.

Function of hydraulic circuit 30 ° c: The operating pump pumps the cooled water from the cold water tank and delivers it to the oil coolers of the injection moulding machines. The cooling water removes the heat from the consumers and flows into the warm water tank. It is pumped by the hermeticool pump to the hermeticool hybrid unit and cooled off by the cold outside air. The hermeticool hybrid unit uses the air cooler principle in a closed circuit without loss of water. To achieve a water temperature of 30 ° C, the intake cooling air must - at temperatures above 25 ° C - be cooled in an adiabatic flow. This is achieved by using hollow cone nozzles that atomise water and enrich the intake air with humidity thus cooling it down. To increase cooling efficiency, the hermeticool in the mould circuit is switched over to the hydraulic cooling circuit.