BOSCH
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Compressed air for Bosch supplier Hechinger

Reference Report Bosch Industrial

Compressed air and heat systems reduce costs and CO_2 emissions

The company

The medium-sized company group Hechinger grew steadily since its foundation in 1953 and the traditional location in the middle of Villingen-Schwenningen did not offer enough space anymore. Therefore, the company Helmut Hechinger GmbH & Co. KG built an impressive new building of about 15,000 m² with production hall and attached offices on the greenfield in Dauchingen. The manufacturer of solenoid coils, electronic and plastic parts as well as electromechanical assembly production supplies primarily customers from the automotive industry, including the automotive sector of Bosch. Also companies from the building or medical technology are supplied with customer-specific products. The new company building at the Dauchingen location is only a few minutes away from the company headquarters and has been officially in operation since 2017.

The new construction of the production and office building of the Hechinger Group has a total area of around 15,000 m².
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The project

The engineering office Staudacher from Ulm was responsible for the entire energy center of the new building. The integration of the two compressed air and heat systems from Bosch happened in cooperation with the e-con AG. These plans were implemented by the plant constructor Alois Müller GmbH from Memmingen. Due to the new building, the engineering office Staudacher had a great deal of freedom in the

use and arrangement of possible energy systems. Prerequisites were a high energy efficiency and a possible expansion of the production buildings and thus the energy supply in the coming years. Products of high efficiency now provide compressed air, heat and cold, and the energy center also offers sufficient space for additional systems thanks to its functional layout. Energy consumption is reduced by 45 % compared to similar new buildings. This corresponds to the energy efficiency standard 55 Kfw and means that only 55 kWh of energy are consumed per m^2.

Efficient compressed air generation

This very high energy efficiency is not commonplace for industrial companies. In addition, the energy source compressed air is used in production. Conventional generation of compressed air is very expensive and energy-intensive, since electricity is applied to drive the compressor and usually the occuring waste heat is not used. This is different with the company Hechinger. Here, Bosch's two compressed air and heat systems (CHA) produce the required compressed air – using cheaper natural gas instead of electricity. The CHP CA 570 NA compressed air and heat systems supply the company building with the base load requirement of compressed air of 17.5 m^3/min. It is used in production, e.g. for cylinders, pneumatic actuators and switching valves on the production equipment. In addition to this, it is also used for the CO_2 plant, for

The compressed air system is expandable for the future.

the cleaning process of laser welding systems or for vacuum generation. The CHA are integrated directly into the compressed air network for optimum supply, which is supplemented by conventional compressed air compressors when peak loads occur.

Use of waste heat with an absorption refrigerator

The decisive factor is the effective use of the generated waste heat in order to ensure high energy and cost efficiency. In this case, the complete 250 kW heat output of the two CHA are introduced. Whenever possible, it is supplied to the heating circuit and used for heating and hot water preparation. A 3,000 liter

The two compressed air and heat systems from Bosch supply the company building with the base load requirement of compressed air of 17.5 m^3/min and 250 kW heat output.

Whenever a lower heat requirement prevails, the connected absorption chiller generates 190 kW cold with the occuring waste heat of the CHA.

buffer tank allows the CHA higher annual running times as the heat can be temporarily stored. An additional 800 kW is supplied by a SB745 boiler of the Bosch brand Buderus.

Due to the seasonal temperature differences a complete introduction of the heat output in the heating system is not always possible. For periods where there is less heat demand, the CHA transfer the waste heat of 250 kW into the integrated cooling and cooling water central. The connected absorption refrigerator generates with this waste heat 190 kW of cold at a flow temperature of 90 °C. Here, too, two cold storage tanks connected to the absorption refrigerator ensure longer running times. The cold is mainly used for the cooling of the production machines, on warmer days additionally for the building air conditioning.

Due to the new construction, the engineering office Staudacher was able to plan the energy center freely. A spatial separation of heating, cooling and compressed air supply creates space for potential extensions. Exact coordination and dimensioning of the system resulted in maximum savings: Reduced purchase of electricity for compressed air generation and use of waste heat with the help of an absorption refrigerator in case of need. The careful use of resources and an efficient energy concept form the basis. The energy supply through the gas-operated compressed air and heat systems could be put into operation just in time.

Conclusion

“As an energy-intensive company, it is very important to us to constantly improve our energy efficiency. We were looking for an efficient alternative to make part of the compressed air supply more cost-effective than traditional solutions,” explains Markus Duffner, Managing Director, Helmut Hechinger GmbH & Co. KG. Due to a more efficient energy source and without additional heat generation: By using CHA in comparison to conventional compressed air generation, Hechinger achieves an annual cost saving of around € 99,000. In addition, the installation was funded by the state. An amortisation of the compressed air and heat systems is therefore already after about three years. But not only the cost reduction is crucial for Hechinger. In addition to high energy efficiency, the reduction of CO_2 emissions and the ecological footprint are essential. The use of CHA supports this and thus CO_2 savings of 560 tons per year can be achieved. This is approximately half of the CO_2 emissions generated by conventional compressed air generation and roughly corresponds to the CO_2 annual output of 375 cars.

Compressed air from natural gas

The Bosch compressed air and heat system looks like a classic CHP module but it generates compressed air and heat instead. Like in a combined heat and power system, a combustion engine – here with a mechanical shaft power of 60 kW – forms the heart of the compact module. Instead of using a generator to produce electricity, however, a compressor is powered using the entire drive power of the engine. To adapt to the varying need for compressed air, the speed of the gas-powered engine is controlled and can be set to any value from 60 % power upwards.

At a fuel power of 164 kW, the amount of compressed air generated is 9.5 m^3/minute at a maximum operating overpressure of 8.5 bar and the usable heat output is 135 kW – equalling a thermal efficiency of 82 %. To achieve this heat output, the heat of the CHA is decoupled to three different components by means of heat exchangers. Heat is released first at the engine, which is designed to generate a large part of the heat, with a heat output of 48 kW. The screw-type compressor also releases large amounts of heat with 48 kW heat recovery. A classic plate-type heat exchanger in the CHA's waste gas duct recovers an additional 39 kW.

The companies involved

Operator:
Helmut Hechinger GmbH & Co. KG
Tel.: +49 7720 988-0
info@hechinger.de
www.hechinger.de

Constructor:
Alois Müller GmbH
Tel.: +49 8331 9448-0
info@alois-mueller.com
www.alois-mueller.com

We are:
Bosch KWK Systeme GmbH
Tel.: +49 6406 9103-0
bhkw@de.bosch.com
www.bosch-industrial.com

General planner:
Ingenieurbüro Staudacher
GmbH & Co. KG
Tel.: +49 731 140343-73
m.s.@ib-staudacher.eu
www.ib-staudacher.eu

Planner:
e-con AG
Tel.: +49 8331 75041-0
info@econ-ag.com
www.econ-ag.com

Bosch KWK Systeme GmbH
Justus-Kilian-Strasse 29-33
35457 Lollar
Germany
Tel. +49 6406 9103-0
Fax +49 6406 9103-30
bhkw@de.bosch.com
www.bosch-industrial.com
www.bosch-industrial.com/YouTube