BOSCH
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Baking biscuits with compressed air and heat by Bosch

Reference report Bosch Industrial

Compressed air and heat system at Bahlsen in Berlin

The company

Cookies, chocolate biscuits, cupcakes, whole wheat biscuits – almost 90 % of Germans are familiar with products made by the Bahlsen Group. Founded in 1889, this traditional family business headquartered in Hannover is now one of Germany's most successful biscuit manufacturers and perhaps one the most well known and most popular companies in Germany. It is one of the economically strongest names in the European confectionery market too. The 2,830 members of staff at its six facilities in Germany and Poland produce around 140,000 tons of biscuits every year (figures for 2017).

Bahlsen's production facility in Berlin manufactures products such as the popular chocolate biscuits called Pick Up.
© Image: Bahlsen

Baking biscuits with Bosch

Chocolate and biscuit: Pick Up is one of Bahlsen's most recognised products on the German market and is manufactured in Berlin. Biscuit production requires compressed air and heat, some of which is provided by the Bosch CHA CA 570 NA compressed air and heat system (CHA). The new CHA has been in use since 2017 and complements the existing compressed air system.

"We aim to use our resources sustainably and have as little impact on the environment as possible by keeping our CO_2 output low. This is also underlined by our DIN EN ISO 50001 certification. The Bosch CHA is one of the solutions we use to reduce the energy our factory needs to generate compressed air – and consequently reduce our running costs as well," explains Joachim Dolling, Head of Internal Power Supply, Occupational Safety and Environmental Protection at Bahlsen.

Compressed air is one of the most expensive energy sources in modern-day production processes, yet its use as control air or process air, for example, is indispensable to numerous industrial production methods. Conventional compressors usually convert only around 5% of the electrical energy they use into compressed air. Furthermore, the heat generated by this process is often just a waste product that goes unused. Electricity – the expensive energy carrier used to power the compressors – amplifies this effect even more as significant energy losses occur during generation and transmission. A boiler is typically used to generate the additional heating capacity that is often required. The efficient use of heat and direct generation of compressed air is the secret behind the Bosch CHA, in which a screw-type compressor is driven by a natural gas engine. Thus, the CHA uses low-cost gas instead of pricey electricity as its energy carrier, thereby halving the energy costs of compressed air generation.

Operating for around 6,000 to 6,500 hours a year, the compressed air and heat system at Bahlsen covers the company's base-load need for compressed air.

The logo of traditional family company Bahlsen.
© Image: Bahlsen

To achieve maximum efficiency from the CHA, it is recommended to utilise both the compressed air and the emitted heat. The Bosch CHA is in operation for around 6,000 to 6,500 hours a year at Bahlsen, meaning that it provides the company's base-load supply of compressed air. Conventional compressors are there on standby to help cover peak loads as and when needed. The boiler house on the production site has space for the compressed air and heat system, which in turn is connected to the compressed air central station via a recently laid 80-metre-long stainless steel pipeline. The compressed air is fed into the existing compressed-air filtration system before being used in production, primarily as control air.

The traditional meets the contemporary

Three Loos boilers (now Bosch Industriekessel GmbH) from 2003 and 2005 complete the boiler house. The gas pipe already in the boiler house made it the perfect place to install the CHA. The two UNIMAT UT-H hot water boilers generate a heat output of 7,000 kilowatts, which covers the majority of the heat demand. The waste heat emitted by the CHA is fed into the boiler return flow at about 90°C, thus making heat generation more efficient. The individual components of the system provide the entire factory with heat and are joined together via a central heating system. Since heat consumption remains constant throughout the year, there is no need for the CHA to have an emergency cooling system. The heat is used in virtually all areas of the factory and all parts of the production process, for instance for keeping liquid raw materials warm or for the air heaters in the air conditioning systems in the production and storage areas. Since 2005, a UL-S UNIVERSAL steam boiler has been producing 1,250 kilograms/hour of process heat in the form of steam, which is used in production for boiling jam, for example.

Two UNIMAT UT-H boilers generate a heat output of 7,000 kilowatts, and a UL-S UNIVERSAL steam boiler generates 1,250 kilograms of steam per hour.

Integration and remote maintenance

Integrated measuring points continuously measure the relevant parameters of the compressed air and heat system to make sure that it is operating safely and efficiently. These parameters can be monitored and changed via a touchscreen panel. To guarantee energy-efficient operation like at Bahlsen, however, it is extremely important to combine and control the energy flows of the individual components. The prepared data points can be linked to the customer's building management system or energy management system with ease. At Bahlsen, the CHA is connected to the higher-level control system for central compressed air generation.

Servicing and maintenance play a crucial role in keeping the systems energy efficient. The remote maintenance system, MEC Remote, helps the Bosch Service team to do this at Bahlsen. All relevant system data can be viewed and adjusted remotely via Internet-enabled mobile devices. Bosch service technicians can also access this data, enabling the Service team to react should a fault message be issued, conduct an initial analysis and bring any spare parts that may be needed to the site.

Summary

Primary energy is costing more and more while resources are dwindling all the time. This means that using resources efficiently is the key to economic success. Like an increasing number of companies, Bahlsen is making it a priority to improve its CO_2 balance and ecological footprint. Using a compressed air and heat system instead of a traditional compressed-air generator and boiler combination enables CO_2 output to be reduced by as much as 50 %. The combination of components also makes it possible to use considerably less primary energy – almost half, in fact. Because the CHA uses gas as its energy source rather than electricity, which is expensive, savings of around EUR 64,000 a year can be made, assuming typical use. Norbert Nitsche, Key Account Manager for compressed air and heat systems at Bosch, adds: "What's more, up to 100 % of the energy tax is refunded in Germany for CHP plants that have an annual capacity utilisation of over 70 %. In short: Regardless of the electricity market and future electricity price trends, energy costs are lower, overall efficiency is higher, fewer resources are used and CO_2 emissions are minimised."

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 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

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