Exemplary steam generation at the Bechtel private dairy

Reference Report Bosch Industrial

Installation during running operation

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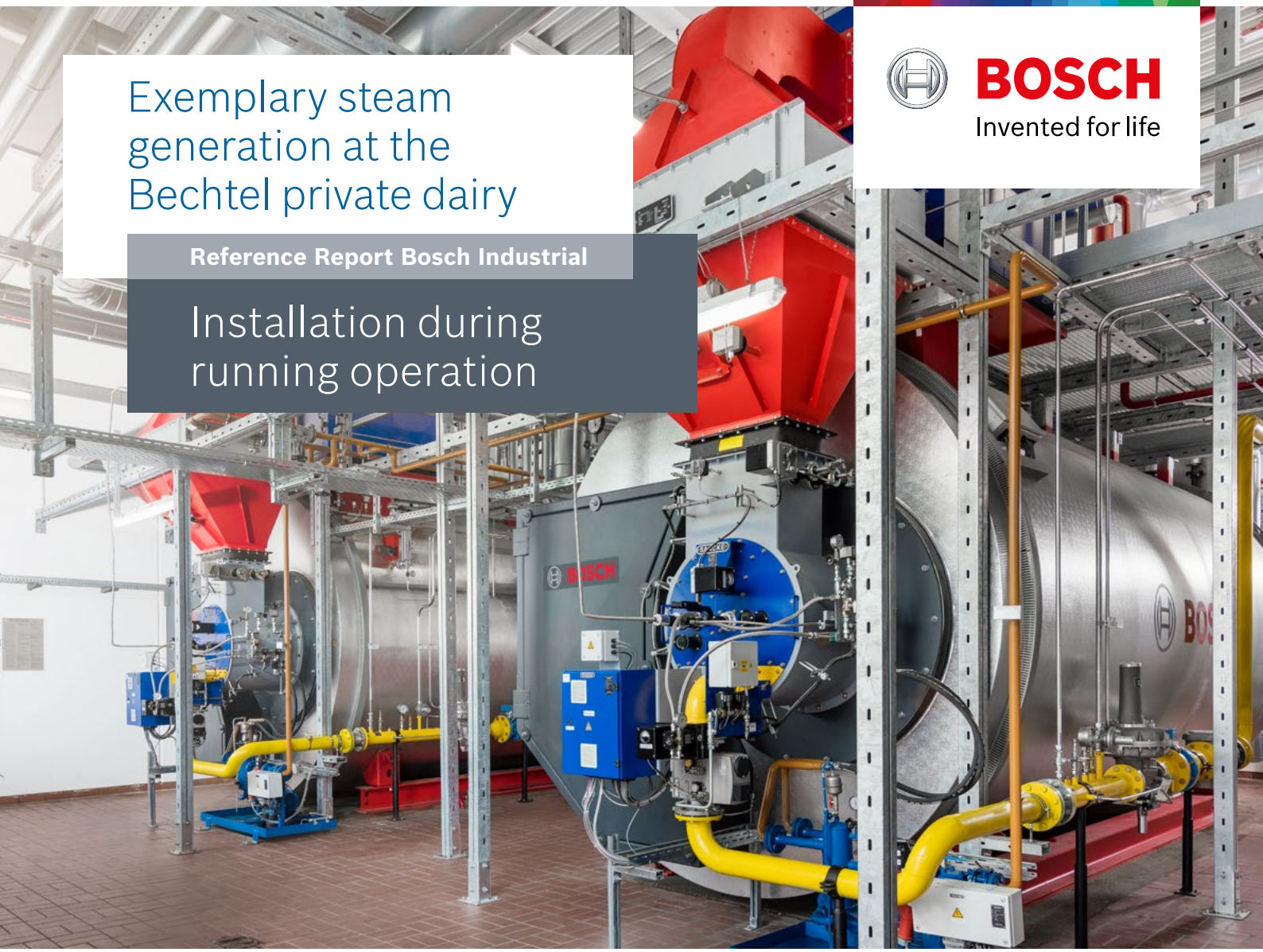

The company

The Bechtel private dairy („Privatmolkerei Bechtel“) lies in the heart of the Oberpfalz region in Eastern Bavaria and is one of the largest dairies in Germany. With its around 500 employees, the dairy processes over 1 million kg of milk per day into high-quality cheese and dairy specialities. Bechtel produces a large part of its products for other companies, which includes for example the „Grünländer“ brand. Where a lot of milk is processed, energy-intensive processes are involved. In addition to its power and cooling requirements, the dairy requires steam for various heating processes such as pasteurization, ultra-high heating, sterilization, cleaning and evaporation. These process stages are essential for ensuring that the maximum product quality is achieved, and that the strict guidelines for food safety are observed. It is important at the same time to produce energy-efficiently in order to remain competitive.

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The project

Due to increasing demands on capacity at Bechtel, the existing steam supply system was no longer sufficient to meet the requirements. The two Loos steam boilers, which were installed in 1994, had a total output of 16 t/h and were already running at full

load in continuous operation. Bechtel, however, needs twice as much steam. The dairy found two expert partners to implement this challenging project in Bosch Industriekessel from Gunzenhausen, which was commissioned to supply the boiler system technology, and Karl Lausser from Pilgramsberg, which was responsible for all the engineering and installation of the entire plant. The requirement was that the new system had to be installed without any interruption to operation, and that 100 % supply security had to be maintained. This was because Bechtel produces around the clock seven days a week. The dismantling of the existing boilers and the installation of the new steam boilers could therefore only be implemented on a staggered basis and under restricted space conditions. In order that production could continue without interruption, Lausser supplied at the start of the project a temporary steam boiler with an output of 8 t/h. An extra gas pipe was laid for the rental boiler solution, and also the existing gas supply had to be completely modernized for the new boiler system. The dairy uses natural gas as the main fuel, but the old oil supply remains however for emergencies. Additionally, Lausser had to integrate the existing water treatment module into the new system. In coordination with the dairy‘s operating processes, the boilers were put into operation by Bosch Industriekessel in stages – without any supply interruptions to production. Bechtel now has not only more steam thanks to the system output of some 30 t/h, but it also has an advanced boiler system as regards energy efficiency, operating safety and flexibility.

The air preheating system reduces fuel consumption and emissions.

An overview of the system components

Heat recovery with economizer and air preheating

The high level of boiler efficiency of over 97 % is very impressive. In addition to integrated economizers, both boilers have an air preheating system: part of the boiler feed water flow is directed by the system into a heat exchanger on the air side, which raises the combustion air temperature from 25 °C to 80 °C. The cooled feed water then flows through a heat exchanger bundle on the flue gas side and reduces the temperature of the hot boiler flue gases before it is being fed back into the main feed water flow. Up to 2 % fuel saving can be achieved in this way. In addition, the Bosch preheater system has fewer components than conventional air preheaters and requires less space for installation.

Flexible output adjustment

The modern dual-fuel burners also enhance the energy balance. The number of burner starts and therefore the accompanying energy losses are reduced significantly thanks to the large control range of 1:14 in gas operation. The total burner heat output of around 20 MW can be reduced to 1.4 MW, without causing a shutdown of the burners. The installed O_2 controls work positively on the modulating burner operation. The fuel-air ratio has to be maintained at every output stage in order to achieve the optimum combustion quality. This is done by continuously measuring the oxygen content in the flue gas and by automatically adapting the air supply depending on the air pressure, temperature and gas quality. Speed controls are also installed, which further optimize the operating mode. They reduce the fan speed on the combustion air fan depending on the current burner output, and this saves a lot of electrical energy in partial load.

Data analysis at its finest

As far back as 2012, Bechtel had already introduced an energy management system. The aim was to continually monitor energy consumption in the dairy, and thereby to save costs and prevent negative environmental impact. In perfect harmony with this, Bosch‘s MEC Optimize system tool captures and analyses all the data from the steam boilers and from all the associated system components. Using a clear and precise form, the system indicates any increased energy consumption and evaluates the boiler‘s operating mode. Forecasts of component wear are also issued based on the individual operating mode, and this increases the system availability. At Bechtel the whole process is visualized on standard desktop laptops or tablets. This means that the particular persons in charge always have the energy consumption and system availability in view. The staff at the dairy also have access via MEC Optimize to a digital document storage with operating instructions and service reports as well as an electronic boiler logbook.

Efficiency and availability in view: MEC Optimize stores, evaluates and visualizes the data of all linked system components.

High operational reliability: automation and remote service

The integrated Bosch control systems are also of crucial importance in meeting the high demands of milk processing as regards reliability. They deliver the relevant operating data to MEC Optimize and automate the boiler and system operation, as well as providing intelligent control features such as automatic start-up and multi-boiler control. Integrated safety logic protects the boiler system against maloperation. The linking of the control units to Bosch‘s MEC Remote service tool offers Bechtel additional security. Whether outside or inside the company premises: the functional performance of the system and all the

The boiler controls ensure a high degree of automation and deliver relevant operating data to MEC Optimize.

relevant system data can be checked in real time, which means that boiler operator can react quickly to any adverse changes. The data visualization is via internet-enabled user terminals such as tablets, smartphones or desktop PC, and a sophisticated security concept protects against unauthorized access. A further benefit is the optional remote support by the Bosch service experts. At the request of the customer, they can access the system and perform software updates or parameterization for example, as well of course as quickly eliminating causes of problems. This not only increases system availability but also saves time and cost.

All-round success

Other system components, such as feed water de-aeration, are also part of the Bosch scope of delivery. Lausser installed the system parallel to the old feed water system and created additional space for it by first installing a grating level. The module is approx. 5 metres high and over 7 metres long, and the tank has a capacity of 25,000 liters. The deaeration process is an important part of achieving the optimum water quality, and it protects the boiler and its components against corrosion. By heating the make-up water to 103 °C, the corrosive component parts such as carbon dioxide and oxygen are released and escape with a small quantity of exhaust vapour via the roof. This exhaust vapour contains usable heat, which is recovered by a downstream vapour cooler with an output of 80 kW. This enables make-up water to be preheated with „free“ energy.

The system equipment also includes continuous conductivity measurement as well as automatic desalting and blow-down devices. The modulating feed water controls ensure that there is a constant water level in the boilers. These measuring and regulating units are controlled via the Bosch boiler controls. In addition to increasing the degree of automation, these measures provide a more even level of operation with less material stress, as well as ensuring that energy losses are reduced.

The feed water deaeration module from Bosch provides optimum water quality and protects the boiler and components against corrosion. This increases the operational safety and the service life of the system.

The result

The new Bosch steam boiler system fully meets the growing capacity requirements and has the potential to cover additional load demands. In addition to this, the potential for energy and cost savings has been systematically tapped thanks to the optimum matching of all the components. This enables the Bechtel private dairy to lead the way with an exemplary system, when it comes to energy efficiency and environmental protection. Alfred Gürster, Head of Production and Technology at Bechtel, summarizes as follows: „Implementing the project during running operation was certainly not easy and entailed many risks and difficulties, all of which were overcome. In the final analysis however, it was due to the coordinated cooperation of all those involved in the project, that the new steam boiler system was implemented without any supply interruptions. Our capacity problems are solved and the system is running very well. Thanks to MEC Optimize, we also have a state-of-the-art efficiency monitoring system, and can therefore view the energy consumption and system availability at any time.“

The companies involved

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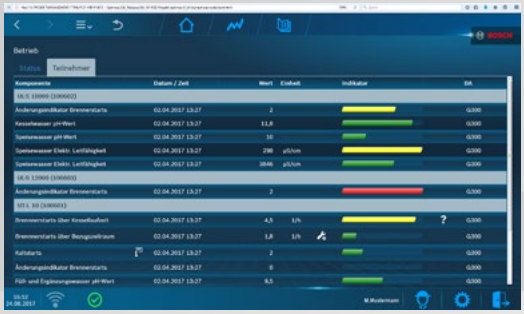
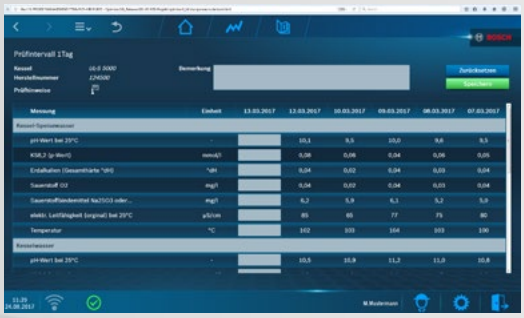
MEC Optimize for high efficiency and availability

Optimum system efficiency and a high level of system availability are important factors for industries to reduce production costs and to increase competitiveness. In this field the use of state-of-the-art data acquisition and analysis is very beneficial and gives information about the operating performance and efficiency of energy-generating systems. With MEC Optimize, Bosch offers operators of steam and hot water boiler plants a new, innovative system for energy monitoring and operational safety.

MEC Optimize captures all the operating parameters and messages of the linked system components. Over many years the data are stored locally, which means that the plant operator remains the data owner. The visualization takes place in the three separate areas of efficiency, operation and service and provides a comprehensive analysis.



After an automated data analysis the system indicates any increased energy consumption as well as evaluates the system‘s operating performance. Based on their load profile components are assessed for wear which enables the plant operator to ensure that system availability is maintained.



Sample data

At every test interval, the boiler attendant can enter the recorded measurement values into the electronic boiler logbook and print these out if required via an export function. The intelligent boiler logbook also checks all entered data, then compares this with the manufacturer‘s specifications and gives action recommendations if there are any discrepancies

Further benefits of MEC Optimize:

- Easy plant integration in the process control system or visualization via PC/tablet
- Digital document storage for operating instructions, data sheets, maintenance and service reports
- Optional connection to remote service tool MEC Remote: transfers the current system status and reports important information via SMS or e-mail to the plant operator

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