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## Energy concept with CHP and four-pass boiler

Reference Report Bosch Industrial

# Cost-efficient steam generation for dairy products

### The operator

The roots of Immergut GmbH & Co. KG reach back to 1883 when the Stavenhagen dairy was founded. The site in the town of Schlüchtern in Hesse, Germany, followed 11 years later. There, the dairy processes around 45 million kilograms of milk and approx. 25 million kilograms of soya milk every year to create a range of soft drinks, refreshments, yoghurt drinks



*Aerial view of the Immergut dairy in Schlüchtern.*

and desserts. The milk products are filled using innovative soft packaging. In addition to the long-established Immergut brand, the portfolio includes the well-known Drinkfit and Naschkatze brands. The company's headquarters have been situated in Elsdorf, North Rhine-Westphalia, since 2005.

### The project

Since 1970, the dairy plant in Schlüchtern has been putting its trust in boilers from LOOS INTERNATIONAL (now Bosch Industriekessel GmbH) for the production of process steam. The steam is mainly used for sterilisation in Immergut's production process.

Following a comprehensive site analysis, a new energy concept was implemented in collaboration with plant construction company Helmut Herbert GmbH & Co. The required energy is supplied by cogeneration. A combined heat and power unit (CHP) was chosen for

on-site power generation. The downstream waste heat boiler with own firing converts the waste heat that accumulates from the engine into process steam via its additional fourth smoke tube pass. To increase efficiency further, a separate flue gas heat exchanger is connected downstream of this smoke tube pass. The fourth pass and the heat exchanger reduce the flue gas temperature of the CHP unit from almost 500 to approx. 118 °C, generating an output of 240 kilowatt. An additional peak load boiler was not necessary due to the use of the design variant with own firing. This enabled investment costs, space requirement and expenditure on equipment to be reduced accordingly. The low temperature waste heat from the engine cooling circuit is discharged into a heat storage tank and used to heat the building and provide hot water. The waste heat arising from the power generation is thus almost completely recovered.

In addition to the waste heat boiler with own firing and a fourth smoke tube pass, type UL-S, the system also includes modular components from Bosch Industriekessel for water treatment, heat recovery and control. These provide more energy efficiency, a higher efficiency rating and increase operational reliability.

#### Technical details of the boiler system

- ▶ Boiler with integrated economiser and additional fourth smoke tube pass for waste heat utilisation
- ▶ Separate flue gas heat exchanger connected downstream of the fourth smoke tube pass to further increase efficiency
- ▶ Natural gas powered firing with oxygen and speed regulation providing low-emission operation
- ▶ WSM-V water service module to supply the boiler with degassed and chemically-conditioned feed water
- ▶ BEM blow-down, expansion and cooling module to dispose of blow-down



Maximum level of efficiency: the innovative boiler system with an additional fourth smoke tube pass and own firing.



The additional smoke tube pass converts the waste heat from the CHP unit into process steam.

- ▶ WA water analyser for the fully-automatic measurement and monitoring of the boiler water quality
- ▶ BCO boiler control for intuitive operation and display of all boiler operating data via touchscreen
- ▶ SCO system control combining boiler control and all module controls in one universal system control
- ▶ Remote service function for accessing BCO/SCO operating parameters and signals to quickly rectify faults

#### Implementation phases of the modernisation measures

- ▶ Expansion of the existing boiler house
- ▶ Supply and setup of the new boiler and boiler house components
- ▶ Installation including setup of the new chimney
- ▶ Commissioning simultaneously to existing boiler system
- ▶ Dismantling and disposal of the old boiler
- ▶ Preparation of the foundation for the CHP unit on the site of the old boiler
- ▶ Installation of the CHP unit and connection of the flue gas pipe to the new boiler
- ▶ Commissioning the system as a whole



Fully-automatic water treatment via the WSM-V water service module.

#### The result

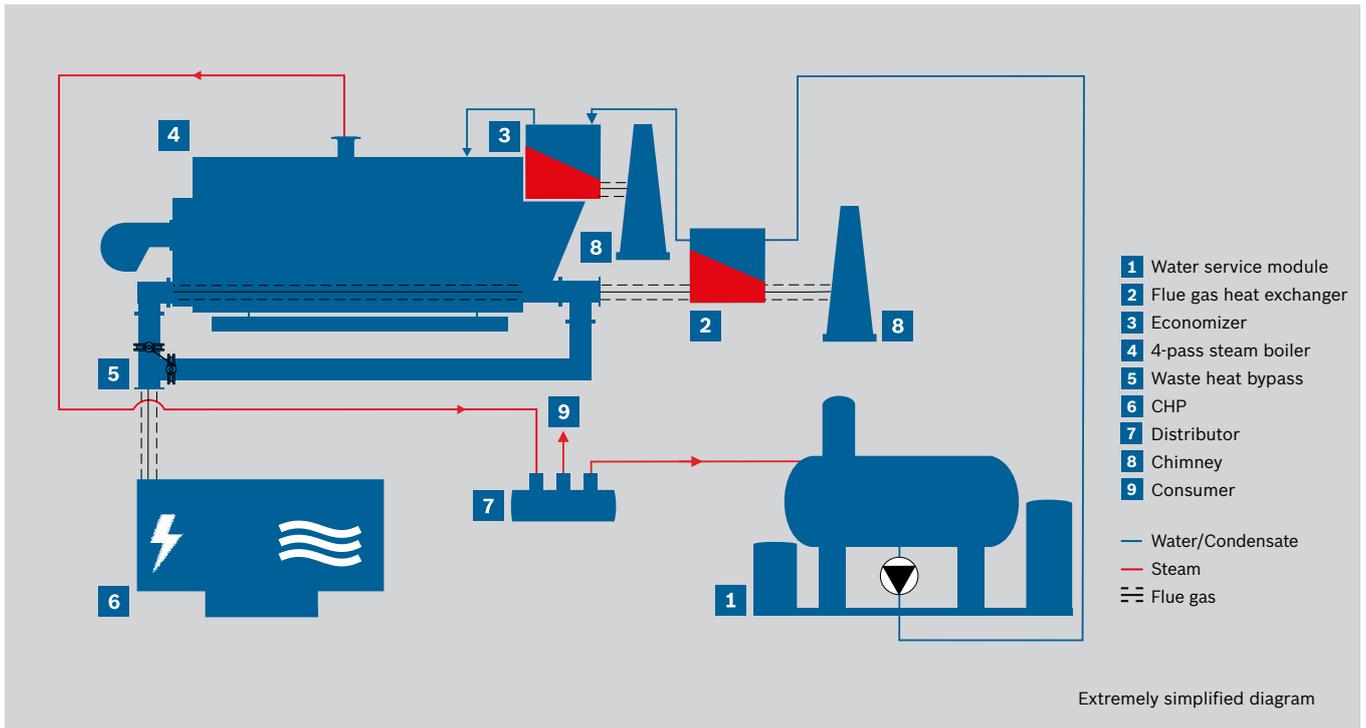
On-site power generation with the CHP unit in conjunction with waste heat exploitation by the high-efficiency four-pass boiler leads to a considerable increase in efficiency in comparison with separate electrical power and heat generation. The ROI (return on investment) for the investment as a whole is less than six years. At the same time, the environment is benefitting from minimised CO<sub>2</sub> and NO<sub>x</sub> emissions.



Separate flue gas heat exchanger connected downstream of the fourth smoke tube pass to provide maximum efficiency.



The modern BCO and SCO touchscreen controls enable the optimum setting and control of the boiler system.



System diagram of CHP unit and four-pass boiler combination at Immergut.

## The companies involved

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