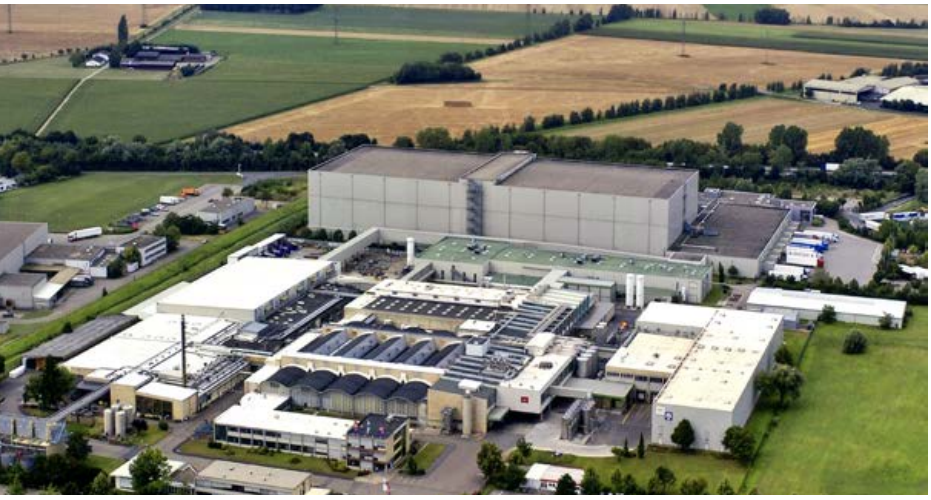
Cogeneration Plant Delivers Heat and Power

TURNING HEAT AND POWER INTO RICH ICE CREAM

Who Ice cream manufacturer Langnese
What Heat-controlled congeneration plant featuring an MTU Series 4000 gas engine
Where Heppenheim, Germany

Germany's largest ice cream producer operates out of Heppenheim in the beautiful southern state of Hesse. Langnese makes ice cream for the whole of Europe here. Since the end of 2009, an Rolls-Royce heat-controlled cogeneration plant (CHP) has been in service here to partly cover the high demand for heat and power. The 16-cylinder Series 4000 natural gas engine achieves an efficiency factor of 87.1% by optimizing the utilization of heat. The combined heat and power plant allows Langnese to adapt heat generation flexibly to satisfy peak production demands in its factory.

Heppenheim, Germany – Magnum, Capri or Cornetto – Langnese ice cream has a long tradition. Way back in 1927, businessman Karl Rolf Seyferth purchased a biscuit factory from export merchant Viktor Emil Heinrich Langnese thus securing the brand name. The very first ice cream on a stick was produced in 1935. Langnese now belongs to the consumable goods giant Unilever and produces ice cream all over the world. The company creates more than 250 different ice cream products in Heppenheim – up to five million each day. That equates to around 150 million liters of ice cream every year.



A Rolls-Royce cogeneration plant supplies heat and power for the Langnese ice cream factory. (Picture: Langnese Heppenheim / Unilever)

The frozen dessert is not only exported throughout the European continent but also to Israel, Australia, the USA and many other countries. Each factory concentrates on a certain product. “Heppenheim focuses on producing the Magnum, we don’t make any products involving wafers, like the Cornetto, here”, explains Friedrich Daum, Production Engineer at the Langnese factory in Heppenheim. “Those products are manufactured at our Caivano site in Italy which has its own wafer bakery.”

Heat for Production

Heat plays a key role in turning the basic ingredients milk, sugar, fat, chocolate, fruit preparations, aromas, water and air into rich ice cream. Ice cream manufacturer Langnese generates its own heat for the production process. The company relies on an Rolls-Royce combined heat and power plant to meet its needs. The CHP features a MTU 16V 4000 type L62 natural gas engine generating 1,719 kW of thermal power. The unit was hooked up to the existing boiler house and supplies heat directly to the plant heating circuit which operates at 105 °C. “You have to think of the heating circuit in household terms”, Friedrich Daum explains. “When we need heat at a certain point we simply tap it from the central heating circuit using heat exchangers.” The CHP can heat up to 45 cubic meters of water per hour. The heat is used during production to keep ingredients in the tanks, such as fats and chocolate, at the right temperature for smooth processing. All the ingredients are poured into mixing vats and the

1 Installation of the cogeneration plant in the immediate vicinity of the existing boiler house was a fundamental prerequisite to optimize the heating circuit. (Picture: Langnese Heppenheim/ Unilever)

2 The CHP is driven by a MTU 16-cylinder 4000 engine. (Picture: Langnese Heppenheim / Unilever).

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mass is then pasteurized and homogenized by the heat. The ice cream is then left in maturing vats for between two and seven hours at +4 °C. The liquid mass is subsequently pumped into freezing machines. The machines are chilled to -40 °C by ammoniac jackets. Scrapers are used to clear the frozen mass from the walls. “This process is constantly repeated, the mass scraped from the walls being returned to the liquid until it gradually takes on a firmer, thicker consistency”, Daum explains further.

Filling is the next stage in the procedure. In the case of premium ice creams like the Magnum this involves forming the mass in a stainless steel pipe and pressing it out, inserting the stick and cutting off the finished bar before placing it on a moving stainless steel plate under the “mouthpiece”. The ice cream on the plates is frozen solid in a tunnel in which air circulates at -40 °C. Once past the tunnel, the frozen bars are taken up by grippers, dipped in a bath of chocolate and loaded into the packing machine. And that’s it, the ice creams are ready to enjoy. The heat from the MTU unit is not only used in the production process. Another heat exchanger draws thermal energy for the cleaning circuits. The heating circuit also incorporates auxiliary heaters which warm the radiators in the production halls and also ensure a supply of hot water. An efficiency factor of 87.1% is achieved by optimizing the utilization of heat.

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Friedrich Daum
Production Engineer at the Langnese factory in Heppenheim

Peak Season at Langnese

The ice cream production facilities at Langnese operate at full stretch during the hot summer months. “During this period we need more hot water than the CHP can deliver. So to heat up the water to the required temperature we hooked our existing boiler up to the CHP. Any superfluous heat is stored in buffer tanks. And we can run the CHP down completely if demand is low”, explains Friedrich Daum. A transformer converts the 400 volts supplied by the unit into 20 kV for the factory power grid. Production demands more power than the CHP can provide on its own. “We total between 5,000 and 5,500 CHP operating hours per year”, says Daum. “It depends on whether our production capacity is utilized evenly over the course of the year. “The workload is high in hot summers. We then have a continuous demand for heat and leave the CHP working all the time, that runs up more hours in operation. It runs less in cold summers as the demand for ice cream is lower and we would otherwise produce too much heat.”

Special Requests Fulfilled to Perfection

Installation of the cogeneration plant in the immediate vicinity of the existing boiler house was a fundamental prerequisite to optimize the heating circuit. “Seeing as there was no room in the boiler house we were left with just a small strip of land to set up the CHP”, confides Friedrich Daum. The factory is close to a residential area which meant no more than 45 decibels of residual sound pressure at a distance of ten meters. “That’s a tall order for a big engine. Other suppliers found this one tough to swallow, but Rolls-Royce said: “We can do this!““, says Daum describing the exacting requirements. “They made us the best offer based on our special requests. And anyway, we know we’re in good hands with them.” Rolls-Royce service engineers have been looking after the CHP at Langnese since commissioning in November 2010 under the terms of a full maintenance contract. The customer was offered a special container as a solution to reduce CHP noise emissions. The Rolls-Royce CHP at the Langnese factory in Heppenheim is a significant development – not only in view of the financial benefits it offers: “This is a crucial step towards achieving our ambitious objectives in regard of sustainability.”, Friedrich Daum explains. “At the same time, we’re helping to alleviate the difficult energy situation in Germany as we don’t have to resort to the frequently overburdened mains grid quite so often.”

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