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Special: District Heating

BOSCH
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In Focus

Whether for base load supply, for covering peak loads or as backup: Numerous local and district heat suppliers rely on the steam and hot water boilers from Bosch. The industrial boilers provide maximum reliability, continuous efficiency and flexible operation. In our latest issue you can look forward to impressive application examples from this sector.

We wish you an enjoyable read.

Under 50 mg/Nm³: Low-NO_X boilers for complex district heating network

Always reliable and ready for operation around the clock: since December 2015 two Bosch hot water boilers, each with 20 MW, have been in operation in the new Pieter Wiersma heating plant in Lent (Netherlands). Thanks to innovative boiler and burner technology, it is one of the lowest-emission plants of this type in Europe. It feeds heat into the Nijmegen district heating network, which in the coming years will supply up to 14 000 households in Waalsprong and Waalfront. The base load is generated by a waste energy plant operated by the company ARN. The Bosch boilers support the district heating network during winter peak loads and serve as back-up in emergencies. This ensures that the heat supply to the inhabitants is uninterrupted.

The used UT-HZ hot water boilers are particularly suitable for district heating supply due to their large modulation range. Each of the boilers is equipped with two natural gas burners, and the flame tubes and smoke gas passages are completely separated. This enables both burners to be operated in parallel, or also single operation with only one burner. The boilers can therefore react very dynamically to load fluctuations, and also operate particularly efficiently at low rates of loading. The reduced number of burner starts saves fuel and reduces wear significantly.

The boiler system is linked to the customer‘s existing energy management system. As soon as the pressure in the district heating network is no longer sufficient, the boilers switch in automatically. The precondition for this automated, supervision-reduced operation is the safety equipment including a wide range of automation equipment and the precise setting of the system. Nefit Bosch (Netherlands) also delivered all the necessary equipment components and customised control

Delivery and positioning – each boiler had a transportation weight of 68 tons

Highly modern and innovative:
the Pieter Wiersma heating plant in Lent

units, and carried out the commissioning and test operation. The company Strukton Worksphere was responsible for implementing the entire heating plant project.

Very low emissions were also an important factor in the project. Compared with heating that is produced in individual households, up to 70 percent of the CO_2 emissions can be saved by using the district heating network. The Bosch hot water boilers also contribute to this: in the case of all four Dreizler burners, the NO_x emissions are under 50 mg/Nm³. In addition to this, they are also very economical due to a wide range of equipment such as combustion control units and speed-controlled burner fans.

Nefit Bosch is also entrusted with the maintenance services to ensure a long service life and optimum system settings for continuous availability and efficiency. In addition, Nefit Bosch guarantees the customer Nuon immediate on-site service if required. The fast reaction time offers additional reliability. The system and service concept fulfil the requirement of Nuon to be able to assure system availability of 99.5 percent over the next 10 years

The NO_x values of the customised boiler system are under 50 mg/Nm³

Bosch boilers heat the town of Dunakeszi

Impressive rebuilding of the heating plant
Video clip at www.bosch-industrial.com/references

Around 40 000 people live in the town of Dunakeszi, which is situated 15 kilometres north of Budapest in Hungary. For many years, more than 2 300 households and eight public establishments of the town have been enjoying the benefits of the district heating supply provided by the company Dunakeszi Közüzemi Kft. The houses and other buildings have no smells from their own heating or costs for maintenance and cleaning, and everybody has more space. Further, the consumers don't have to fear cold houses or unheated schools and kindergartens. In order to maintain 100 percent supply and to optimise efficiency the energy supplier has undertaken comprehensive refurbishment.

The measures include the modernisation of the complete boiler house. The local Bosch partner, Kazantrade Kft., offered the optimum solution for the renewal of the energy generators, including all consulting services and the commissioning of the boiler system. It consists of three Bosch heating boilers of the UT-L type. It was the high level of efficiency and reliability of the proposed system that was the deciding factor.

The previous three boilers from the 1970's with a total of 24 MW had since become over-dimensioned. The district heating network now operates more efficiently thanks to new, insulated piping systems, modernised transfer stations and other measures. The new boiler system was

Dunakeszi Közüzemi Kft. heating plant during the rebuilding phase

designed accordingly and has a heating capacity of 18.2 MW. Two of the natural gas powered heating boilers generate the base load together with an existing combined heat and power plant. The third heating boiler ensures the heat supply at peak load times. This boiler can be operated with both natural gas and light fuel oil, which offers additional reliability.

The heating boilers are equipped with condensing heat exchangers, which provide an even higher energy yield. They use the waste heat of the boilers efficiently to heat the return water in the network. The boiler efficiency is therefore around 98 percent. The modern burners also ensure a high level of efficiency: they are fitted with fan speed controls, whereby the speed of the fan is adapted to the actual burner output - instead of running constantly at full load at all load ranges. This reduces power costs by up to 75 percent and minimizes the operating noise considerably.

The customer, Dunakeszi Közüzemi Kft., also saw an additional benefit in the compact design of the UT-L type series, as well as in the fact that the system was delivered complete including all components and accessories. Thanks to the pre-assembled equipment and insulation, valuable time and costs could be saved during installation. After the existing system had been dismantled and the new boilers had been brought in, only pipework had to be connected on site. Plug-in connections ensured that cabling work was also reduced. The control systems were tested on a virtual system prior to delivery, in order to ensure quick and efficient commissioning.

Efficient in operation thanks to effective recovery of flue gas heat. The new boiler system saves nearly 10 percent fuel in comparison to the previous energy generation system

Huge steam output for new power plant giant

Large boiler project at the Ledvice power plant
Video clip at www.bosch-industrial.com/references

11.6 metres long, 4.5 metres wide and almost eight metres high – these are the impressive dimensions of the four Bosch boilers for the new Ledvice power plant unit of the energy company ČEZ. In total the boilers produce up to 167 tons of superheated steam per hour for the start-up process of the new steam turbine (power generation). But the Ledvice power plant does not just supply a large quantity of power, it also supplies heat for some 300 companies and 20 000 inhabitants. The huge boilers provide additional supply during peak load periods and serve as a backup for the district heating network. This redundancy ensures that there is a very high degree of operating reliability around the clock.

In its role as general contractor, the company Škoda Praha Invest was responsible for implementing the turnkey power plant unit and the steam boiler system. The stringent safety requirements and tight time schedule demanded a high degree of flexibility and experience from all those involved in the project. „Following the complex tendering process, our objective together with our partner Škoda Praha Invest was to implement the steam boiler system as quickly as possible, and to ensure that a consistent supply of heat was provided to the towns of Teplice and Bilina," says Rudolf Rotta, sales engineer at the Bosch subsidiary in the Czech Republic.

After customer-specific manufacturing, the large boilers and their associated components were delivered by low-loader and ship from the industrial boiler factory in Gunzenhausen (Germany) to the Czech Republic. The boiler house at the power plant comprises a complete boiler system, including feed water deaeration system and control technology. The superheater modules on the reverse chambers of the boilers generate superheated steam and, thanks to high steam temperatures, prevent energy losses in the pipe network. Due to their height of more than five metres, the boilers were equipped with the superheaters on-site – and this gives them a height of almost eight metres.

Bosch's huge feed water system with a deaeration capacity of 177 500 kg/h can store up to 100 000 litres of feed water

The integrated economizers for using waste heat and the eight natural gas burners in total, had already been installed at the Gunzenhausen factory. The total combustion heat output is more than 136 megawatts – equivalent to the output of 250 Formula 1 engines. On this kind of scale, there is a need for a high level of energy efficiency. The burners can be operated particularly economically thanks to the installed speed controls. They reduce the power consumption during partial-load operation by up to 75 percent and also reduce the noise level to a minimum.

Each of the boilers are equipped with two natural gas burners – both parallel and single operation is possible

Fast availability of the steam boilers is essential for operation of the power plant. Each of the four boilers is therefore equipped with a heat maintenance system. The backup boilers can thus provide additional steam generation within a very short period of time. The integrated sequence control is implemented by means of a network pressure system. As soon as the primary boiler can no longer generate the required steam pressure, the backup boilers switch in automatically. The higher-level control technology with its industrial Ethernet connection enables information flow between Bosch‘s control system and the control centre of the power plant. All operating messages and current process data are transmitted directly to the operators at the power plant, thus they can control the system remotely at any time.

In summary, the power plant is equipped with a consistently reliable and energy-efficient steam boiler system. Thanks to the comprehensive automation equipment, a high level of supply reliability as well as operation without continuous supervision (72 h) are guaranteed. Vilém Šarkády from the general contractor, Škoda Praha Invest, is very satisfied with the progress of the project: „In total there were four boiler manufacturers in the final selection. The crucial

reasons for choosing Bosch were the product quality and brand as well as the reliability.“ The successful project implementation was rounded off with the commissioning of the steam boiler system on schedule.

Intelligent control concept for automated boiler operation

Ledvice power plant during the building phase of the new boiler house

Reliable heat supply at -30 °C

Shymkent is the third largest city in Kazakhstan and is situated in the south of the country near to Uzbekistan. The new „Nursat“ administrative and residential district has been established to meet the growing population of the city. This offers space for around 30 000 inhabitants over an area of 370 hectares. In winter there can be icy temperatures – the record is below -30 °C. It is therefore essential to have an absolutely reliable heating and hot water supply system. For this reason a giant new heating plant was built with five Bosch hot water boilers. They can provide the new district with up to 190 MW of heat.

Supply is provided on the basis of demand and the weather. Whether at peak load times or at low demand, the double-flame tube boilers run efficiently and with low emissions over every load range due to the large modulation range of 1:20. Thanks to Bosch control technology with sequence control, the boilers can be switched on and off individually and automatically. At least one of the boilers is generally in standby mode and can support the heating network at any time. Dual-fuel burners offer additional security. If there are supply shortages at the natural gas supplier, it is also possible to operate the system with light fuel oil.

But the project is not only impressive regarding its size, reliability and efficiency. The transport of the large boilers was also considerable: the steel giants with a transportation weight of approx. 85 000 kilos/each, travelled around 7 200 kilometres to their destination. Starting at the Bosch factory in Gunzenhausen (Germany), they travelled to the port at Roth and then onwards via the canal to Rotterdam (Netherlands), and from there to St. Petersburg (Russia). When they arrived there, the boilers were transported 4 000 kilometres by road through Russia and Kazakhstan. Due to their height of around five metres, power lines had to be temporarily dismantled. The weather conditions were also a great challenge for the experienced haulage company, Instar Logistics. Since the delivery took place during the winter months, the roads were partially covered with snow and ice. The boilers reached their destination in Shymkent safely after a total transportation time of eight weeks. They have since been installed there, and the first two have already been commissioned by Bosch customer service.

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