



Photo: Hartmuth Klemme

Efficient control of thermal capacity using ball sector valves in the district heating system of Stadtwerke Bielefeld



An application report by Frank Husemann, Thomas Birkmann, Dirk-Carsten Wilker and Henning Müller

The Stadtwerke Bielefeld public utilities company was founded in 1856. The Stadtwerke foundation stone was laid with the erection of a small gas power station in the centre of Bielefeld. With its approx. 2200 employees, the Stadtwerke Bielefeld now generates a turnover of around 660 million euros. The primary business segment, the provision of district heating, water, gas, electricity and telecommunication services for the Bielefeld greater area, has developed into a municipal energy supplier in recent years that now also supplies energy throughout Germany.

Around 400,000 t waste from the households and the industry in the Bielefeld region are combusted annually in the thermal waste treatment plant in Bielefeld, this then being converted to thermal and electric energy. All of the thermal energy that is generated by the combustion plants is fed into the Stadtwerke district heating system, this therefore covering the base load for the district heating generation that corresponds to around 320 Mio. kWh district heating. The Stadtwerke Bielefeld district heating system has 3600 connections, is around 200 km long, has a thermal peak load of 300 MW and provides heating for around 6500 customers (Reference: www.stadtwerke-bielefeld.de).

Task

Some time ago the plans of the Stadtwerke Bielefeld to carry out major work on the district heating system and replace diverse control valves in the following year took on a concrete form. The reason for the planned conversion measures was that the thermal output was to be increased in some of the zones within the existing district heating system. In selected supply strings, the hot water volume flow was to be increased from approx. 500 m³/h to 750 m³/h, the difficulty here being a possible reduction of or respectively maintaining the pressure loss, through the final controlling devices. After all, a low pressure loss through the control valves means a reduced pumping capacity and therefore reduced electricity consumption. A stable supply for the consumer was also to be ensured during extreme changes to the heating

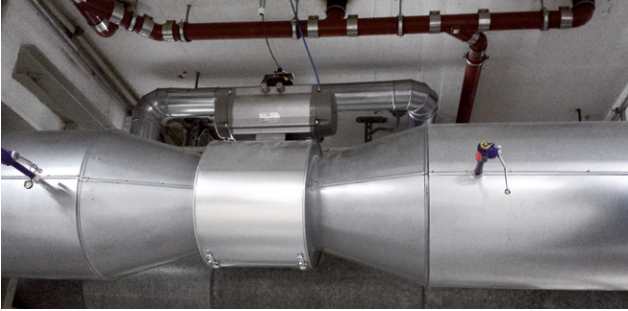
demands and the pressure fluctuations during the summer and winter periods that make the situation additionally difficult. Up to then, Stadtwerke Bielefeld had given preference to the use of seat-plug-control valves and oval type wedge gate valves.

The Solution

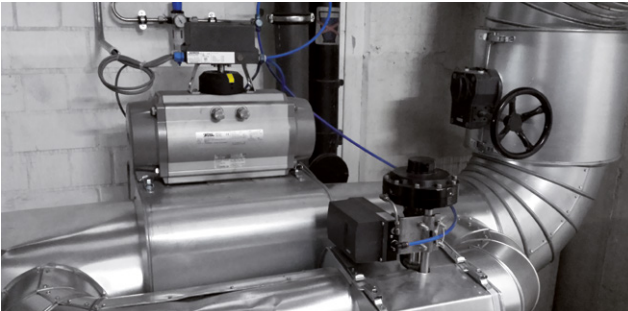
During the planning phase for a solution of the afore-mentioned task, the responsible Stadtwerke Bielefeld staff came across the Ball Sector Valves from Schubert & Salzer Control Systems GmbH. Their special cut-out ball sectors with double shaft bearing provides them with an extraordinarily wide control range with a rotation angle of 90° and an extremely high position ratio. The elliptic flow surface and a generous overlapping to the sealing zone of the ball sector ensure an enormous degree of resistance to contaminated process utilities and a high degree of tightness during a long service life. The staff at the measurement and control department at the Stadtwerke was especially convinced by all of these benefits offered by the Ball Sector Valve technology.

The specialists from Schubert & Salzer Control Systems developed a concept together with Mr. Kyewski and Mr. Birkmann using Ball Sector Valves in order to control the pressure and volume flow of the hot water supply flow and return flow in each of the supply strings stably and precisely across a wide operating range. The optimal control valve parameters were determined on the basis of numerous calculations that were made with different load conditions and it became evident that the Ball Sector Valves from Schubert & Salzer Control Systems were a perfect fit for the use in these extreme conditions (10 – 800 m³/h with a system pressure of 5 – 8 bar). This resulted in Schubert & Salzer Series 4040 and 4030 Ball Sector Valves being installed in the Lohmannshof stations “DE” and “HKW”.

1. Lohmannshof Station, return flow
"University" BSV DN 200



2. Lohmannshof Station, supply flow BSV DN 200



3. "DE" Station, Line 6 supply flow BSV DN 200



4. "DE" Station line 6 return flow BSV DN 250



5. "HKW" line 6 return flow BSV
with motor drive DN 250



Results

It was quickly noticed, that the installed Ball Sector Valves, with its extremely high K_{vs} value, have considerably reduced the pressure loss in the system. This valve technology is even able to ensure the required minimum pressure level of the return flow, even when under full load in the main heating period. The precise control quality of the Ball Sector Valves provides an extremely wide rangeability in summer-winter operation. Even the smallest volume flows in midsummer at a lower heat consumption in the system, the Ball Sector Valves are able to control low flow rates of just $10 \text{ m}^3/\text{h}$ in a stable and precise manner.

After more than 5 years of experiences in the Stadtwerke Bielefeld district heating supply, the operators are still extremely satisfied with the Ball Sector Valves from Schubert & Salzer Control Systems. These positive experiences and the low operating and maintenance costs shall be playing a decisive role in future Bielefeld Municipal Authority conversion and expansion projects.

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