Sliding gate valves excel in handling toxic chemicals

Chemiewerk Bad Köstritz relies on Schubert & Salzer for SO_2 control

An application report by Marcus Nöthlich and Rainer Weigelt

Sulfur dioxide is a highly toxic medium. Its handling is therefore subject to major accident prevention regulations and places the highest demands on the safety and reliability of the valves used. At Chemiewerk Bad Köstritz, sliding gate valves from Schubert & Salzer are used to control liquid and gaseous sulfur dioxide, achieving exceptional results in terms of service life and control accuracy.

"Because Chemistry Matters" is the slogan of Chemiewerk Bad Köstritz (CWK). The manufacturer of specialty inorganic chemicals from Thuringia looks back on a history spanning more than 195 years, beginning with the opening of the Heinrichshall salt works in 1831. Today, CWK is a medium-sized chemical company with a historically developed specialization in sulfur compounds, among other things. Thiosulphates are one such group of compounds, and CWK is one of only a few suppliers worldwide capable of supplying customers on a commercial scale. For many years, the company has relied on sliding gate valves from Schubert & Salzer in its production processes.

Thiosulphates – versatile sulfur compounds

Thiosulphates are chemical compounds consisting of sulfur, oxygen and a positively charged counter-ion such as sodium or potassium. They are used, for example, as "anti-chlorine" agents in sewage and exhaust gas treatment, as valuable fertilizer additives, as important reducing agents in the chemical industry and have a long and significant history as fixing salts in analogue photography.

Dipl.-Ing. (FH) Marcus Nöthlich, Operations Engineer in the Sulfur Compounds Division at CWK, describes the production of sodium thiosulphate as a two-stage batch process: first, caustic soda and sulfur are reacted exothermically in a cooled stirred tank reactor to form sodium polysulphide solution. This solution is then charged stoichiometrically (in the exact quantitative ratio) into a reaction vessel together with caustic soda, water and a sodium thiosulphate mother liquor. In the second process step, liquid sulfur dioxide (SO_2) is introduced into this mixture. Precise flow control is achieved

A type 8043 sliding gate valve from Schubert & Salzer regulates the flow of liquid and gaseous sulfur dioxide into the reaction vessel.

using a type 8043 sliding gate valve from Schubert & Salzer. The liquid SO_2 expands in the reaction vessel and becomes gaseous. Under continuous agitation, the gaseous SO_2 reacts exothermically with the other raw materials, with controlled cooling, to form sodium thiosulphate solution.

Sliding gate valves – safe handling of toxic SO_2

One particularly critical aspect of this process is the handling of sulfur dioxide. “This chemical is hazardous and highly toxic,” explains Marcus Nöthlich. “Because we store and process it in very large quantities, our plant is subject to major accident prevention regulations. Continuous monitoring of the ambient air for its exact SO_2 concentration is essential. Even the smallest leaks in the system trigger an alarm from the installed gas sensors within seconds. Just a few breaths can cause severe respiratory distress. At higher concentrations, there is an acute danger to life.”

For this reason, the tightness and reliability of the valves used to control sulfur dioxide are of central importance to CWK. With the wafer-type sliding gate valves from Schubert & Salzer, the company has found a solution that more than meets these demanding requirements. For this application, the flange connections are designed with tongue-and-groove sealing in accordance with DIN EN 1092-1. External tightness at the valve spindle is ensured by an additional metal bellows seal alongside the packing. The complete valve fulfils the requirements of the Technical Instructions on Air Quality Control (“TA-Luft”) in accordance with ISO 15848-1.

Sulfur dioxide

Description:
colourless, toxic gas with a pungent odour
Melting point: -103.9 °F
Boiling point: 13.82 °F
Molecular weight:
64,06 g/mol

Application:
sulfur dioxide is used, among other things, in the manufacture of chemicals and as a preservative, antioxidant and disinfectant in the food industry.

H331 Toxic if inhaled.

H370 Causes damage to organs.

H314 Causes severe skin burns and eye damage.

Maximum service life and control quality

“In addition to their outstanding tightness, we were especially impressed by the reliability of the sliding gate valves,” explains Marcus Nöthlich. “The valves we used previously had to be completely replaced twice a year due to wear. That causes costs, downtime and, because of the SO_2 residues in the pipework, represents a safety risk for our technicians along with additional effort. With the sliding gate valves, however, we only replace individual wear parts even after several years of operation. Thanks to practical training provided by Schubert & Salzer here at the chemical plant, our technicians can even carry out this maintenance work themselves without any problems.”

These exceptionally long service lives are made possible by the underlying operating principle of the sliding gate valve: two slotted sealing discs arranged perpendicular to the direction of flow slide against each other, thereby varying the flow cross-section. By design, the valve stroke is extremely short – depending on the nominal size, only 6–9 mm. As a result, the packing and metal bellows in sliding gate valves are subjected to significantly lower mechanical stress, leading to reduced wear and longer service life.

Dipl.-Ing. (FH) Marcus Nöthlich (right) and Rainer Weigelt, Technical Sales at Schubert & Salzer, during an inspection of the valves used at Chemiewerk Bad Köstritz. In addition to sulfur dioxide for thiosulphate production, sliding gate valves at CWK are used in a wide range of applications, including steam, liquid sulfur and other liquid and gaseous media.

Sliding gate valves control and shut off liquid, vaporous and gaseous media precisely, quickly and economically.

A sealing disc fixed perpendicular to the flow direction in the body has a certain number of transverse slots. A movable sealing disc with the same slot arrangement is pushed vertically against it, which changes the flow cross-section. The existing pressure difference presses the movable disc against the fixed disc.

In addition to increased service life, the use of sliding gate valves has also significantly improved control quality. “To adjust the pH value of our thiosulphate solution, we inject gaseous SO_2 after the liquid SO_2 stage. The high control spread of the sliding gate valve used for this process enables us to regulate the mass flows precisely and manufacture a product that meets both our own quality standards and those of our customers,” explains Marcus Nöthlich.

Wide range of applications for sliding gate valves

As a result of these and similar experiences, sliding gate valves have long been an integral part of the various processes and systems at Chemiewerk Bad Köstritz. They help to increase operational safety, improve precision and reduce maintenance costs. “Whether for controlling sulfur dioxide, steam or other liquid or gaseous media – the sliding gate valves from Schubert & Salzer have proven themselves exceptionally well in our plant. So all one can say is: chemistry matters here,” concludes Marcus Nöthlich.

About Chemiewerk Bad Köstritz

Chemiewerk Bad Köstritz GmbH (CWK), based in Thuringia, is an internationally active medium-sized company specialising in the development and manufacture of specialty inorganic chemicals.

CWK
Weil die Chemie stimmt.

Its portfolio includes in particular sulfur compounds, silicic acids and molecular sieves. These are used in a wide range of industrial applications, such as water treatment, the food industry, gas purification and environmental technology.

With a high level of technological expertise, many years of experience and great flexibility, the company develops customized solutions for international markets. Continuous investment in modern production technologies as well as energy and resource efficiency strengthens the company’s position as a high-performance and sustainable partner for customers worldwide.

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