



## An Exotic Valve with Economic Potential



### Celanese solves tricky situation with Ball Sector Valve

An application report by Volker Gatzert and Thomas Labahn

**When an expensive control valve breaks down after three months only, a remedy is needed badly. But engineering resin producer Celanese (formerly Ticona) had been having to live with this situation for considerable time due to their extraordinary production process. Thinking outside the box was the way out. Using an “exotic” ball sector valve not only solved the problem, but also saves money.**

The control valve was ready for scrapping after only three months. We are not talking about some cheap plug valve made from low-quality steel, but rather a valve made from high-quality Hastelloy C. This situation could not be tolerated for long, but the harsh conditions in fiber reinforced plastic production at Celanese (Ticona) in Kelsterbach meant that abrasion and corrosion occurred on the body, tapered seat or plug after only a short time, leading to total failure.

Globe valves of the type used until in the 1980s could not be considered because of the emissions regulations in “TA-Luft”. Thomas Labahn, the person responsible for plant planning and EMC at Celanese (Ticona) in Kelsterbach, took a long hard look at the problem. This explains why he was very interested in a ball sector valve that he saw during a plant tour of the valve manufacturer Schubert & Salzer in Ingolstadt. “As soon as they explained the control valve to me, a light went on in my head,” is how Labahn describes his Eureka moment.

The fiber enforced plastics manufacturer conducted a parallel test of a ball sector valve from Schubert & Salzer and one from another manufacturer. The latter valve lasted precisely three weeks before seizing up. The Schubert & Salzer valve on the other hand, performed well in this application: “The very first attempt was a major success. The valve lasted nearly ten months, almost three times as long as before,” explains Labahn. The trick: The valve is made from standard material (stainless steel) and only has hard chrome-plated (stellited) ball sector surfaces. This is the reason why it is significantly less expensive than the previous valve made from Hastelloy. Furthermore, the damaged valve can be repaired and even costs a good deal less to buy than does the plug valve



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Thomas Labahn, Celanese (Ticona): “We managed to increase the service life almost by a factor of three right from the first attempt.”

made from Hastelloy. Considering the numerous control functions in which these valves are used at Celanese under extremely challenging conditions, the saving potential is quite considerable.

### A small actuator is sufficient

After ten months in operation, only the holder of the seat ring had come loose, and the manufacturer is already working on a solution to this problem with an improved variant. “We found there was abrasion on the parts that were not stellated but came into contact with the medium,” describes Labahn. As far as the client is concerned, the reason for the longer service life is principally to do with the geometry: “The media flows through the ball sector element in a totally different way than in the plug valve,” explains Labahn.

In future, completely stellated valves are expected to offer even greater improvements. Other important aspects in favor of using ball sector valves are their comparably light weight and relatively low actuator thrusts. The friction against the stuffingbox seal in

plug valves means they have a very high break-loose torque and this explains why they need powerful actuator thrusts. The torque with the ball sector valve, on the other hand, is relatively low and the actuators can be correspondingly smaller. A single acting pneumatic rotary actuator with a safety position is used on the valves. Furthermore, the valve does not get blocked because the entire pipe cross section is left unobstructed when the ball sector is fully open. The fibre enforced plastics manufacturer is also happy when it comes to the control response: "In our case, the control accuracy that has been achieved is comparable to that of the plug valve we used to use," reports Labahn.

"We are planning to test using the ball sector valve as a manual valve as well soon," declares operations assistant Volker Gatzert. The client anticipates this will result in greater ease of movement at the same time as saving space and weight. "There's not much room available where we use the valve," describes Gatzert. However, it is a disadvantage that the unit is not built as a flange valve. Gatzert: "I think the manufacturer should consider designing a flange valve to open up a new and wider range of applications for its valves."

## COMPACT - Principle of the ball sector valve

The ball sector valve consists of a hemispherical shell - the ball sector - that is held securely in the valve body using two large bearing stems. Part of the hemispherical shell is used for isolating, while the other has a hole with a diameter corresponding to about 80% of the nominal size of the valve. The ball sector is turned through about 90° from fully open to closed. The shape of the opening cross section changes from completely round to elliptical in this case. This practically round shape for the flow opening reduces the risk of blockage when small control settings are made. The valve characteristic maintains almost the same percentage value with constant differential pressure. The modified equal-percentage operating characteristic (in operation, the differential pressure increases as the valve closes) combined with the outstanding rangeability of 300:1 mean that that valve can be used for most control tasks. The special connection of the valve body ensures that the differential pressure on the valve has little effect on the actuating torque. Ball sector valves are used as isolating and control valves for fluids, gases, suspensions and sludges, especially in the pulp and paper and chemical industry. Abrasive slurries of iron ore, coal, lime and fly ash are also controlled with this type of valve.



(1) The ball sector valve opens almost the entire pipe cross section when it is open.  
 (2) The actuator of the ball sector valve is small and compact.

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