

When the going gets tough

Gravel, sand, cement, powder, chalk, pellets, granulates, ash, sugar and salt are bulk materials that need to be dosed. As the materials often enough are dry, powdery and granulous, it is an enormous challenge to keep a plant operating seamlessly. Special valves, however, have a license to control.

This already makes clear that valves designed for bulk materials handling are used often enough – and they don't need to hide behind plant components in the oil, gas and energy industry which stand more in the limelight. In very central industries, such as the building materials industry, food and chemical industry, as well as environmental engineering, they perform important duties – all in the name of economic growth.

Laborious handling

Handling of bulk materials is a laborious affair, the materials are need to be shut off, dosed, conveyed, as well as loosened up. Dangers lurk for specialists. "Dust loading in open haulways and unprotected manufacturing processes are a growing concern," explains Andreas Kühn, key account manager, Ebro. The trend therefore is towards closed, non-susceptible systems. Here, high-performance extraction and filter systems are used, whose pipes again need to be isolated.

A further trend demands "intelligent" solutions, i.e. smart valves with certain look-ahead functions that can transmit data to higher-level controllers.

Bridging as a risk

Downtimes are a special risk in the case of bulk materials. "If a valve is seldom used and shuts off the discharge volume of a medium with difficult flow properties, bridging often occurs," emphasises Andreas Kühn, Ebro. Bridging begins at the valve disc. Often enough bridging blocks the flow of material right up into the silo. The valve disc is then subjected to disproportionate frictional forces when opening. Elaborate countermeasures can, in some cases, be avoided from the start if the proper valve is used: "The valve disc is set to vibrate in light, linear way through a vibrator located on the lower shaft. The frequency is controlled

11th International Valve
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27–29 November
2018
Düsseldorf, Germany



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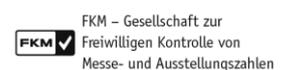
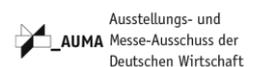
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via air pressure. The vibrations keep the medium in motion and successfully reduces bridging,” explains Kühn. A medium, which has already compressed or adhered to the disc, is loosened up and comes off. “With a mounted positioner various coarse/ fine flows can be started, so that the medium can be discharged very delicately even with small opening angles”. During this process the seal of valve dampens the valve body. A disc made by Ebro is designed as a wafer type with nominal diameters between DN 150 and DN 400 (stainless steel bodies available until DN 300) and for temperatures ranging from -10°C to +200°C – depending on medium, pressure and material.

Unhindered discharge

This allows vibrating dosage discs to offer the necessary performance. First off, they offer a near unhindered discharge (full flow) of the product when open. “If the discharge weight requires a fine flow in order to be realised, for instance from the scales, i.e. a defined reduction of the volume is needed, the valve closes to an opening angle of merely 20°”. Bridging here normally already occurs with powders with normal flow characteristics, often enough up into higher areas of a silo. “A consistent, reliable and above all reproducible discharge is no longer possible. Only with appropriate fluidisation or externally initiated vibration can the product flow be kept going,” underlines Kühn.

It is decisive the valve can target the bridges force: the valve disc vibrates horizontally with a selectable frequency and amplitude. End users can opt freely in which opening area the vibration can be turned off and on. Kühn: “Compacting of the medium is effectively suppressed, as the vibration is only horizontal, i.e. axially in direction of the valve shaft, but not against the direction of the flow”.

Coarse components

Valves for bulk goods often enough are components for handling rough stuff – when the going gets tough and the tough gets going, highest requirements concerning the wear resistance of the valve materials need to be fulfilled. This always is a concern for manufacturers when designing products. Cera Systems, for instance, manufactures an “particularly robust, metallic ball valve for the open/close function for abrasive and excessive abrasive media, preferred for applications when pneumatically

transporting bulk materials”. Such a valve requires the stem shaft, the stem shaft insert and the seats to be made “in a particularly stable manner“. The ball valve can be pressurised from both sides.

The operating principle of Cera’s ball valve is based upon a float ball, above DN 150 as a trunnion mounted ball. The seat elements are pressed against the ball using springs. “The round geometrical shape of the ball bore is standard. This ball valve has a ‘two part body’ design,” explains the company. On top of it all, the valve is highly flexible, as they are available with a manual lever or gear box, as well as with pneumatic, electric and hydraulic actuators.

Adhesion and abrasion

From Ebro’s point of view, shut-off and dosing elements require two main characteristics. They need to be able to resist adhesion and abrasion.

Abrasion of seal elements, bearing points for moving parts, as well as conveying or dosing components limit the options in terms of material combinations. “The optimal evaluation of the processes therefore is of elementary importance”.

Adhesion needs to be kept in mind: bulk materials, which tend to be adhesive can cause major problems in throttle, dosing, or shut-off valves.

Special coatings, elastomer seals and functional elements, such as inflatable liners and flanges, explains Andreas Kühn, key account manager, Ebro.

Protection from explosive materials

It is far from seldom that bulk goods are explosive materials, such as in the chemical industry. “Consequences of dust explosions can be devastating: lost production, damage to equipment, systems and buildings, or even personal injury,” emphasises valve manufacturer Hoerbiger. Comprehensive explosion protection therefore is indispensable. A quickly opening relief valve offers help, allowing the overpressure to vent flamelessly, without a dart flame. Venting off overpressure makes sure a container isn’t damaged. “After an explosion,

the valve seals tightly again, preventing secondary explosions,” the company points out.

The chain of bulk materials handling is long and ranges from discharge, conveying and weighing to storage. For operators of silos, containers and chutes for such goods level measurement is of great importance. Siemens has developed a vibration switch for high, low and demand levels for materials with low bulk density. It can be used with powdery and granular low density bulk goods up to 60 grams/liter in mining the food and plastics industry, as well as in chemical and pharmaceutical plants. The vibration switch also serves as an overflow and dry-run protection. Furthermore, it can handle vibration, which can be significant. “The vibrating fork design ensures the sensing tines are kept clean for reduced maintenance,” explains Siemens. This, in turn, leads to a lower total cost of ownership – the same naturally also is the case for optimised discharge, dosing and shut-off valves.

Automation on the rise

Manufacturers of high-quality valves for bulk materials handling are set to profit from the current market conditions: production processes in emerging markets are steadily becoming automated. So far, manually moved bagged goods are now transported in sealed pipelines, due to hygienic reasons. “Manually performed dosing is automated, mixing processes optimised. Automated packaging of final products also requires considerably improved shut-off valves,” says Andreas Kühn.

In general, countries such as Germany, Italy and Benelux are important buyers of valves for bulk materials, as they have “strong, export orientated plant engineering”. China and Australia are also coming into focus, due to “strongly rising raw materials production and processing“. The world is sometimes not enough ...

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