

Rotary valves: robust conveying

As demands for sustainable cement production impact on bulk materials handling, more robust and durable valves for cement conveying lines are being developed. These withstand abrasive materials for longer and often provide energy savings in terms of operation.

■ by **Coperion GmbH**, Germany

The handling of abrasive bulk materials in the minerals and cement industries occurs in challenging conditions, particularly in terms of components in pneumatic conveying systems. These systems are subject to extreme wear caused by a combination of the abrasive materials handled, high differential pressures and conveying speeds.

To meet these demands Coperion has developed the DuroProtect wear protection concept for rotary valves, backed by knowledge and experience gained through the implementation of many projects, research and testing. For example, its in-house wear test facility enables the testing and evaluation of Coperion's wear protection concept and used materials (eg, chrome, tungsten carbide, ceramic) in combination with highly abrasive bulk solids from customers.

With this experience Coperion has succeeded in developing a finely-balanced portfolio of different wear protection levels for its rotary valves – ie, the DuroProtect concept. Furthermore, the company has recently refined this DuroProtect system to further comply with the present and future needs of its customers.

Considering all aspects of customer applications (including bulk material

Figure 1: Coperion's DuroProtect concept

WEAR PROTECTION LEVEL	DP10	DP20	DP30	DP40	DP50	DP60
HOUSING	DUROCHROM	DUROCHROM	DUROCHROM	DUROCHROM	DUROCARB	DUROCERA
COATING THICKNESS	[Progressive increase in thickness from DP10 to DP60]					
ROTOR	STEEL	STEEL	DUROCHROM	DUROCARB	DUROCARB	DUROCARB
SIDE PLATE	CAST IRON	DUROCHROM	DUROCHROM	DUROCHROM	DUROCARB	DUROCARB/ DUROCERA

properties, differential pressures, conveying speed) and individual needs, Coperion is able to provide the optimum solution.

Pneumatic conveying

Rotary valves are becoming increasingly important in the pneumatic conveying of abrasive bulk materials, especially in the cement industry.

Compared with other feeding technologies used to date (such as screw pumps or pressure vessels) rotary valves offer significant advantages and are becoming even more attractive due to the benefits offered by Coperion's DuroProtect concept. With the range, it is possible to satisfy all customer requirements of wear-

protected rotary valves in the cement industry. Throughputs of up to 300tph and conveying pressures of up to 2barg can be achieved – either by blow-through rotary valves or discharge rotary valves.

The main advantage of a blow-through rotary valve, as provided by Coperion, is the higher possible throughput rate particularly at high conveying pressures, due to the forced emptying of the rotary chamber (see also Figure 2).

Benefits of rotary valves

One of the most important challenges in the cement and other industries is saving energy, particularly for sectors that have high energy consumption.

Using rotary valves to feed pneumatic conveying systems in cement applications has a significant impact on the energy consumption of the complete pneumatic conveying system. Therefore, it saves costs and reduces environmental impact tremendously.

Low power drive units

Rotary valves only require low power drive units. In typical cement applications the drive power on rotary valves is in the range of 5-10kW. Therefore, compared to screw pumps – which can be equipped with 150kW drive units or even bigger – power consumption can be reduced by 90 per cent and more in identical applications.

Figure 2: blow-through rotary valve

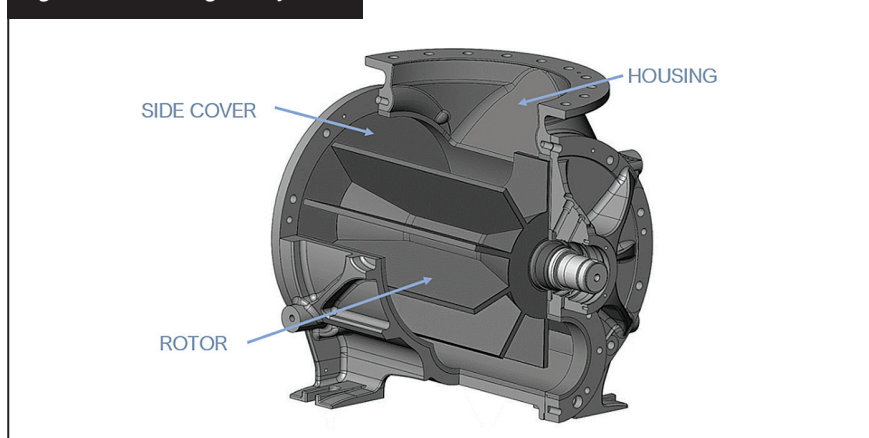
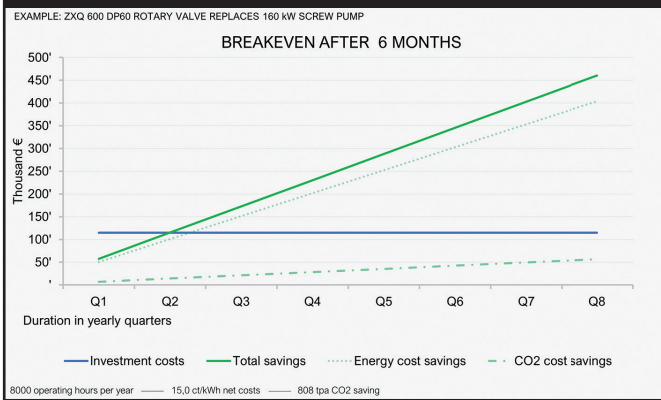


Figure 3: amortisation and savings of rotary valve investments for cement conveying applications



Low pressure loss and air leakage levels

However, the low power requirements of the rotary valve unit is not the only energy-saving factor. Leakage of conveying air and pressure loss in the conveying line are also major factors that influence power consumption of the complete system and therefore, investment and operating costs.

A rotary valve creates only ~50mbar of pressure loss and air leakage can be kept at a low level via small gaps between the rotor and housing, which are additionally sealed by the bulk material itself, regardless of whether the rotary valve is running under full load or with reduced capacity. The pressure loss of a screw pump for example, with up to 300mbar, is much higher and the optimum operating parameters in terms of pressure loss and leakage rate can only be achieved under full load conditions.

Due to these characteristics of rotary valves, the air supply system for the conveying air can be sized ~10 per cent smaller, since the required air volume as well as the conveying pressure can be reduced. Another potential saving is the reduction of CO₂ costs, which should also be considered.

The various factors combined are the key to an optimal solution that amortises within months.

Easy installation

A further advantage of the rotary valve is its customer-friendly and simple installation. Expensive and elaborately reinforced foundations (necessary for other heavy weight solutions) are not required. The rotary valve can simply be mounted to the floor using bolts, needing no special preparation. In addition to the easy installation itself, a blow-through rotary valve also keeps the installation height

power consumption, equipment lifetime and maintenance costs are key factors in the economical operation of valves, particularly in applications characterised by wear and tear, such as cement conveying.

Therefore, Coperion aims to provide the best possible solution, meeting the sweet spot of equipment lifetime and related investment costs. Due to the different wear protection levels provided by the DuroProtect concept, the optimum solution can be selected, based on bulk material properties and pressure level.

The highest grade of wear protection

to a minimum. Compared to feeding technologies like screw pumps or pressure pots the required space is much smaller.

Longer equipment lifetime, reduced maintenance costs

In addition to lower installation costs and

within Coperion's portfolio is the DuroProtect 60 rotary valve, a ceramic lined rotary valve. With the patented seamless ceramic lining of housing and side covers in combination with tungsten carbide-protected rotor surfaces, wear and tear can be reduced to a minimum.

This results in a long lifetime in difficult applications at maximum performance and is considered the valve of choice in cement conveying applications at high conveying pressures.

Conclusion

Taking into account increasing sustainability requirements when designing and operating conveying equipment has led to the development of valves that are more robust and stand up to the abrasive bulk material handling so often found in the cement industry.

Coperion's DuroProtect wear protection concept opens up new possibilities for using wear-protected rotary valves in pneumatic conveying systems. Thanks to knowledge gained through years of experience, the company is able to provide its customers with the best solution to reach maximum energy savings, equipment lifetime and performance in their material handling systems. ■

Significant energy savings for German cement plant

A well-known cement plant in Germany equipped its pneumatic conveying systems for cement and raw meal with four Coperion ZXQ 600 DP60 ceramic lined blow-through rotary valves. As a result, the cement producer has been able to achieve significant energy savings.

FACTS AT A GLANCE: 4pc ZXQ 600 DP 60 – GERMAN CEMENT PLANT

CEMENT RAW MEAL & CEMENT CONVEYING

4x ZXQ 600 DP 60

- > Conveying capacity: 165 t/h
- > Conveying pressure: 1.4 barg

- ✓ Consumption **ROTARY VALVE** 7,5 kW
- ✗ Consumption **SCREW PUMP** 160 kW

Energy reduction of 152,5 kW through **EACH ROTARY VALVE**

SAVINGS PER YEAR

1.220 MWh
182.000 €
29.000 €

Each rotary valve
Energy costs
CO₂ emission saving



TOTAL ENERGY SAVINGS FOR GERMAN CEMENT CUSTOMER:
844.000 € and 4.880 MWh PER YEAR