

HANDLING TRANSITIONS BETWEEN EQUIPMENT IN HARSH APPLICATIONS

Reliable gates, valves and diverters can have a tremendous impact on process flows while handling abrasive and corrosive materials.

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In this white paper, we will:

- Explain the benefits and usefulness of gates, valves and diverters.
- Explore challenges that arise – such as safety concerns and costly downtime – from substandard equipment.
- Show practicality and effectiveness of custom-made gates, valves and diverters on a process stream.

INTRODUCTION

Harsh conditions are a part of life in bulk material handling. Considering the nature of the industries – fertilizer, mining, pulp and paper, utilities, etc. – there are portions of the process relying on high-functioning equipment despite abrasive and corrosive materials, as well as blistering heat.

Equipment that thrives in those conditions can separate leading operations with those trying to play catch up. It's invaluable to have versatile and reliable transitional equipment, such as slide gates, valves and diverters.

Slide gates offer several benefits for a bulk material facility. They can reduce downtime by temporarily stopping or by-passing material flow to provide proper maintenance to necessary downstream equipment.

Slide gates are well-suited for simple “open/closed” operation or can be designed as an effective metering device through electric linear actuators or pneumatic/hydraulic cylinders equipped with linear transducers.

They are also a good option for plants dealing with a wide range of free-flowing materials in various sizes. A slide gate's installation envelope is relative shallow compared to other options. This low profile is a major advantage for retrofits and process flow alterations.

Clamshell valves can be easily adapted to equipment and work best for unrestricted flow of product. This makes them practical if all that's needed is an open/closed valve – such as loadout to truck or railcars and under bins and silos.

Clamshells are also a good option for free-flowing granular-type products, as well as high-volume material discharge.

Diverters, also known as diverter valves, control the flow of bulk material from one material stream to another. They use an actuating blade or basket/pan to ease the flow of materials to multiple chosen discharge points.

Diverters are one of the most versatile pieces of equipment in a process flow. To name a few examples, they could:

- Take product from one piece of equipment to another, by-pass downstream equipment in an upset condition or bisect the product flow to additional pieces of equipment.
- Distribute product to bins, silos or other pieces of storing devices.
- Transfer product from primary equipment to secondary equipment, allowing maintenance on primary equipment without shutting down.

No matter the industry, tough and reliable gates, valves and diverters allow for flexibility that keeps production flowing to limit unnecessary downtime.

CHALLENGE

A plant has several hurdles in the pursuit of consistent profits. Looking at the role transitional equipment plays, it's important gates, valves and diverters are built to handle elevated temperatures (+300°F) and the constant pounding and sliding of abrasive and/or corrosive materials.

Otherwise, the equipment will have a shorter lifespan and require more-than-normal maintenance, which eats away at profits and consume maintenance resources.

Transitional equipment made either with substandard materials or not for precise site specifications have a higher chance of malfunctioning or failing when exposed to the extreme environment. This clogs the arteries of a facility and halts the flow of the product.

For example, gate/valve seals could melt or deteriorate, resulting in improper blade sealing and leakage. Actuators in elevated temperature environments can also be problematic because of thermal expansion, electrical issues, and other issues come into play at temperatures higher than 200°.



If this happens, there is a high chance cylinders will leak air or oil. Also, if the seal is broke or damaged, it won't have enough force to open or close. This would result in a leaking gate.

Depending on the material handled, excessive wear and erosion could eventually lead to additional leaking. In more extreme operating temperatures, the gate's body could begin to deform from thermal expansion.

These risks could result in potential safety hazards, lost production and/or downed equipment that loses time and money. Think of every drop of fluid being another dollar of profit lost – especially if the leak turns into that full-blown failure.

The abrasive and/or corrosive nature of the materials being handled at a site don't help, either. Whether it's sand (highly abrasive), sludge (highly corrosive) or anything in between, the product and its properties relentlessly pound a facility's equipment – especially in 24/7 processes. Equipment that isn't properly built runs the risk of lasting well short of the projected life expectancy because of these abrasive or corrosive materials.

While needs of a certain company may be specific, a common problem for many facilities is dealing with these harsh conditions. Nearly all industries utilize gates, valves and diverters as part of their overall operations, including:



Biomass



Cement



Fertilizer



**Minerals
& Mining**



**Ports &
Terminals**



Potash



Power



Pulp & Paper



Utilities

In the **cement business**, production of Portland and masonry cement slightly increased in 2018 at 87.8 million tons and sales were up 3%. There is a considerable need for gates, valves and diverters to push forward the calcination process. Also, they must be strong enough to fight against the hot environment of the kiln and move a variety of materials, including either the wet or dry mix.

Equally important, the process flow must absorb the abrasive nature of the clinker as it gets moved into the slow cooling portion. Considering the potential hazards with clinker dust, transitional equipment must contain the product.

In the **glass industry**, gross output from American manufacturers have increased each year from 2009-2016. It reached nearly \$27 billion in 2016.

In the manufacturing process, controlled flow of the silica sand, soda ash, limestone and other chemicals into the furnace is essential. Having transitional equipment that can't handle the abrasive nature of the sand and the high temperatures near the melting furnace is a recipe for unplanned downtime and economic troubles.

In **coal-fired plants**, the ramifications between quality and poor gates, valves and diverters are drastic. While the burning of coal to produce energy is highly beneficial, dependable equipment should take on the resulting coal ash. Coal ash is the second-largest industrial waste product domestically, with nearly 130 million tons produced each year.

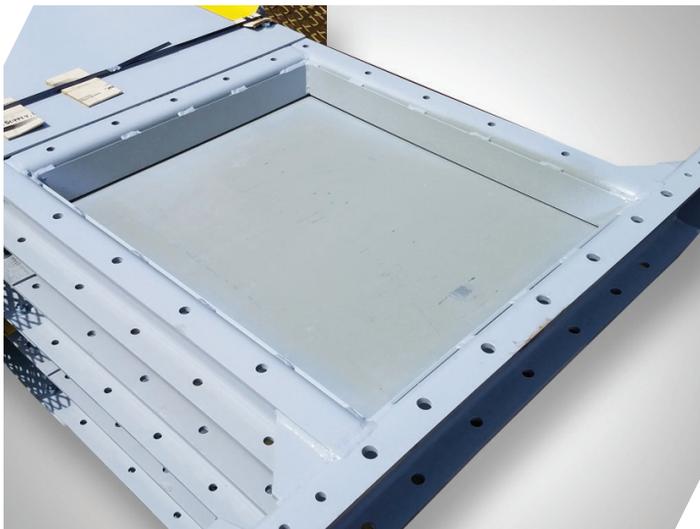
Whether it's fly ash, bottom ash or boiler slag, if the coal combustion residuals (CCR) are properly dealt with, it can have a number of positive results, including recycling into concrete and wallboard.

In **potash and fertilizer**, domestic production of potash had a comeback year in 2018, with an estimated boost to 500 million metric tons after years of decline. The high demand faced by the fertilizer industry means downtime can have tremendous financial implications. Unplanned downtime can easily lose fertilizer operations more than \$100,000 per hour and potentially cost a facility millions of dollars per day in lost profits.

Transitional equipment must not slow the drying process. It must withstand the heat of the rotary

dryer and the corrosive nature of the potash. Having tough equipment in the process flow – including those gates, valves and diverters – can also help ensure the quality of the product.

In the *pulp and paper industry*, stable gates, valves and diverters can be a part of a larger system that pumps hog fuel either into piles or into the boiler, the latter of which creates the steam necessary to generate power for the mill. Keeping that hog fuel boiler running efficiently helps prevent the necessity of using natural gas in order to protect thin margins. The gates, valves and diverters also need to effectively remove ash. Without that abstraction of ash, it heightens the chance of having a problem with a boiler – and being forced to resort to those imposed costs of natural gas to run the facility.



SOLUTION

While they seem like a minor part of a larger process flow, transitional equipment has a tremendous impact. It controls the flow of bulk material through a site, better allowing a facility to work through the rigor of 24/7 operations.

However, what makes a quality gate, valve and diverter?

It begins with the manufacturer understanding what's best for one plant may not be best for another. A one-size-fits-all approach may be cheaper initially but ends up costing the facility more in the

long run. Find a manufacturer that will work with a customer hand-in-hand, understanding the best approach to fit their specific needs.

That comes with customizing the gates, valves and diverters by:

- Material option
- Power option
- Industry specific
- Level of control

With varying abrasion and corrosion levels, consider the best material to create the gates, valves and diverters – whether that's carbon steel, abrasion-resistant steel or various grades of stainless steel.

A reputable conveyor manufacturer should also be able to offer gates, valves and diverters with different power options:

Manual

- Primarily used for low actuating processes, this is a cheaper alternative for plants that don't have a high need of partial usage

Electrical

- Electrical actuators can be more self-sufficient since it runs on electricity

Hydraulic

- Great for applications that require heavy cutting through material with the actuator blade

Pneumatic

- More practical if a plant's process requires higher cycle rates

A major benefit of customized gates, valves and diverters would be the flexibility that comes with built-to-order sizes of inlets and discharges. This gives more freedom to have flows that properly match a facility's product and its production goals. Customized transitional equipment can also help minimize the risk of major obstacles that come with unplanned downtime.



Lost production

In industries reliant on high volumes, loss of any production can be detrimental. Carefully crafted gates, valves and diverters ensure that the product is moving smoothly and efficiently.



Wasted labor

Waiting on faulty equipment to be fixed means wasted time for employees, who may be inactive until the equipment is repaired. Reliable gates, valves and diverters ensure labor costs are maximizing production.



Safer Workplace

Having customized gates, valves and diverters made with tough, reliable materials can help limit the chance of a safety hazard from broken down equipment – such as that leaking hydraulic fluid.

All of this revolves around a manufacturer understanding not all bulk material handling facilities are alike. Different industries have different needs. Even different facilities in the same industry will have customizable variances. That's what makes the one-size-fits-all approach so dangerous.

Forcing a square peg into a round hole is never the best option.

Instead, find a manufacturer that guides each step of the way to make sure transitional equipment is made specifically for that site. Each bulk material handling facility is different – with a different layout, different materials and different challenges. Find a manufacturer that understands that.

ABOUT THE AUTHOR

Andrew Parker is President for CDM Systems, Inc. He has more than 20 years of experience in the bulk material handling industry. He oversees operations, including conveyor design and development.

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