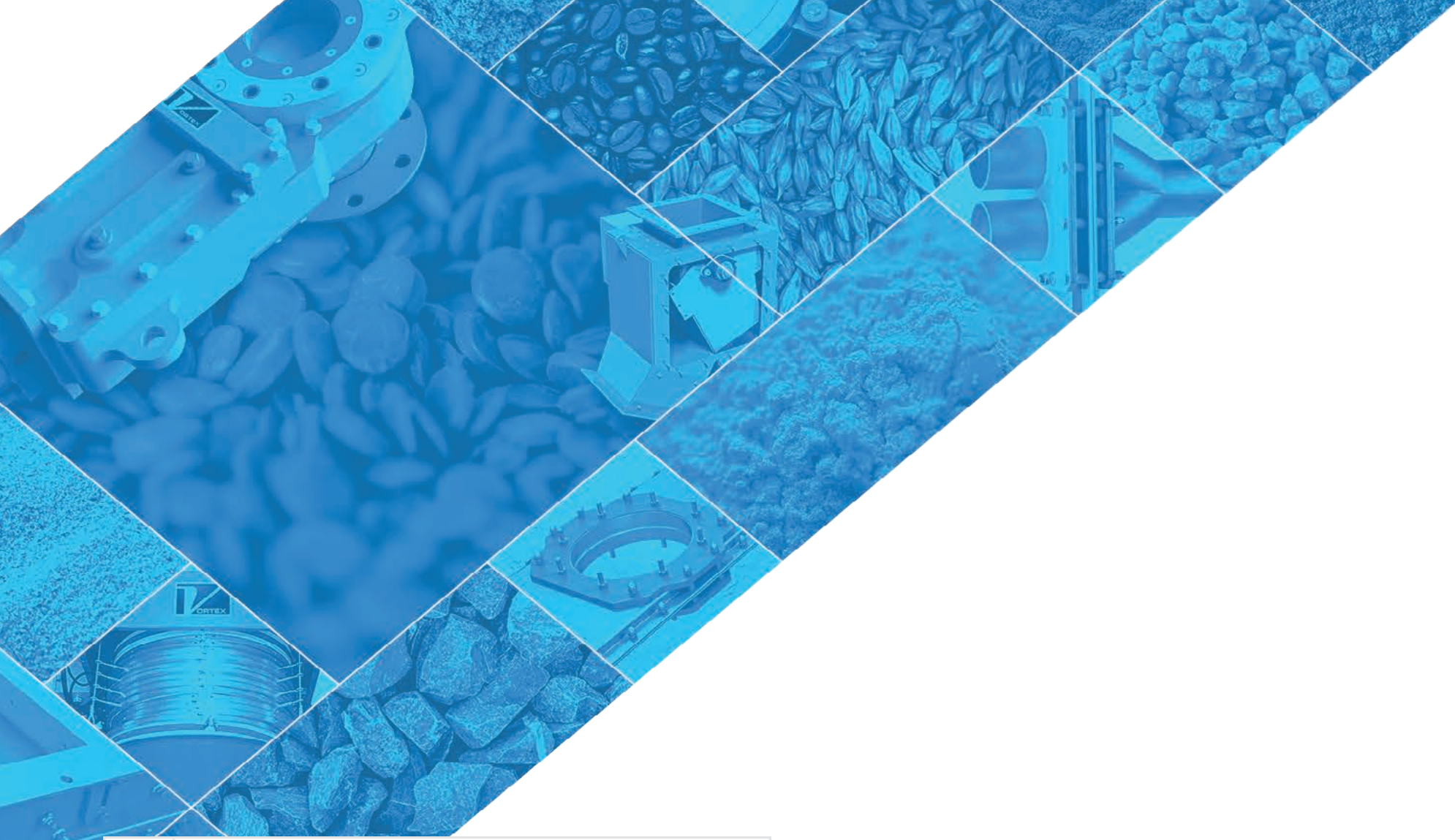

VORTEX LOCAL REPRESENTATIVE

New Representative
Eastern Canada
Rate Technology Systems

Rate Technology Systems
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Email: sales@ratetechnology.com
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Toronto, Ontario, M5E 1W7

VORTEX

SOLIDS & BULK HANDLING COMPONENTS

GATES | DIVERTERS | IRIS VALVES | LOADING SOLUTIONS

Since 1977, Vortex has delivered innovative solutions to a wide range of industries handling thousands of material types. If the product is dry...

We Ca

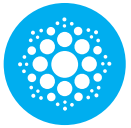

n Handle It.

Who We Are.

Vortex specializes in the design and manufacture of components used to transport and control flow of dry bulk solid materials. Vortex's technical focus is in the development of innovative technologies to improve solids process efficiency, ensure dust-free environments, and establish long-term reliability.

A GLOBAL LEADER & BUSINESS PARTNER

Worldwide, more than 20,000 companies – including ADM, BASF, Bunge, Cargill, Dow Chemical, DuPont, Fluor, In-Bev, Jacobs Engineering, Kraft Foods, Nestle, P&G, PepsiCo, Rio Tinto, Sabic, Solvay, and Vale – rely on Vortex slide gates, diverters, iris valves and loading solutions. With a global service network that spans more than 120 countries, Vortex delivers global solutions through localized relationships.

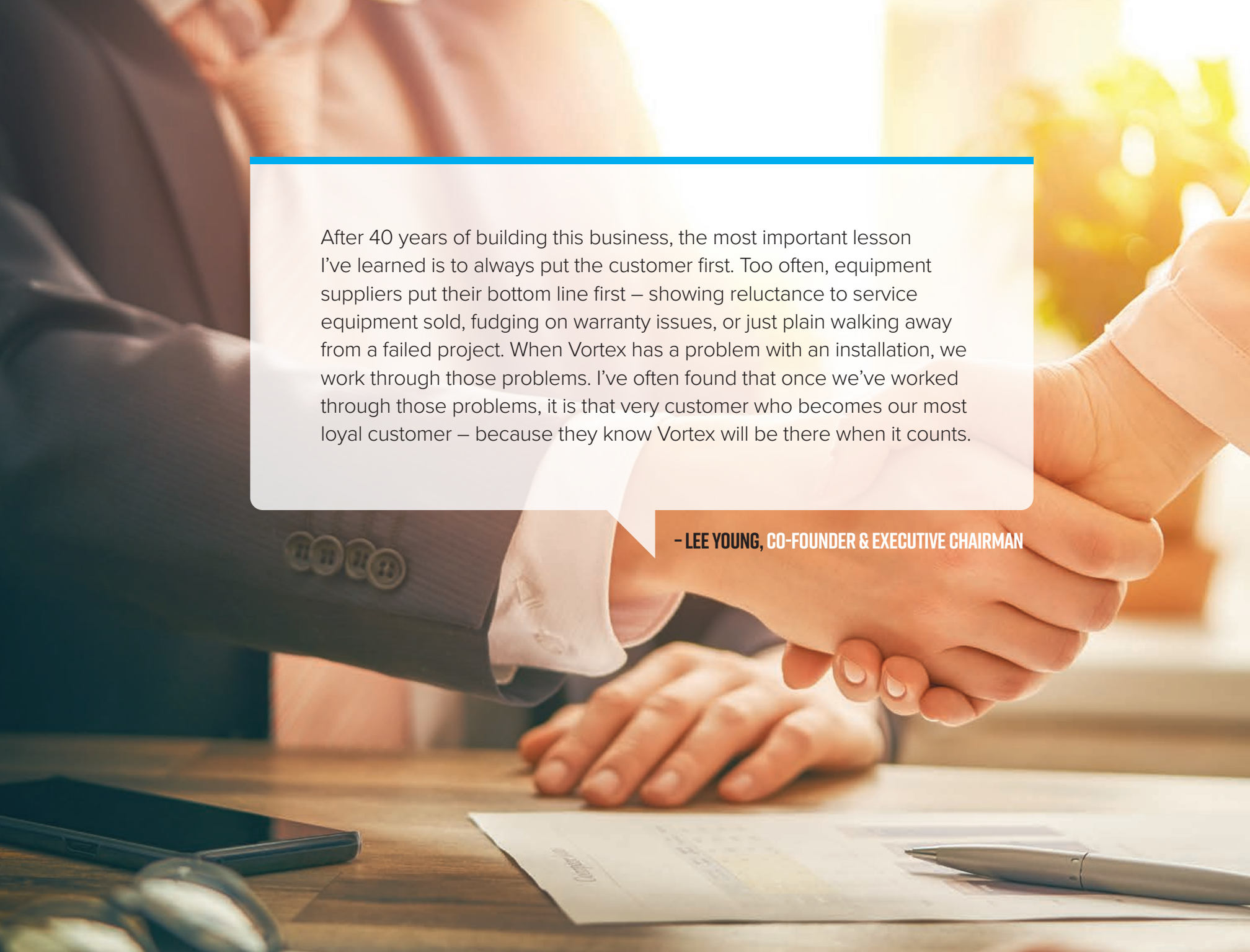


EXPERTS IN HANDLING DRY BULK SOLIDS

With more than 300 years of combined experience in the solids and bulk processing industry, our application engineering knowledge is unprecedented. We have delivered solutions to a wide range of industries handling thousands of dry solid types. If the material is dry, there is a high probability Vortex has handled it.

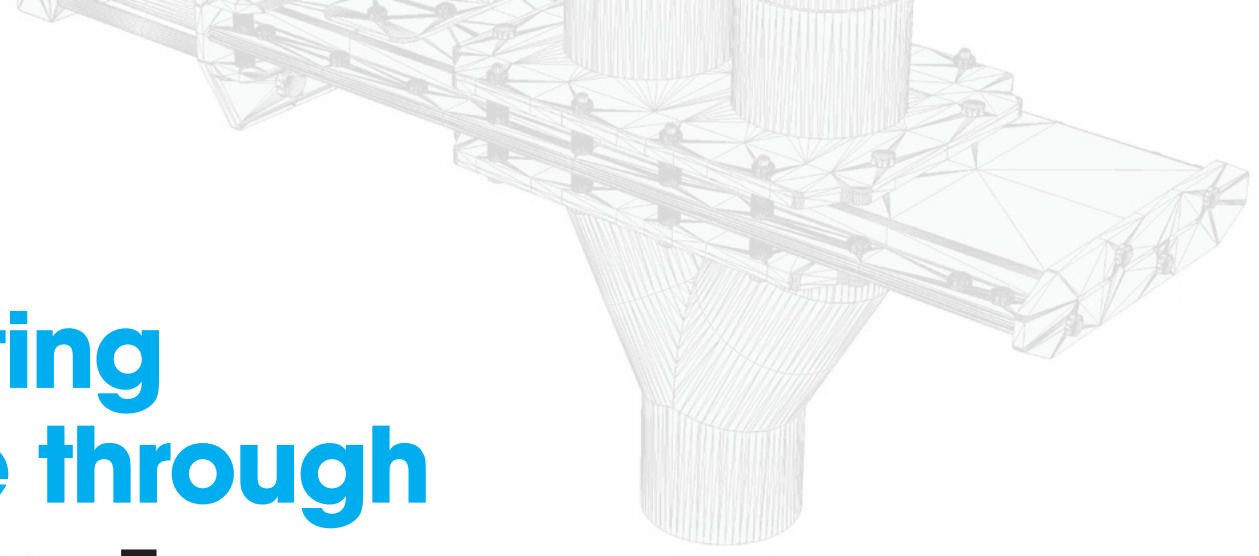
QUALITY ASSURANCE & CUSTOMER SERVICE SPECIALISTS

Vortex's client-focused quality management program is registered to ISO 9001:2015 and covers every aspect of product quality and technical services, from initial inquiry to product performance. Our specialists are available for you to contact at any time and can be quickly on-site. Vortex listens to end user needs and welcomes their feedback, based on product performance in-the-field. This open line of communication has led to many design improvements and new product developments – and allows our client-focused design philosophy to take shape.



After 40 years of building this business, the most important lesson I've learned is to always put the customer first. Too often, equipment suppliers put their bottom line first – showing reluctance to service equipment sold, fudging on warranty issues, or just plain walking away from a failed project. When Vortex has a problem with an installation, we work through those problems. I've often found that once we've worked through those problems, it is that very customer who becomes our most loyal customer – because they know Vortex will be there when it counts.

– LEE YOUNG, CO-FOUNDER & EXECUTIVE CHAIRMAN



Creating value through Design.

Our mission is to provide value-added products that are specifically designed for end users in-the-field, while maintaining a technical focus on developing innovative technologies using the following core principles:

+ COMPENSATE FOR WEAR

Vortex closely studies the characteristics of thousands of dry bulk materials and how they interact with various materials of construction. We assess the wear potential for each client's process and make application-specific modifications to ensure reliability, durability and longevity.

+ MAINTENANCE FRIENDLY

Our priority is to keep you up and running – because in your world, there is no time for downtime. Vortex components are engineered with in-line service features that accelerate the system maintenance process, saving your team time and money.

+ LONG SERVICE LIFE

End users are often attracted to equipment on the fallacy of low price, ignoring the cost-benefits of reliability and longevity. Vortex designs products that will out-perform and outlast market alternatives – so that end users realize the full value of their investment.

+ MINIMAL SPARE PARTS

Vortex approaches wear parts with simple, durable design. Doing so means maintenance procedures are also kept simple, while the need to perform maintenance is infrequent. This reduces spare part inventories – which also means a cost reduction.

+ APPLICATION ENGINEERING

Vortex believes in offering only value-added products that are designed for purpose, rather than producing off-the-shelf, commodity components. With an in-house team of engineers, Vortex designs equipment for even the most demanding applications.

+ DUST FREE ENVIRONMENTS

Facilities have an ethical obligation to protect against the hazards of manufacturing. Vortex closely studies trends in air quality, environmental dust emissions, workplace safety protocols and other evolving regulations. Our components are designed with these concerns in mind.

What We Do.

THE VORTEX DIFFERENCE:
INNOVATORS OF DRY BULK PROCESS IMPROVEMENT

Selecting the right piece of equipment is critical to the success of any dry bulk solid material handling system. Misapplied components and deficient designs add unexpected costs and create processing inefficiencies. The characteristics of dry bulk solid materials are endless, so there is no such thing as an all-encompassing solution that meets every application. This is why Vortex offers a wide range of valves and loading solutions for handling nearly any type of dry bulk solid, from fine powders to heavy ores.

With an in-house team of 70 product engineers and application engineers, and a global service network spanning more than 120 countries, Vortex analyzes the application parameters and works directly with you to match the right solution to the application. We offer collaborative problem-solving and technical support throughout – from project inception to completion. And that...is the Vortex difference.

"Opportunity lies in product and process innovation. If we can automate, we should; if we can make equipment last longer by design, we must; and if we can help lower our clients' costs, we both win."

– Lee Young,
Co-Founder & Executive Chairman

TABLE OF CONTENTS

Quantum SERIES

VALVES FOR DRY BULK PROCESSING & CONVEYING

For more than 40 years, Vortex Quantum Series slide gates and diverters have been used to shut off, meter, divert and converge dry bulk solid materials in gravity flow and pneumatic conveying processes. As our flagship line, the Quantum Series is the foundation to Vortex's design philosophy – and is especially known for in-line maintainability using minimal spare parts.

FAST TRACK

Model No. GRXX

ORIFICE GATE

History: Worldwide, plant managers and maintenance engineers recognize the Vortex® Orifice Gate™ as the industry standard. It was the first valve specifically designed for handling dry bulk solid materials, and is “the original” orifice gate valve.

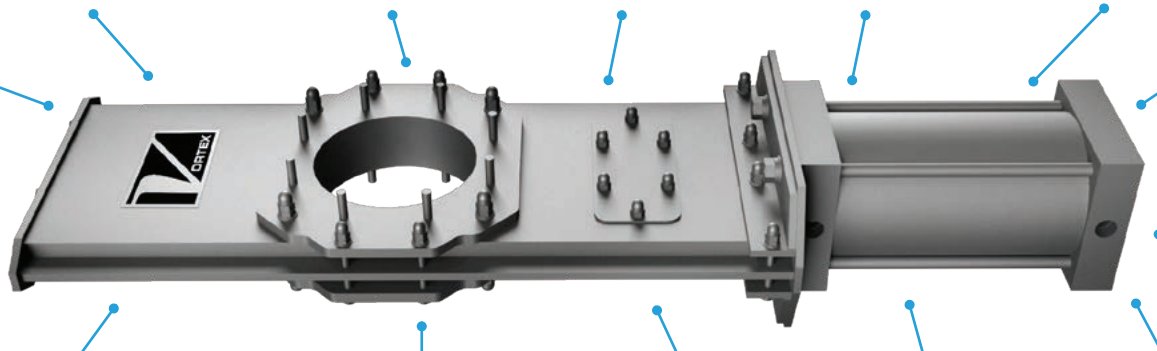
Purpose: Prior to the Orifice Gate, conventional knife gates and butterfly valves were commonly used in dry bulk solid material handling systems. Though knife gates and butterfly valves are well-designed for handling liquids and gases, they are ill-equipped for handling dry bulk solids. With their deficiencies in mind, the Vortex Orifice Gate was designed to present a high-quality solution specifically for dry bulk solids handling.

Studded

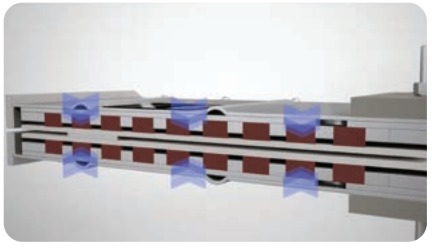
ANSI-DIN

-P

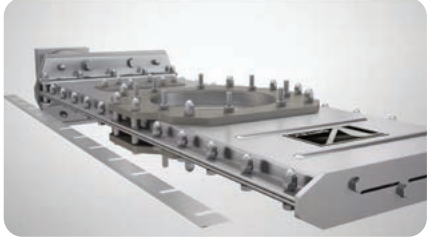
OPTIONS



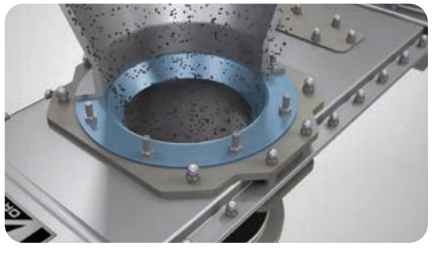
KEY FEATURES



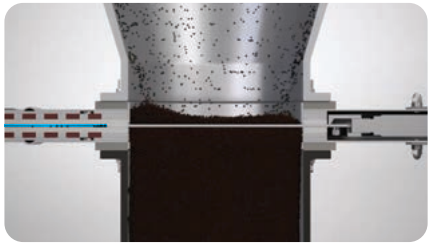
Live loaded, wear compensating hard polymer pressure plate seals



Shimming system for in-line maintenance



Optional Special Service Inlet minimizes material contact with the seals



Displacement area as an alternative to packing materials into an end seal

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow & dilute phase pneumatic conveying applications. Can handle differential pressures up to 15 psig | 1 barg | 0.1 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	2 – 16 in | 50 mm – 400 mm
Opening	Available in round sizes
Overall Height	2 – 3 in | 50 – 75 mm
Weight	10 – 225 lb | 5 – 100 kg
Flange Options	Standard stud bolt pattern, thru-bolt pipe connection, ANSI #125/150, DIN PN10, JIS 10 Custom flanges are available
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Options	Aluminum, 304 stainless steel, painted carbon steel
Material Contact Options	304 or 316L stainless steel
Pressure Plate Options	Nylon, PET, UHMW-PE, glass-filled PTFE, molybdenum disulphide-impregnated nylon
Load Seal Options	Natural rubber and/or silicone rubber
Drive/Actuation	Double-acting air cylinder, hand wheel/crank, chain wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches, and/or clear bonnet cover for visual indication (see page 63)
Material Flow Controls	AVP, IVP, VPO, VPC (see pages 65 & 66) ** Gate must cycle to full-open between runs to keep the displacement area clear of materials*
Other Options	Sealed body air purge (see page 64) Special Service inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Orifice Gate vs. Alternatives

- Many alternative slide gates and butterfly valves rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. Others rely on bonnet packing, which can relax and allow material packing in the seals. These deficiencies promote leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Vortex® Orifice Gate™ addresses these issues by incorporating "live loaded" hard polymer pressure plate seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the sliding blade. The seals are also shielded from the material flow stream, to protect them from abrasion. This design maintains the gate's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- Many alternative slide gates and butterfly valves have open cavities where materials can wedge and prevent positive material shut-off. Wedging can also create seal wear and material degradation, and can cause a gate to seize and bind. Wedged materials also create risk for cross-contamination and spoilage. To prevent wedging and ensure positive gate closure, the Orifice Gate's sliding blade is designed to mechanically clear materials away from the sealing surfaces with each opening stroke. This ensures migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

- Many alternative slide gates allow metal-on-metal sliding, which creates galling. This causes a gate to seize and bind, and can create foreign metal fragment contamination. The Orifice Gate's hard polymer seals eliminate metal-on-metal contact to resolve each of these concerns.

- A butterfly valve's rotating disc is directly exposed to the material flow steam, which creates wear to the disc itself. The exposed disc also disrupts convey line pressures and obstructs material flow as they pass through the valve, which can cause line plugs and other maintenance concerns. To resolve these issues, the Orifice Gate's sliding blade is machined with an unobstructed, full-bore orifice that maintains convey line pressures and allows unrestricted material movement.

- If the pressure plate seals have partially worn and the compression load is lessened, slight dusting may be present through the weep holes at the front of the gate. With this maintenance indication, the Orifice Gate's shimming system can be utilized to restore the gate's dust-tight seal. Unlike alternative valves, which require spare parts be kept on-hand for seal maintenance, the Orifice Gate requires removal of parts. By simply loosening the nuts along the lateral aspects of the gate, shim(s) can be removed from each side and the nuts retightened to restore the pressure plate seals' compression load. This maintenance process can be performed while the gate remains in-line, and can be repeated several times before the shims and pressure plate seals must be replaced.

- The Orifice Gate is designed with several replaceable parts, including actuator, sliding blade, clevis, pressure plate seals and shims, among others. If maintained and operated as recommended, these should be the gate's only wear parts. In several cases, this has allowed an Orifice Gate to remain in service for many years –and sometimes, even decades.

For more information & technical resources, please visit: **www.vortexglobal.com**

FAST TRACK

Model No. SXX

ROLLER GATE

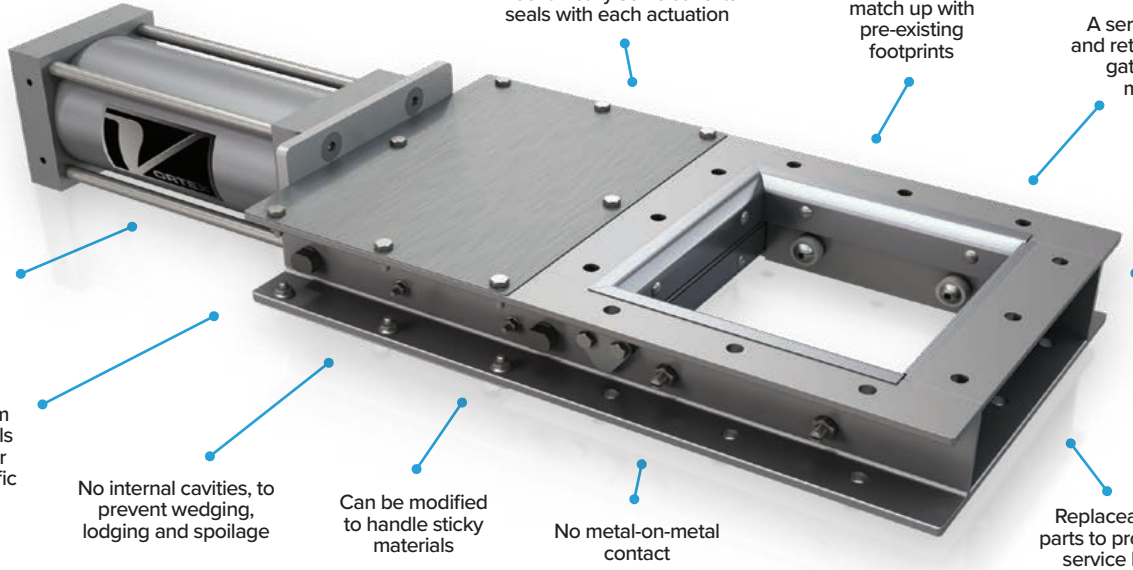
Ideal application: Installations above or below gravity-fed hoppers/silos, mixers, and augers/screw conveyors. It is also an excellent choice for application as an air shut-off gate/damper valve in vacuum dust collection systems. Custom sizes are available to accommodate any combination of gate stroke or width.

Square

Rectangle

Dual Cylinder

OPTIONS



For operator safety, no pinch points or exposed moving parts

Mechanically self-cleans its seals with each actuation

Flange options to match up with pre-existing footprints

A series of deflectors and retainers protect the gate's seals from material flow

Positive seal of materials/dust-tight seal across the blade and to atmosphere

Optional dual cylinder actuators for limited space installations and greater closing force. Can reduce the gate's overall footprint by 30%.

Constructed from specialized metals and polymers for application-specific durability

No internal cavities, to prevent wedging, lodging and spoilage

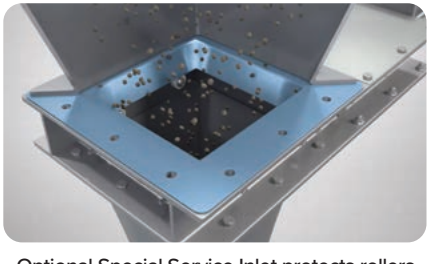
Can be modified to handle sticky materials

No metal-on-metal contact

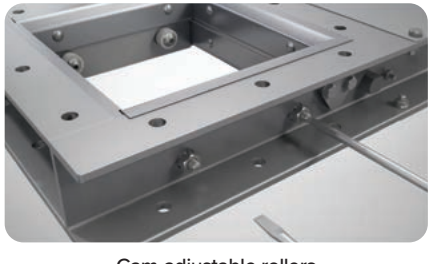
Replaceable parts to prolong service life

Narrow profile for limited space installations

KEY FEATURES

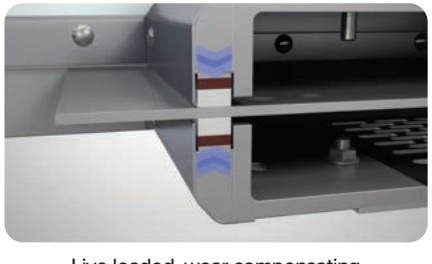


Optional Special Service Inlet protects rollers and minimizes material contact with the seals



Cam-adjustable rollers for in-line maintenance

Replaceable bonnet seals for in-line maintenance



Live loaded, wear compensating hard polymer bonnet & side seals

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only. Contact us to discuss suitability for use in low pressure/vacuum applications.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets, granules and dusts. Modifications available for handling sticky and/or corrosive materials, and for wash-down.
Standard Sizes	6 – 30 in | 150 – 760 mm Contact us for custom sizes
Opening	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	3 – 4 in | 75 – 100 mm
Weight	30 – 200 lb | 15 – 90 kg
Flange Options	Standard flange or CEMA flange Custom flanges are available
Material Temperatures	180°F | 80°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Options	6061-T6 aluminum, 304 or 316L stainless steel
Material Contact Options	304 or 316L stainless steel
Bonnet & Side Seal Options	Nylon, PET, 25% glass-filled PTFE, felt
Load Seal Construction	Silicone rubber
Roller Options	PET, 25% glass-filled PTFE, hardened steel, stainless steel & bronze
End Seal Options	UHMW-PE, polyurethane, PET, 25% glass-filled PTFE
Drive/Actuation	Double-acting air cylinder, hand wheel/crank, chain wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches, and/or clear bonnet covers for visual indication (see page 63)
Material Flow Controls	AVP, IVP, VPO, VPC (see pages 65 & 66)
Other Options	Dual cylinder actuators (see page 61) Sealed body air purge (see page 64) Return Pan & Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Roller Gate vs. Alternatives

The Vortex® Roller Gate™ provides advantages over alternative roller-supported slide gates:

- Many alternative roller-supported slide gates rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. Others rely on bonnet packing, which can relax and allow material packing in the bonnet area. These deficiencies promote leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Roller Gate addresses these issues by incorporating "live loaded" hard polymer bonnet seals and side seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the sliding blade. When equipped with a Special Service Inlet, the seals and rollers are also shielded from the material flow stream, to protect them from abrasion. This design maintains the gate's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- Many alternative slide gates allow metal-on-metal sliding, which creates galling. This causes a gate to seize and bind, and can create foreign metal fragment contamination. The Roller Gate's hard polymer seals eliminate metal-on-metal contact to resolve each of these concerns.

- Many alternative roller-supported slide gates have open cavities where materials can wedge and prevent positive material shut-off. Wedging can also create seal wear and material degradation, and cause a gate to seize and bind. Wedged materials also create risk for cross-contamination and spoilage. To prevent wedging and ensure positive gate closure, the Roller Gate's sliding blade is designed to mechanically clear materials away from the sealing surfaces with each actuation. With each closing stroke, the Roller Gate mechanically self-cleans its side seals. With each opening stroke, the gate's bonnet seals prevent the blade from carrying materials back into the bonnet area. Both of these considerations ensure migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

- If materials and dusts begin to migrate and collect in the gate's bonnet area, it indicates that the gate's bonnet seals have partially worn and the compression load is lessened, causing the seals to no longer be forced against the sliding blade as they should be. With this maintenance indication, the Roller Gate features access slots on each side of the gate that allow bonnet seal replacement while the gate remains in-line. Using simple tools, new bonnet seals are driven into one access port as the worn bonnet seals are simultaneously ejected on the other side of the gate, through the opposite access port.

- When the Roller Gate is closed, if materials and dusts begin to leak past the sliding blade, it indicates that the gate's side seals have partially worn and the compression load is lessened, causing the blade to no longer be forced against the side seals as it should be. With this maintenance indication, the Roller Gate's cam-adjustable rollers can be utilized to restore the gate's dust-tight seal. Using simple tools, the cam rollers can be adjusted to lift the sliding blade against the side seals and restore the compression load. This maintenance process can be performed while the gate remains in-line, and can be repeated several times before the side seals must be replaced.

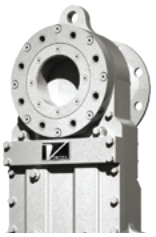
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. HDPXX

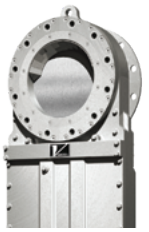
HDPV2 GATE

The HDPV2 Gate was originally developed to isolate silos in applications where high pressure aeration is used to fluidize powder discharge. Over time, the HDPV2 Gate has been redesigned and modified for greater application versatility.

Ideal application: Higher-pressure applications when handling non-abrasive to moderately abrasive powders, pellets or granules.

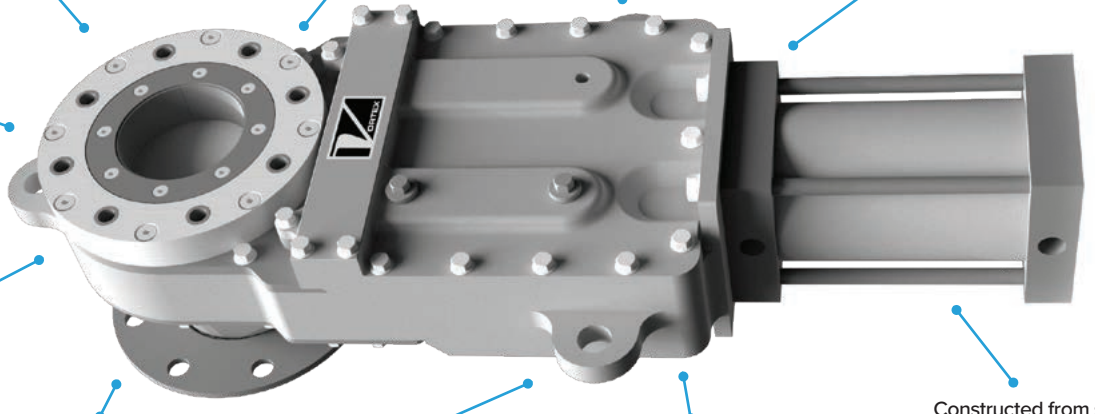


Standard Inlet



Special Service Inlet

OPTIONS



Optional Special Service Inlet minimizes material contact with the seals

Unobstructed opening for unrestricted material flow and to maintain convey line pressures

Positive seal of materials/dust-tight seal across the blade and to atmosphere

Optional air purge assembly keeps fine materials in the flow stream, to prevent them from collecting in the gate's body

Seals fine materials

Must be installed so that the actuator is parallel to the horizontal plane

No internal cavities, to prevent wedging, lodging and spoilage

Closing action reduces seal wear and minimizes material shearing

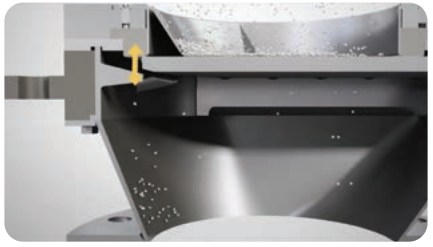
Lifting lugs for ease of installation

For operator safety, no pinch points or exposed moving parts

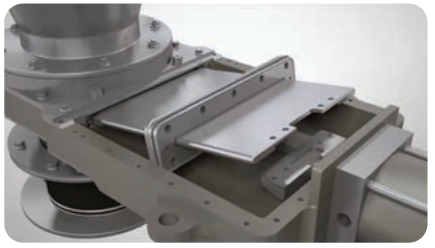
Constructed from specialized metals and polymers for application-specific durability

KEY FEATURES

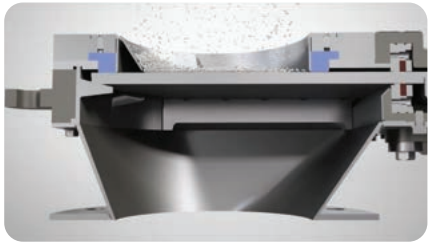
Externally adjustable blade for in-line maintenance



Patented “rising blade” action to positively seal against high pressures



Replaceable parts for in-line maintenance and prolonged service life



End seal displacement pocket to prevent material packing upon closure

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow, dilute phase and dense phase pneumatic conveying applications up to 75 psig | 5 barg | +0.5 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Well-suited for handling sticky and/or corrosive materials, and for wash-down.
Standard Sizes	4 – 16 in | 100 – 405 mm ID & OD diameters are available. Also available in schedule 10, 20 or 40 pipe sizes.
Opening	Available in round sizes
Overall Height	8 – 9 in | 200 – 230 mm
Weight	75 – 425 lb | 35 – 195 kg
Flange Options	ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	250° F | 120° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Construction	Cast aluminum
Material Contact Options	304 or 316L stainless steel, carbon steel
O-Ring Seal Construction	Silicone
Drive/Actuation	Double-acting air cylinder (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches (see page 63)
Material Flow Controls	AVP (see pages 65 & 66)
Other Options	Sealed body air purge (see page 64) Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex HDPV2 Gate vs. Alternatives

- Many alternative slide gates and butterfly valves rely on seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. This deficiency promotes leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Vortex® HDPV2 Gate™ addresses these issues by incorporating a durable, silicone (durometer 70) O-ring seal, which provides greater wear resistance and longer service life than alternative sealing materials. To hinder materials from migrating into the gate body, the HDPV2 Gate also features a bonnet seal cartridge, which houses a PTFE-treated packing gland. PTFE-treated packing gland also provides greater wear resistance and longer service life than alternative sealing materials. Within the bonnet seal cartridge, the packing gland expands to create a dust-tight seal around the vertical perimeter of the blade. The bonnet seal cartridge shields the packing gland from the material flow stream, to protect it from abrasion. This design maintains the gate's positive seal with infrequent maintenance intervention. Once the packing gland has experienced significant frictional wear, it can be removed and replaced to restore the gate's dust-tight seal. This maintenance process can be performed while the gate remains in-line.

- A butterfly valve's rotating disc is directly exposed to the material flow steam, which creates wear to the disc itself. The exposed disc also disrupts convey line pressures and obstructs material flow as they pass through the valve, which can cause line plugs and other maintenance concerns. To resolve these issues, when the HDPV2 Gate is open, its sliding blade is recessed to create an unobstructed opening that maintains convey line pressure and allows unrestricted material movement.

- The HDPV2 Gate is specifically designed to mechanically clear materials away from the sealing surfaces with each actuation. The HDPV2 Gate's packing gland is designed to mechanically self-clean the blade with each opening stroke. This prevents the blade from carrying materials back into the gate body, which could otherwise cause actuation issues and other maintenance concerns. At the closing end of the gate, the HDPV2 Gate can be designed with a partial Special Service Inlet to create a slight void between the leading edge of the blade, the material flow stream, and the O-ring seal. As the leading edge of the blade nears the O-ring seal, a Special Service Inlet ensures any residual materials remaining at the blade's leading edge have an opportunity to fall away into the process line, prior to the blade contacting the O-ring seal. By protecting the O-ring seal from material contact, it reduces seal wear and maintains the gate's positive seal with infrequent maintenance intervention.

- Many alternative slide gates pack materials into an end seal, preventing positive closure. This promotes material leakage through the valve, can cause blade damage, and can cause other actuation issues. Upon gate closure, the HDPV2 Gate's sliding blade "rises" upward into a seat, rather than a true end seal, so that materials remaining at the leading edge of the blade can fall away into the process line below, rather than packing into an end seal. The rising blade design also lifts the blade against the O-ring seal for a better seal of materials and dusts in high pressure applications.

- When the gate is closed, if materials and dusts begin to leak past the blade, it indicates the O-ring seal has partially worn and the compression load is lessened, causing the blade to no longer be forced against the O-ring seal as it should be. With this maintenance indication, the HDPV2 Gate's blade is externally adjustable to restore the gate's dust-tight seal. Using simple tools, the nut beneath the lower bonnet cover can be tightened. This "lifts" the blade to restore its compression load against the O-ring seal. This maintenance process can be performed while the gate remains in-line, and can be repeated several times before the O-ring seal must be replaced.

For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. JAXX

CLEAR ACTION GATE

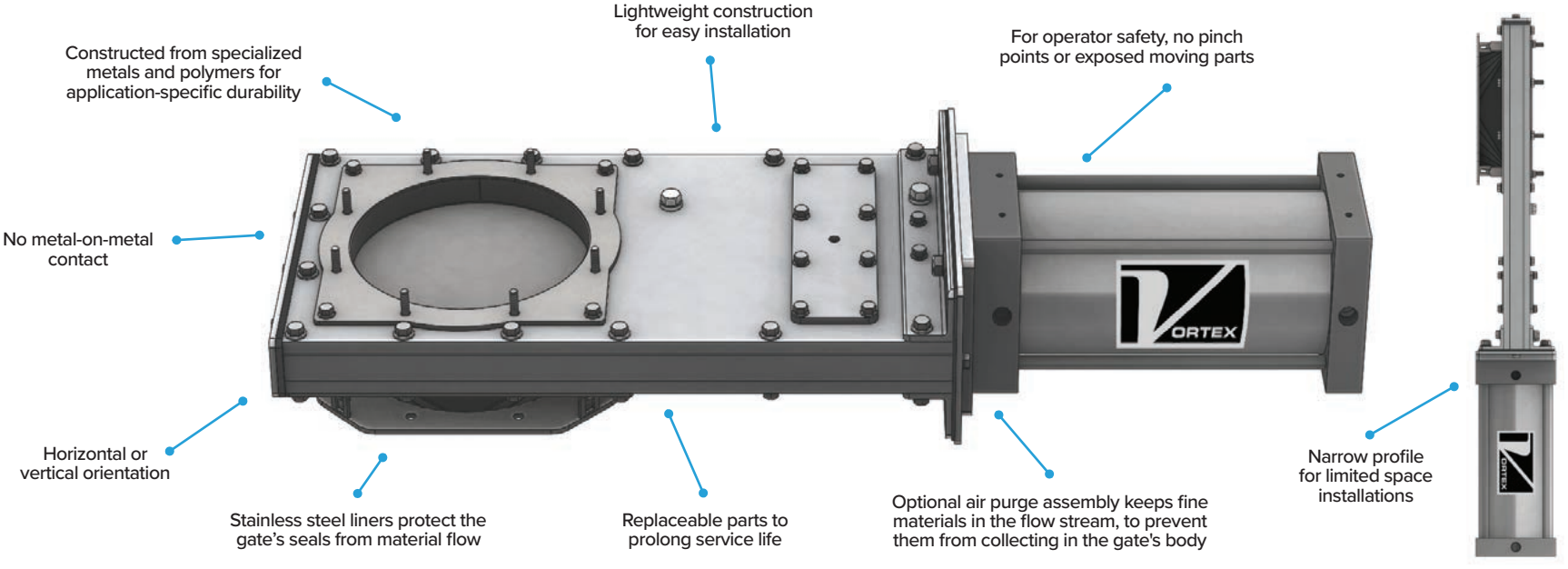
Ideal application: Isolating a rotary airlock from a feeder above. Flange patterns are customizable to match up with any rotary airlock in the industry.

Purpose: Designed to seal against pressure from below. When a rotary airlock is idle, the Clear Action Gate is closed to prevent air loss into upstream equipment. This prevents line plugs and improves blower efficiency. A Clear Action Gate can also act as a maintenance device to isolate upstream equipment, if airlock maintenance is necessary.

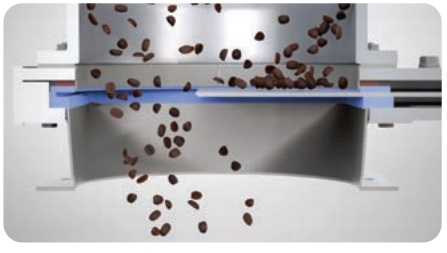
Standard

-P

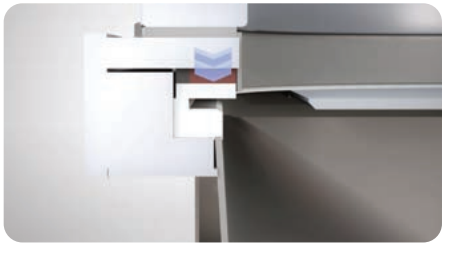
OPTIONS



KEY FEATURES



Positive seal of materials/dust-tight seal across the blade and to atmosphere



Live loaded, wear compensating hard polymer pressure plate seals

Enhance conveying efficiency by preventing air loss

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow and dilute phase pneumatic conveying applications. Can handle differential pressures up to 15 psig | 1 barg | 0.1 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	6 – 16 in | 150 – 400 mm
Opening	Available in round sizes. Square, round or rectangular mating flanges are available.
Overall Height	4 – 8 in | 95 – 200 mm
Weight	55 – 180 lb | 25 – 80 kg
Flange Options	Standard stud bolt pattern, ANSI #125/150, DIN PN10, JIS 10 Custom flanges are available
Material Temperatures	250°F | 120°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Construction	Aluminum
Material Contact Options	304 or 316L stainless steel
Pressure Plate Options	Nylon, PET
Load Seal Construction	Silicone rubber
Drive/Actuation	Double-acting air cylinder, hand wheel/crank, chain wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches, and/or clear bonnet cover for visual indication (see page 63)
Material Flow Controls	AVP, IVP, VPO, VPC (see pages 65 & 66)
Other Options	Sealed body air purge (see page 64) Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Clear Action Gate vs. Alternatives

- Many alternative slide gates and butterfly valves rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. Others rely on bonnet packing, which can relax and allow material packing in the seals. These deficiencies promote leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Vortex® Clear Action Gate™ addresses these issues by incorporating "live loaded" hard polymer pressure plate seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the blade. The seals are also shielded from the material flow stream, to protect them from abrasion. This design maintains the gate's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- Many alternative slide gates allow metal-on-metal sliding, which creates galling. This causes a gate to seize and bind, and can create foreign metal fragment contamination. The Clear Action Gate's hard polymer seals eliminate metal-on-metal contact to resolve each of these concerns.

- Many alternative slide gates and butterfly valves have open cavities where materials can wedge and prevent positive material shut-off. Wedging can also create seal wear and material degradation, and cause a gate to seize and bind. Wedged materials also create risk for cross-contamination and spoilage. To prevent wedging and ensure positive gate closure, the Clear Action Gate's machined, square-edged blade is designed to mechanically clear materials away from the sealing surfaces with each closing stroke. This ensures migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

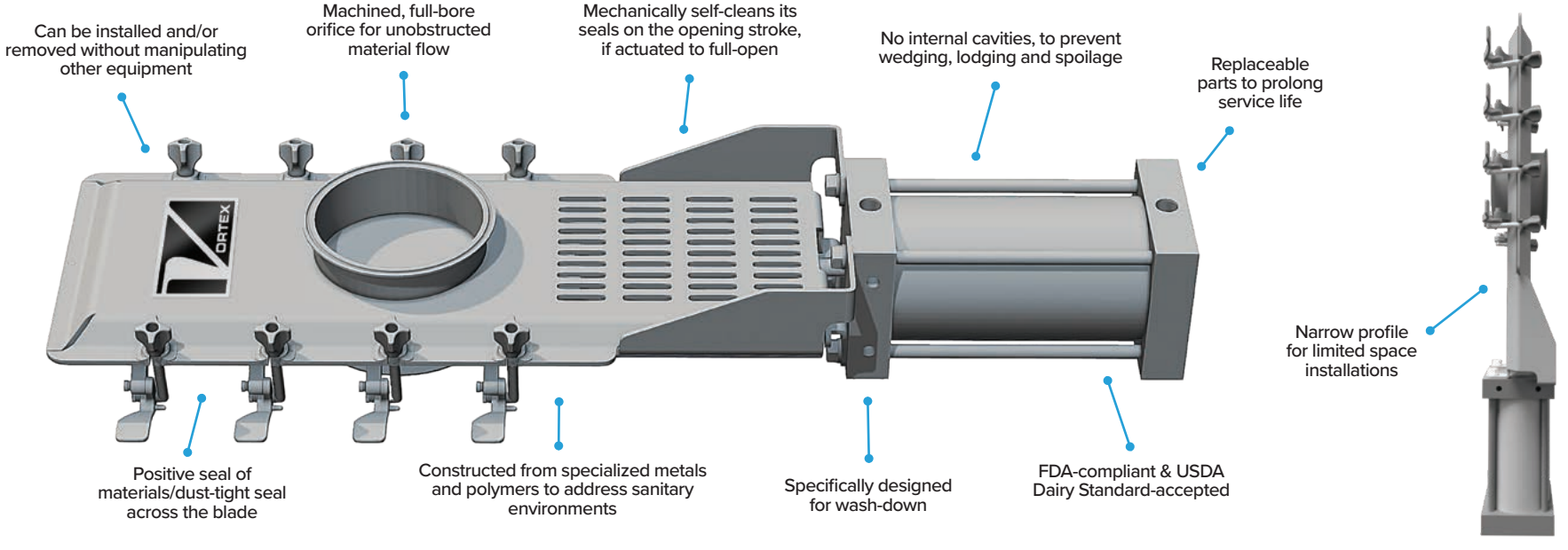
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. QCXX

QUICK CLEAN GATE

Ideal application: Sanitary dry bulk solid material handling applications that require frequent "Clean out of Place." The Vortex® Quick Clean Gate™ can be washed down daily, during shift change, or on any other regular cleaning or sanitation schedule. This eliminates potential for microorganisms, spoilage and bacterial growth.

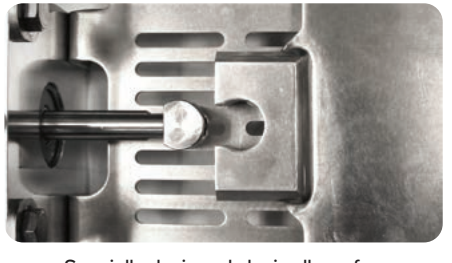
Purpose: The Vortex Quick Clean Gate is the first slide gate to be USDA Dairy Standard-accepted. It can be disassembled and reassembled in a matter of minutes – without using any tools.



KEY FEATURES

Ferrule-type fittings accommodate compression couplings for quick gate installation and removal without tools

Press-lock latches for internal access without tools



Specially designed clevis allows for quick blade removal

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only. Contact us to discuss suitability for use in low pressure/vacuum applications.
Materials Handled	Non-abrasive powders, pellets and granules in applications where regular sanitation is required. Can be used to handle sticky and/or reactive materials.
Standard Sizes	2 – 10 in | 50 – 255 mm ID & OD diameters are available. Also available in schedule 10, 20 or 40 pipe sizes.
Opening	Available in round sizes
Overall Height	5 1/2 in | 140 mm
Weight	30 – 110 lb | 15 – 50 kg
Connection Options	Ferrule-type fittings, tube stubs, thru-bolt, ANSI #125/150 Custom flanges are available
Material Temperatures	100° F | 40° C for standard gate, with modifications that allow up to 200° F | 95° C
Body/Frame Construction	304 stainless steel
Material Contact Options	304 or 316L stainless steel & copolymer acetal
Pressure Plate Construction	PET & silicone rubber Seals should be hand-cleaned in treatment solutions not exceeding 180°F | 80°C
Load Seal Construction	Silicone rubber
Drive/Actuation	Double-acting air cylinder (see pages 61 & 62)
Cylinder Construction	Aluminum
Cylinder Shaft, Barrel Nuts & Tie Rod Construction	303 stainless steel
Position Confirmation	Magnetic reed switches (see page 63)
Material Flow Controls	AVP (see pages 65 & 66) ** Gate must cycle to full-open between runs to keep the displacement area clear of materials*
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA, USDA Dairy Standard

THE POWER OF COMPARISON

Vortex Quick Clean Gate vs. Alternatives
The Vortex® Quick Clean Gate™ offers unique features and many distinct advantages over typical butterfly valves, pinch valves, ball valves and slide gates used in sanitary applications.

- Alternative slide gates and other valves can be problematic if they cannot be readily disassembled and sanitized. If materials collect in a valve's sealing surfaces, cross-contamination, spoilage and bacterial growth can result. The Quick Clean Gate's ability to be "Cleaned out of Place" ensures product safety and quality.
- The Quick Clean Gate is specifically designed to accelerate the sanitation process, so that downtime is significantly reduced. The Quick Clean Gate's compression coupling connections and its press-lock latches allow for quick disassembly, sanitation and reassembly without tools.
- Many alternative slide gates have open cavities where materials can lodge and prevent positive material shut-off. Lodging can also create seal wear and material degradation, and cause a gate to seize and bind. Lodged materials also create risk for cross-contamination and spoilage. To prevent lodging and ensure positive gate closure, such cavities have been eliminated in the Quick Clean Gate's design. The Quick Clean Gate is designed to mechanically clear materials away from the sealing surfaces with each opening stroke. This ensures migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation and/or contamination issues.
- A butterfly valve's rotating disc is directly exposed to the material flow steam, which creates wear to the disc itself. This can result in foreign metal fragment contamination. The exposed disc also obstructs material flow as they pass through the valve, which can cause line plugs and other maintenance concerns. To resolve these issues, the Quick Clean Gate's sliding blade is machined with an unobstructed, full-bore orifice that allows unrestricted material movement.
- Alternative slide gates and butterfly valves can significantly shear materials, as a result of jamming and grinding materials into the seals. Sheared materials cause seal wear, material degradation and damaged product quality. Sheared materials may also wedge in the seals, causing the gate to seize and bind. To address these issues, the Quick Clean Gate's "scissoring" action tapers off material flow throughout closure. In keeping the pressure plate seals clear of materials, their service life is also extended.

For more information & technical resources, please visit: **www.vortexglobal.com**

FAST TRACK

Model No. MSCXX & MRCXX

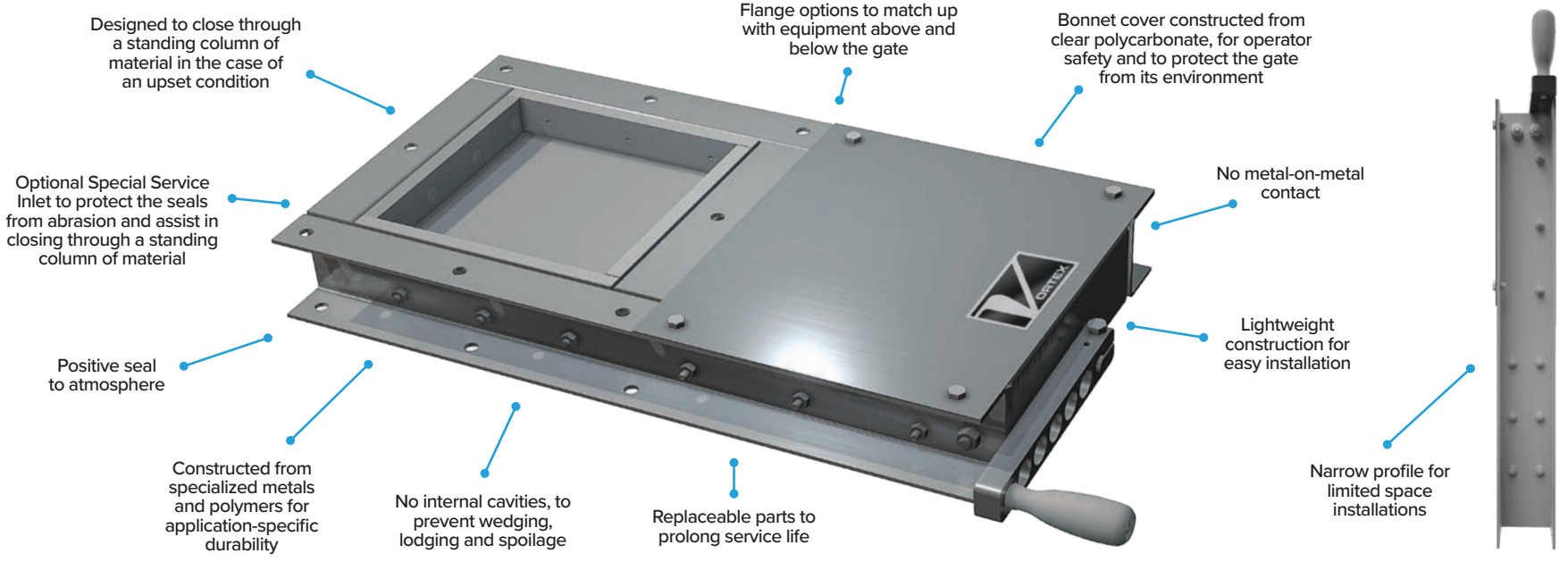
MAINTENANCE GATE

Ideal application: Shut off material flow when maintenance of downstream equipment is required or if an upset condition occurs.

Square

Round

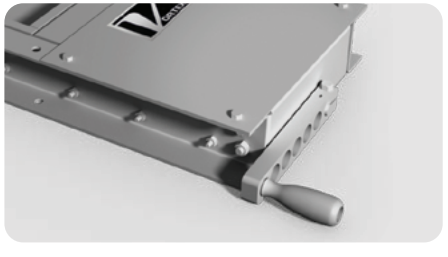
OPTIONS



KEY FEATURES

PTFE-treated bonnet packing gland, for greater wear resistance and longer service life

Non-rising stem, for easier manual actuation



Hand crank actuation, as a standard

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow and dilute phase pneumatic conveying applications. Can handle differential pressures up to 15 psig | 1 barg | 0.1 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Well-suited for handling corrosive materials and/or for wash-down.
Standard Sizes	6 – 18 in | 150 – 455 mm ID & OD diameters are available. Also available in schedule 10, 20 or 40 pipe sizes. Contact us for custom sizes.
Opening	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	5 – 6 in | 115 – 140 mm
Weight	15 – 200 lb | 5 – 90 kg
Flange Options	Standard stud bolt pattern, DIN PN10, ANSI #125/150 Custom flanges are available
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Options	6061-T6 aluminum, painted carbon steel
Material Contact Options	304 or 316L stainless steel, carbon steel
End & Side Seal Options	Nylon, PET, UHMW-PE, 25% glass-filled PTFE
Bonnet Seal Construction	Bonnet seal cartridge with PTFE-treated packing gland
Clevis Construction	Ratio 5:1 ACME threaded rod
Drive/Actuation	Hand wheel/crank, chain wheel (see pages 61 & 62)
Position Confirmation	Clear bonnet cover for visual indication and/or proximity switches (see page 63)
Other Options	Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Maintenance Gate vs. Alternatives
The design and construction of the Vortex® Maintenance Gate offers significant advantages over traditional carbon steel maintenance gates.

- The Maintenance Gate's aluminum body and frame make it lightweight and corrosion-resistant. The gate's stainless steel material contact areas provide additional resistance to corrosion and wear. This provides the Vortex Maintenance Gate with long-term and reliable service.
- Many alternative maintenance gates allow metal-on-metal sliding, which creates galling. This causes a gate to seize and bind, and can create foreign metal fragment contamination. The Maintenance Gate's hard polymer liners eliminate metal-on-metal contact to resolve each of these concerns.
- Many alternative maintenance gates rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. This deficiency promotes leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Maintenance Gate addresses these issues by incorporating a bonnet seal cartridge, which houses a PTFE-treated packing gland. PTFE-treated packing gland provides greater wear resistance and longer service life than alternative sealing materials. Within the bonnet seal cartridge, the packing gland expands to create a dust-tight seal around the vertical perimeter of the blade. The bonnet seal cartridge shields the packing gland from the material flow stream, to protect it from abrasion. This design maintains the gate's positive seal with infrequent maintenance intervention. Once the packing gland has experienced significant frictional wear, it can be removed and replaced to restore the gate's dust-tight seal. This maintenance process can be performed while the gate remains in-line.
- The Maintenance Gate's stainless steel blade and hard polymer liners are FDA-compliant. This makes it an excellent choice in food handling applications and other applications where carbon steel and aluminum are not acceptable for material contact.

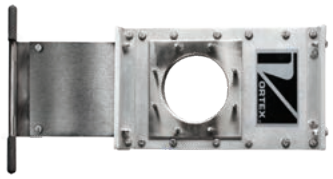
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. FHSXX

HANDSLIDE GATE

Ideal application: Manually operated process gate, used to control flow on the inlet/outlet of hoppers, bins or totes in applications where powered gates are not feasible or desired.

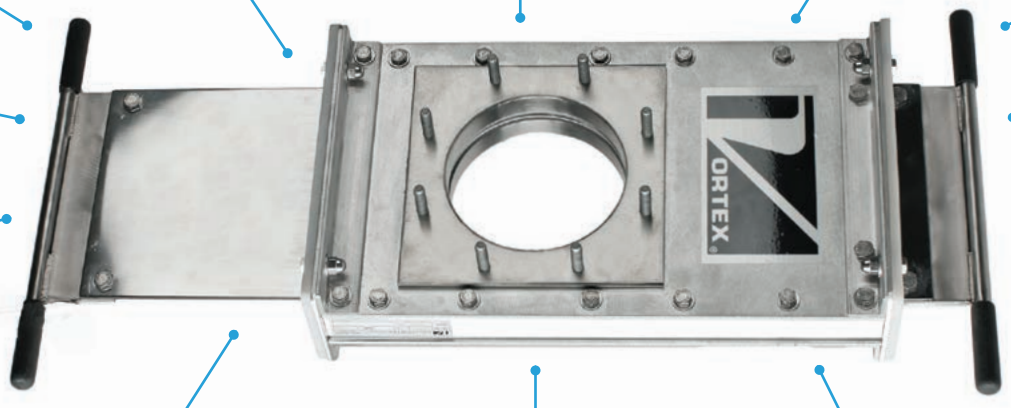
Purpose: Push-pull actuation from either side of the gate makes opening/closure a quick and easy process.



Single Handle

Double Handle

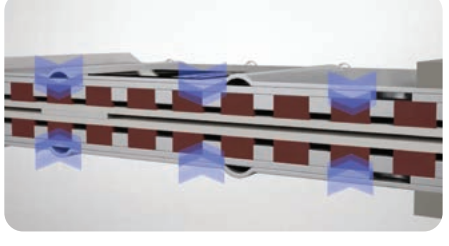
OPTIONS



- Shimming system for in-line maintenance
- Mechanically self-cleans its seals on the opening stroke, if actuated to full-open
- FDA-compliant materials of construction
- Stainless steel liners protect the gate's seals from material flow
- Machined, full-bore orifice for unobstructed material flow
- Locking pin to secure the blade in the open or closed position
- No internal cavities, to prevent wedging, lodging and spoilage
- Lightweight construction for easy operation and installation
- Replaceable parts to prolong service life
- "Scissoring" action reduces seal wear and minimizes material shearing
- No metal-on-metal contact
- Constructed from specialized metals and polymers for application-specific durability
- Flange options to match up with equipment above and below the gate
- Positive seal of materials/dust-tight seal across the blade and to atmosphere
- Narrow profile for limited space installations

KEY FEATURES

Displacement area as an alternative to packing materials into an end seal



Live loaded, wear compensating hard polymer pressure plate seals

Shimming system for in-line maintenance

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only. Contact us to discuss suitability for use in low pressure/vacuum applications.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	2 – 14 in | 50 mm – 355 mm ID & OD diameters are available. Also available in schedule 10, 20 or 40 pipe sizes.
Opening	Available in round sizes
Overall Height	4 – 5 in | 90 – 120 mm
Weight	10 – 95 lb | 5 – 45 kg
Flange Options	Standard stud bolt pattern Modified pipe flanges available
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Construction	Aluminum
Material Contact Options	304 or 316L stainless steel
Pressure Plate Options	Nylon, PET, UHMW-PE, 25% glass-filled PTFE, molybdenum disulphide-impregnated nylon
Load Seal Options	Natural rubber and/or silicone rubber
Drive/Actuation	Push-pull handle
Other Options	Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Handslide Gate vs. Alternatives

The Vortex® Handslide Gate™ is a highly versatile solution. It is often used in applications where air supply is not available, in filling applications where iris diaphragms are not feasible, or as a cost-effective alternative to using powered process gates in low actuation applications.

- Iris diaphragms are limited in scope, compared to the Handslide Gate. Because iris diaphragms feature a fabric sleeve, most are designed to handle bulk densities < 40 lb/ft^3. Because the Handslide Gate features a solid sliding blade, it is well-designed for handling bulk densities above that threshold.
- The fabric sleeve of an iris diaphragm is not designed to handle corrosive materials. Oppositely, the Handslide Gate's material contact areas are constructed from stainless steel to provide appropriate corrosion resistance.
- The fabric sleeve of an iris diaphragm is not designed to seal against fine materials. The Handslide Gate's solid sliding blade and hard polymer pressure plate seals provide a positive seal of materials across the gate and to atmosphere.
- It is not recommended to close an iris diaphragm through a flowing column of material. Doing so can cause wear and potentially break the diaphragm's internal control ring. The Handslide Gate's solid sliding blade is durable, allowing it to be closed through a flowing column of material.
- Many alternative slide gates rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. Others rely on bonnet packing, which can relax and allow material packing in the seals. These deficiencies promote leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Handslide Gate addresses these issues by incorporating "live loaded" hard polymer pressure plate seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the blade. The seals are also shielded from the material flow stream, to protect them from abrasion. This design maintains the gate's positive seal of materials/dust-tight seal with infrequent maintenance intervention.
- If the pressure plate seals have partially worn and the compression load is lessened, slight dusting may be present along the push-pull handle. With this maintenance indication, the Handslide Gate's shimming system can be utilized to restore the gate's dust-tight seal. Unlike alternative valves, which require spare parts be kept on-hand for seal maintenance, the Handslide Gate requires removal of parts. By simply loosening the nuts along the lateral aspects of the gate, shim(s) can be removed from each side and the nuts retightened to restore the pressure plate seals' compression load. This maintenance process can be performed while the gate remains in-line, and can be repeated several times before the shims and pressure plate seals must be replaced.

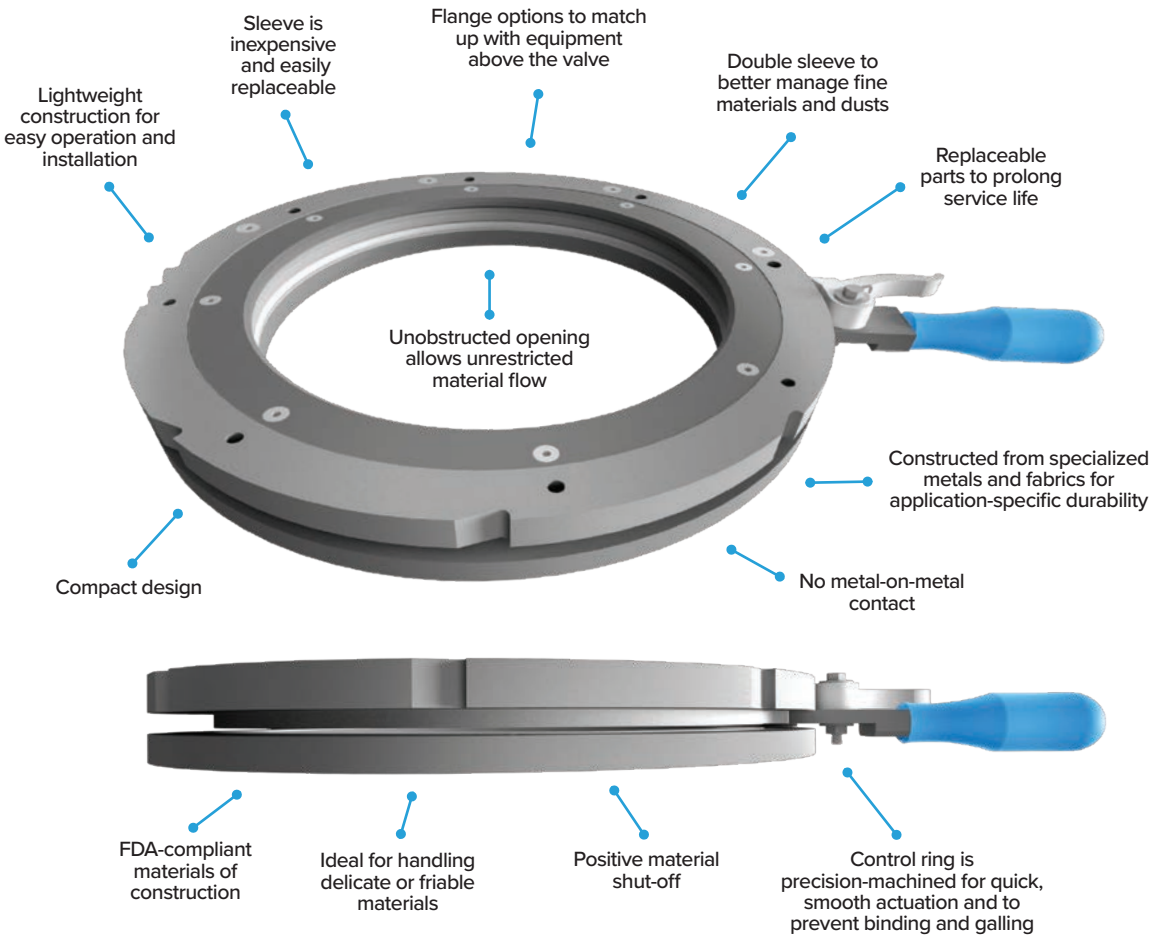
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. UBXX

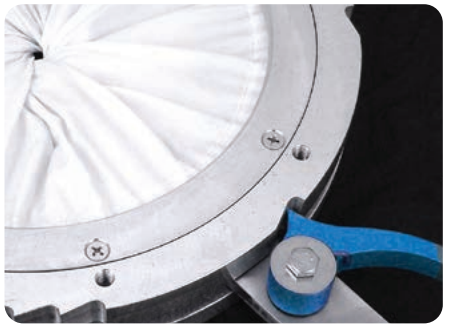
IRIS VALVE

Ideal application: Manually control the gravity discharge of free-flowing dry bulk solid materials.

Purpose: The Vortex® Iris Valve opens from and closes toward the center of its opening to create a gradual flow or restriction of materials. This design ensures an even discharge of materials and allows manual control over flow rates. The Iris Valve's fabric sleeve and gradual closing action protect delicate and friable materials from degradation. When fully closed, the Iris Valve's fabric sleeve is twisted to the point that it becomes a flat, tight barrier to hold back materials.

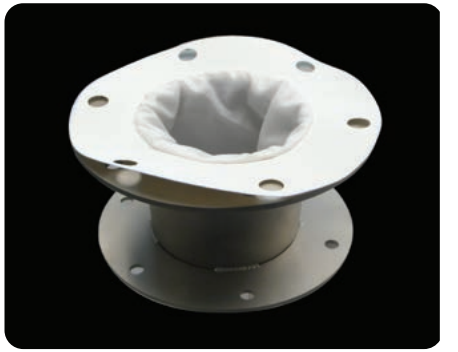


KEY FEATURES



Optional preset positions for quick adjustments in material flow rate

Control ring constructed from stainless steel, for increased torque and added durability



Optional replaceable wear liner reduces material contact with the sleeve to extend service life

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules
Standard Sizes	4 – 18 in | 100 – 455 mm
Overall Height	2 in | 40 mm
Weight	2 – 75 lb | 1 – 35 kg
Connection Options	Standard flange or tube stubs Ferrule-type fittings available by request
Material Temperatures	Up to 150°F | 65°C
Material Bulk Density	Up to 40 lb/ft^3 Contact us to discuss options for greater bulk densities
Body/Frame Options	Aluminum, 304 or 316L stainless steel
Sleeve Material Options	Urethane, silicone, Buna-N nitrile rubber, PTFE, static dissipative
Control Ring Construction	Stainless steel
Position Confirmation	Visual indication via handle position
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

DRIVE/ACTUATION TYPES

Infinite position hand lever: Designed with a twisting lever which must be loosened to adjust valve position and tightened to secure the valve in place. Valve position is infinitely adjustable along a 180° horizontal plane. The infinite position hand lever is constructed from stainless steel.

Quick-lock hand lever: Notches are made in the metal valve body to create preset positions. The quick-lock hand lever is designed with a spring-loaded hammer to secure the valve at each set point. This allows for quick material flow adjustments. The quick-lock hand lever and its spring-loaded hammer are both constructed from stainless steel.

Tote handle: The tote handle is constructed from stainless steel and operates much like the quick-lock hand lever, only squeezing a trigger rather than pushing a spring-loaded hammer.

THE POWER OF COMPARISON

Vortex Iris Valve vs. Alternatives

- The Vortex® Iris Valve is designed with a form-fitted fabric sleeve that creates a barrier to prevent material leakage to atmosphere. The fabric sleeve also prevents materials from coming in contact with the valve's moving parts. With several sleeve material options available, an Iris Valve can be designed for most dry bulk solids material handling applications, including abrasion-resistant and food-friendly, among others.
- Many alternative iris valves are constructed with plastic control rings, trigger locks and handles. Such construction renders iris valves nondurable and unreliable. To address these durability concerns, the Iris Valve is constructed with a stainless steel control ring, as well as a metal trigger lock and a metal handle.
- The Iris Valve is constructed from precision-machined parts, to reduce wear and ensure smooth actuation.

For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. ZXX

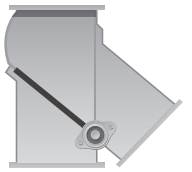
SEAL TITE DIVERTER

Ideal application: Gravity flow applications where dry bulk solid materials must be diverted from one source toward up to three destinations.

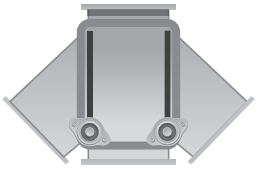
Purpose: The Vortex® Seal Tite Diverter™ offers many unique features and significant advantages over alternative flap diverters.

OPTIONS

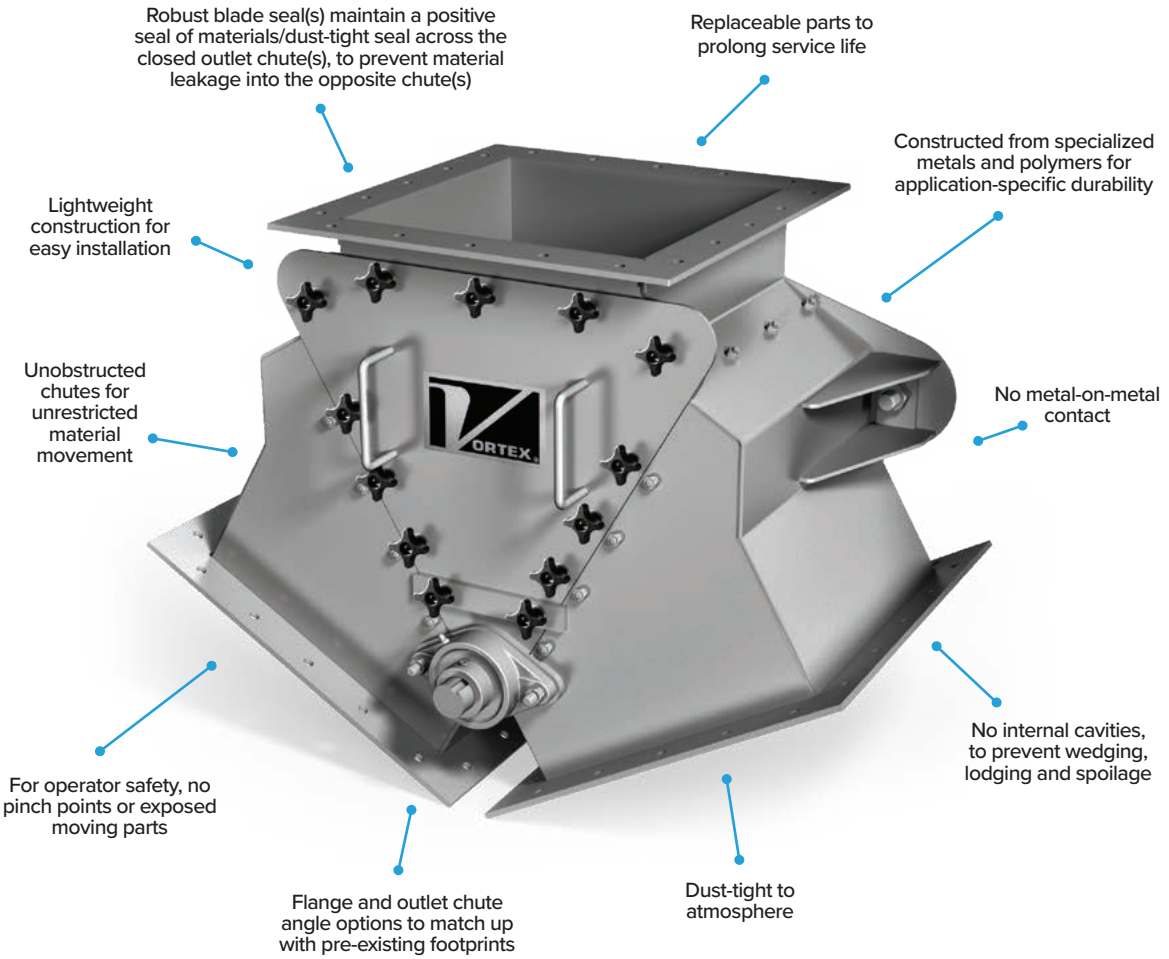
Two-Way



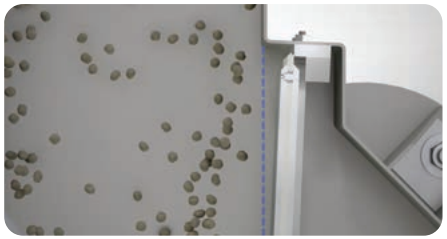
Straight Leg



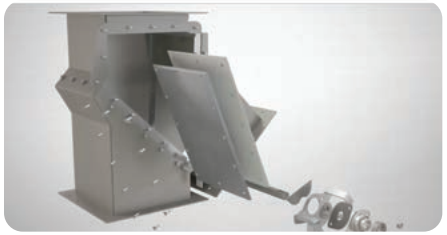
Three-Way



KEY FEATURES



Recessed blade(s) to protect the blade(s) & seal(s) from abrasion



Removable access panel for in-line inspection and maintenance

Live loaded, wear compensating shaft seal(s) protect the blade shaft(s) from wear and prevent material leakage into the opposite chute(s)

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	4 – 30 in | 100 – 760 mm Contact us for custom sizes
Inlet & Outlets	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	15x15 in – 65x55 in | 385x385 mm – 1,640x1,370 mm
Weight	40 – 1,265 lb | 20 – 575 kg
Outlet Chute Angle Options	30° or 45° from center Contact us for custom angles
Flange Options	Standard flange, ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Options	304 or 316L stainless steel, carbon steel
Material Contact Options	304 or 316L stainless steel, carbon steel
Blade Seal Options	Buna-N nitrile rubber, silicone rubber, polyurethane, EPDM rubber
Shaft Seal Options	PET, 25% glass-filled PTFE
Load Seal Construction	Silicone rubber
Drive/Actuation	Double-acting air cylinder, hand lever, chain wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches (see page 63)
Other Options	Spin knobs (see page 68)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Seal Tite Diverter vs. Alternatives

- Many alternative flap diverters have sealed bodies, which limits interior access. In order to perform inspection and/or maintenance, the diverter must be removed from the process line so that its internal mechanisms can be accessed. This can lead to expensive and extensive production downtime. To allow in-line inspection and/or maintenance, the Vortex® Seal Tite Diverter™ is designed with a removable access panel that can be removed using simple tools. This feature is especially beneficial in sanitary applications where frequent interior access is required for proper sanitation, or in abrasive applications where interior access is required for wear part maintenance. The removable access panel feature significantly reduces downtime by accelerating the maintenance process.

- Many alternative flap diverters are designed so that the leading edge of the blade(s) is constantly exposed to the material flow stream, creating wear and abrasion to the blade(s) and seal(s). If wear is significant, it can allow material leakage into the opposite chute(s), in addition to frequent wear part maintenance. To address these concerns, the Seal Tite Diverter is designed with recessed areas so that the leading edge of the blade(s) is shielded from the material flow stream.

- Many alternative flap diverters have thin elastomer seals adhered to the perimeter of the blade(s). Over time, the thin seals erode or tear away from the blade(s) and allow material leakage into the opposite chute(s). The Seal Tite Diverter addresses this concern by incorporating a blade seal constructed from a full sheet of durable rubber. Rather than adhering thin seal strips around the perimeter of the blade, the robust seal sheet is compressed between two metal plates which form the flapper blade. This design ensures the blade seals will not tear away in service, and will provide a positive seal of materials/dust-tight seal over time.

- Many alternative flap diverters do not have seals beneath the blade shaft(s). This creates a significant opening for material migration into the opposite chute(s). Especially in perishable applications, this can foster cross-contamination and spoilage beneath the blade shaft(s). Also, without blade shaft seals, the blade shaft(s) is subjected to material-assisted abrasion, resulting in frequent wear part maintenance. The Seal Tite Diverter addresses these issues by incorporating "live loaded" hard polymer blade shaft seal(s). Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seal(s) is "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seal(s) upward against the blade shaft(s). The seal(s) is also shielded from the material flow stream, to protect it from abrasion. This design maintains the diverter's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- Many alternative flap diverters are designed with irreplaceable wetted parts. Once a primary wetted part is worn significantly, the entire diverter must be replaced. To resolve this cost-effectiveness issue, the Seal Tite Diverter is designed with replaceable wetted parts that can be accessed in-line. This includes actuator(s), flapper blade(s) and blade seal(s), and the blade shaft seal(s), among others. If maintained and operated as recommended, these should be the diverter's only wear parts. In several cases, this has allowed a Seal Tite Diverter to remain in service for many years – and sometimes, even decades.

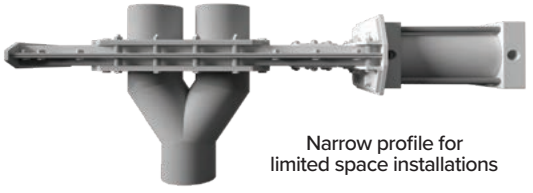
For more information & technical resources, please visit: **www.vortexglobal.com**

FAST TRACK

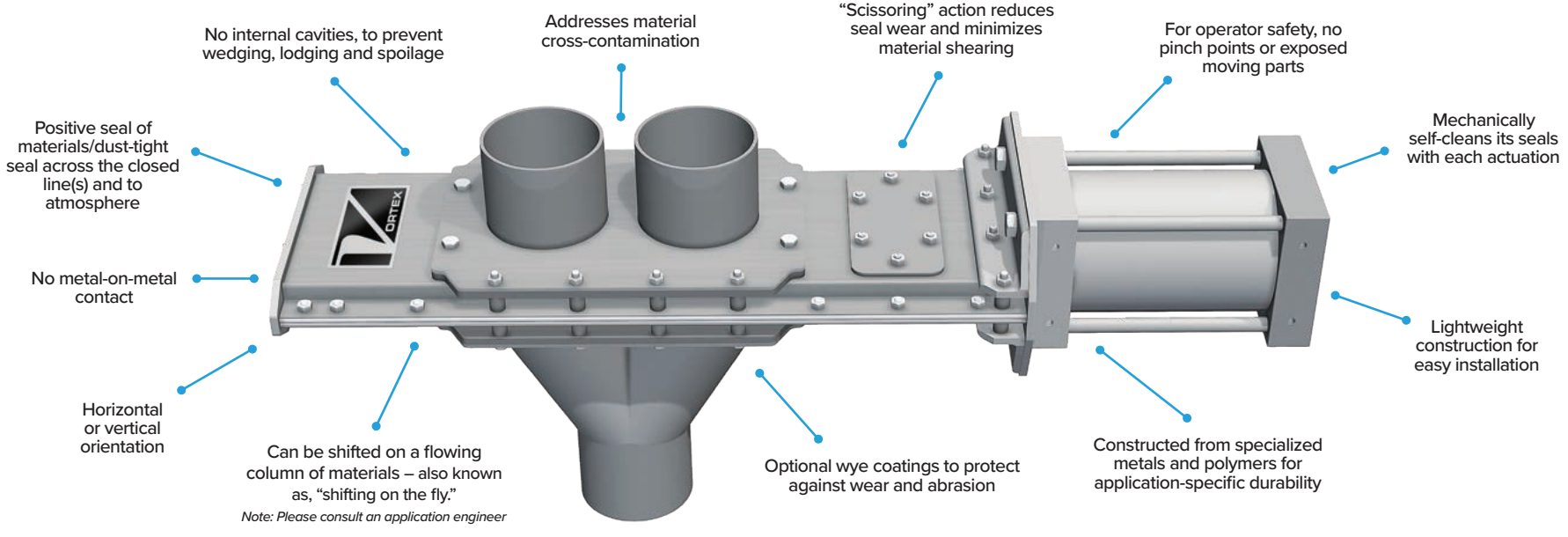
Model No. DRXX

WYE LINE DIVERTER

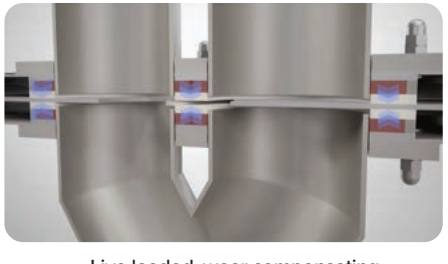
Ideal application: Diverting or converging dry bulk solid materials in high cycle applications. The Vortex® Wye Line Diverter™ is commonly used in storage fill and/or storage transfer applications. When applied in non-abrasive applications or as an air directional valve, Wye Line Diverters often record more than 10 million cycles over the course of their service life.



Narrow profile for limited space installations

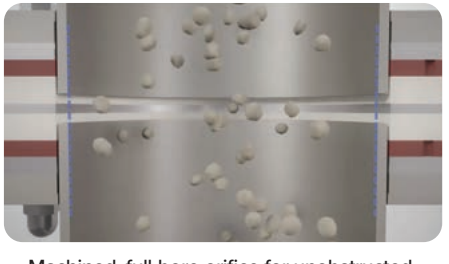


KEY FEATURES



Live loaded, wear compensating hard polymer pressure plate seals

Shimming system for in-line maintenance



Machined, full-bore orifice for unobstructed material flow and to maintain convey line pressures

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow and dilute phase pneumatic conveying applications. Can handle differential pressures up to 15 psig | 1 barg | 0.1 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	2 – 12 in | 50 – 305 mm ID & OD diameters are available. Schedule pipe sizes are also available.
Inlet & Outlets	Available in round sizes.
Overall Height	11 – 43 in | 280 – 1,085 mm
Weight	20 – 450 lb | 10 – 205 kg
Outlet Angle Options	30° or 45° from center Contact us for custom angles
Connection Options	Compression couplings, ANSI #125/150
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Options	Aluminum, 304 or 316L stainless steel, carbon steel
Weldment Options	Aluminum, 304 or 316L stainless steel, carbon steel
Material Contact Options	Aluminum, 304 or 316L stainless steel, carbon steel
Pressure Plate Options	Nylon, PET, UHMW, 25% glass-filled PTFE
Load Seal Options	Natural rubber and/or silicone rubber
Drive/Actuation	Double-acting air cylinder, hand wheel/crank, chain wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches, and/or clear bonnet cover for visual indication (see page 63)
Other Options	Ceramic backing, ceramic/epoxy coating, or reinforced inlet weldment (see page 68) Sealed body air purge (see page 64)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Wye Line Diverter vs. Alternatives

- Many alternative pneumatic diverters rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service, which allows materials and dusts to leak into the opposite line(s) and to atmosphere. Seal damage can also cause actuation issues and several other maintenance concerns. The Vortex® Wye Line Diverter™ addresses these issues by incorporating "live loaded" hard polymer pressure plate seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the sliding blade. The seals are also shielded from the material flow stream, to protect them from abrasion. This design maintains the diverter's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- Plug diverters are prone to seizing and binding, as a result of material build-up in the clearance between the rotating plug and the diverter's housing. The Wye Line Diverter's sliding blade design mechanically self-cleans materials away from the sealing surfaces with each actuation. This prevents actuation issues from materials wedging in the seals, reduces seal wear, and ensures a positive seal of materials/dust-tight seal across the opposite line(s).

- Plug diverters are constructed primarily from bulky, heavy cast iron, making them costly to install or remove for maintenance. The Wye Line Diverter is lightweight and narrow profile, making it well-suited for difficult installations.

- In order to shift a plug diverter, the internal plug must be rotated approximately 150°. This is often a timely process. Before the internal plug can be rotated, the system's blower must be temporarily deactivated. Otherwise, the plug will create back pressure as it rotates. With an average shifting time of 2 – 6 seconds, the Wye Line Diverter can be shifted without shutting down the system's blower and without creating back pressure.

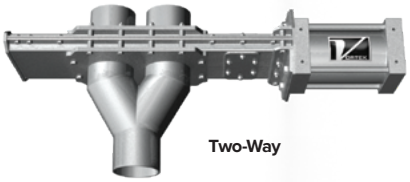
- Many alternative pneumatic diverters have blade(s) and seals which are directly exposed to the material flow steam. This disrupts convey line pressures and obstructs material flow as they pass through the valve, which can cause line plugs and other maintenance concerns. To resolve these issues, the Wye Line Diverter's sliding blade is machined with an unobstructed, full-bore orifice that maintains convey line pressure and allows unrestricted material movement.

- The Wye Line Diverter creates a naturally occurring high-pressure airfoil that deflects errant materials away from the closed line(s) and back into the material flow stream. Also, with each purge cycle, the Wye Line Diverter forces residual materials downstream. This design addresses material cross-contamination to the opposite line(s).

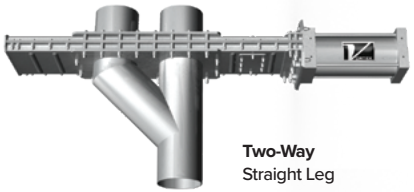
- Alternative pneumatic diverters can pack and grind materials against the seals. This causes seal wear, material degradation and damaged product quality. Materials may also wedge in the seals, causing the diverter to seize and bind. To address these issues, the Wye Line Diverter's "scissoring" action tapers off material flow as it shifts between lines. In keeping the pressure plate seals clear of materials, their service life is also extended.

For more information & technical resources, please visit: **www.vortexglobal.com**

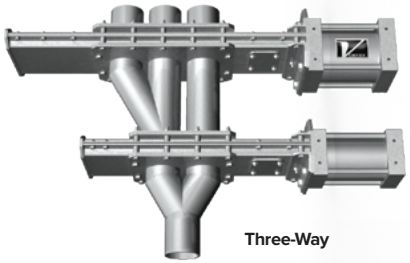
CONFIGURATION OPTIONS



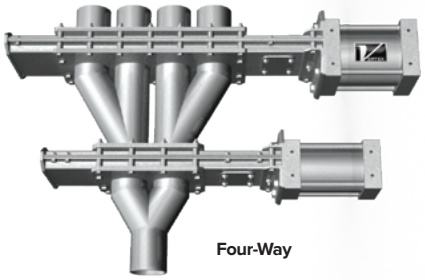
Two-Way



Two-Way
Straight Leg



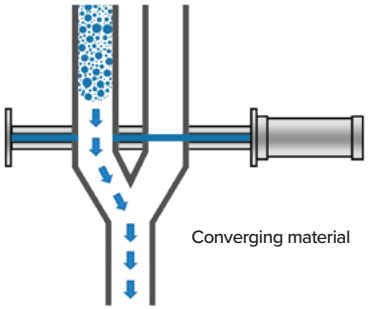
Three-Way



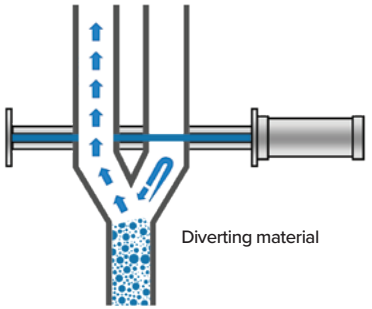
Four-Way

Please note: In Three- and Four-Way diverters, the addition of a second gate will add to overall height. Three- and Four-Way diverters are available in sizes up to 6 in | 150 mm

TWO-WAY MATERIAL FLOW

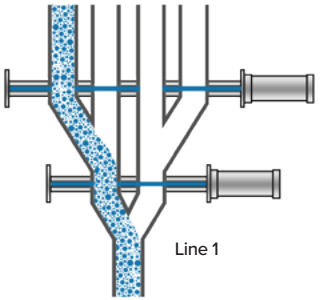


Converging material

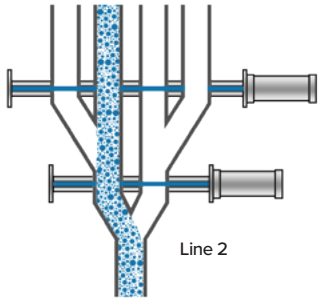


Diverting material

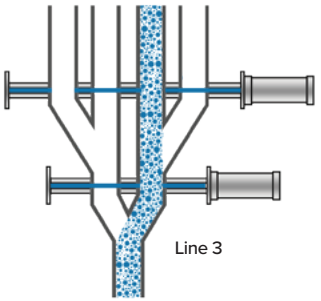
FOUR-WAY MATERIAL FLOW



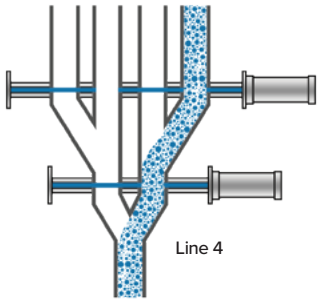
Line 1



Line 2



Line 3



Line 4

MULTI-PORT DIVERTER

Purpose: Vortex® Multi-Port Diverters™ are multi-directional assemblies used to divert and/or converge from many sources toward many destinations. Though Multi-Port Diverters are often designed for dilute phase and vacuum conveying applications, they may also be configured for use in gravity flow applications.

Ideal Application: Multi-Port Diverters typically replace manually operated, labor-intensive hose manifold stations. Because the Multi-Port Diverter is an automated solution, it provides improved processing speeds, reduced risk of workplace injury and human error, and more efficient use of plant personnel. Because Multi-Port Diverters are also more compact than hose manifold stations, they further provide a reduction in footprint to make more efficient use of manufacturing space.

Contact us to learn more about Vortex Multi-Port Diverter configurations.

www.vortexglobal.com

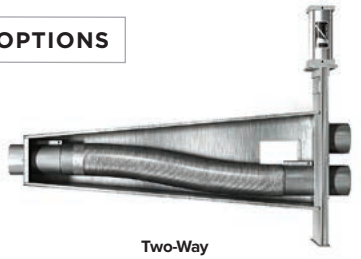
Model No. TXX

FLEX TUBE DIVERTER

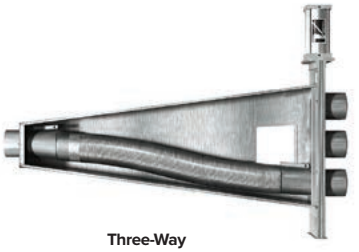
Ideal application: Diverting or converging in applications where material cross-contamination is a concern.

Purpose: The Vortex® Flex Tube Diverter™ is specifically designed to eliminate material cross-contamination. It also offers the convenience of continuous conveying.

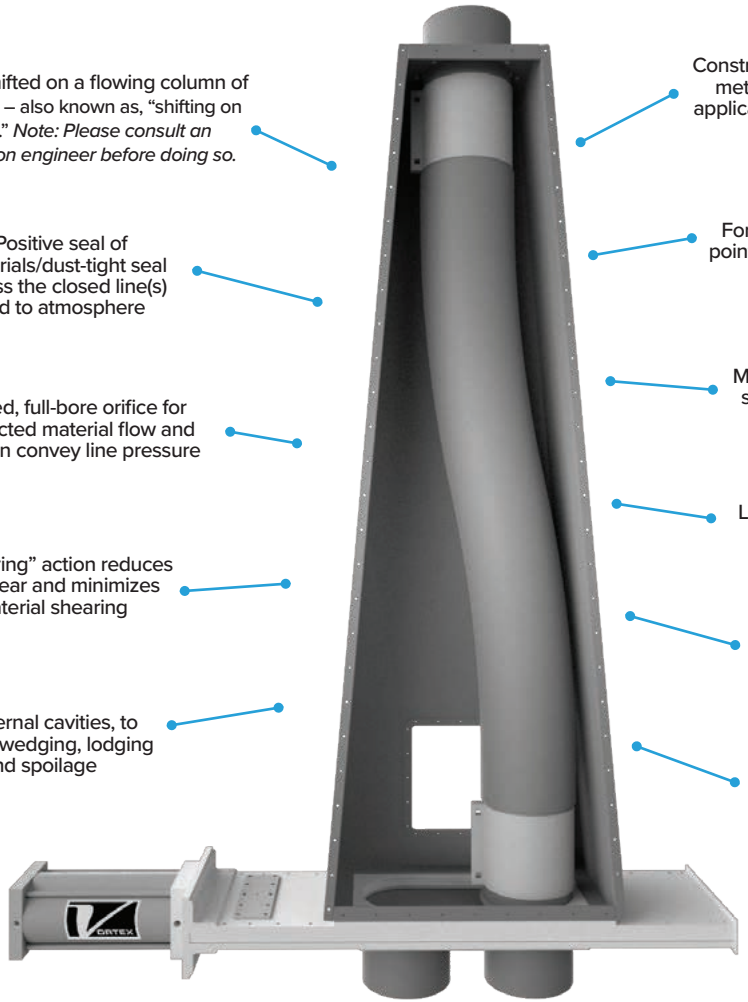
OPTIONS



Two-Way



Three-Way



Can be shifted on a flowing column of materials – also known as, "shifting on the fly." *Note: Please consult an application engineer before doing so.*

Positive seal of materials/dust-tight seal across the closed line(s) and to atmosphere

Machined, full-bore orifice for unobstructed material flow and to maintain convey line pressure

"Scissoring" action reduces seal wear and minimizes material shearing

No internal cavities, to prevent wedging, lodging and spoilage

Constructed from specialized metals and polymers for application-specific durability

For operator safety, no pinch points or exposed moving parts

Mechanically self-cleans its seals with each actuation

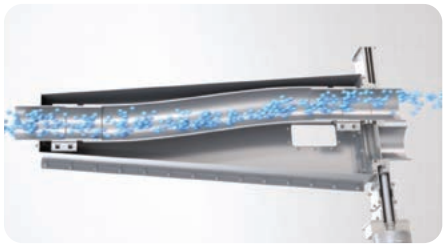
Lightweight construction for easy installation

No metal-on-metal contact

Horizontal or vertical orientation

KEY FEATURES

Can be shifted on a flowing column of materials – also known as, "shifting on the fly." *Note: Please consult an application engineer before doing so.*



No material cross-contamination into the opposite line(s)

Live loaded, wear compensating hard polymer pressure plate seals

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow and dilute phase pneumatic conveying applications. Can handle differential pressures up to 15 psig | 1 barg | 0.1 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	2 – 8 in | 50 – 205 mm ID & OD diameters are available. Schedule pipe sizes are also available.
Inlet & Outlets	Available in round sizes
Overall Height	35 – 100 in | 875 – 2,545 mm
Weight	100 – 500 lb | 45 – 225 kg
Connection Options	Compression couplings, ANSI #125/150 Custom flanges are available
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Construction	Aluminum
Housing Construction	304 stainless steel w/ clear polycarbonate viewport
Weldment Options	Aluminum, 304 or 316L stainless steel, carbon steel
Hose Options	Natural rubber w/ steel wire helix, 304 stainless steel
Material Contact Options	304 or 316L stainless steel
Pressure Plate Options	Nylon, PET
Load Seal Options	Natural rubber and/or silicone rubber
Drive/Actuation	Double-acting air cylinder, hand wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed or proximity switches, and/or clear access panel for visual indication (see page 63)
Other Options	Sealed body air purge (see page 64)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Flex Tube Diverter vs. Alternatives

- Many alternative pneumatic diverters rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service, which allows materials and dusts to leak into the opposite line(s) and to atmosphere. Seal damage can also cause actuation issues and several other maintenance concerns. The Vortex® Flex Tube Diverter™ addresses these issues by incorporating "live loaded" hard polymer pressure plate seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the blade. The seals are also shielded from the material flow stream, to protect them from abrasion. This design maintains the diverter's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- Many alternative pneumatic diverters have open cavities where materials can wedge and prevent positive material shut-off. Wedging can also create seal wear and material degradation, and cause a valve to seize and bind. Wedged materials also create risk for cross-contamination and spoilage. To prevent wedging, the Flex Tube Diverter's sliding blade is designed to mechanically clear materials away from the sealing surfaces with each actuation. This ensures migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

- Many valves with sliding blades allow metal-on-metal sliding, which creates galling. This causes a valve to seize and bind, and can create foreign metal fragment contamination. The Flex Tube Diverter's hard polymer seals eliminate metal-on-metal contact to resolve each of these concerns.

- Alternative pneumatic diverters can pack and grind materials against the seals. This causes seal wear, material degradation and damaged product quality. To address these issues, the Flex Tube Diverter's "scissoring" action tapers off material flow as it shifts between lines. In keeping the pressure plate seals clear of materials, their service life is also extended.

- Many alternative pneumatic diverters have blade(s) and seals which are directly exposed to the material flow steam. This disrupts convey line pressures and obstructs material flow as they pass through the valve, which can cause line plugs and other maintenance concerns. To resolve these issues, the Flex Tube Diverter's sliding blade is machined with an unobstructed, full-bore orifice that maintains convey line pressure and allows unrestricted material movement.

- Many alternative flexible hose diverters feature an exposed flexible hose. When installed outdoors, this subjects the flexible hose to its surrounding environment. Regarding operator safety, an exposed flexible hose also creates hazardous pinch points. To address these issues, the Flex Tube Diverter is designed with a housing that protects the flexible hose and encloses all moving parts.

For more information & technical resources, please visit: **www.vortexglobal.com**

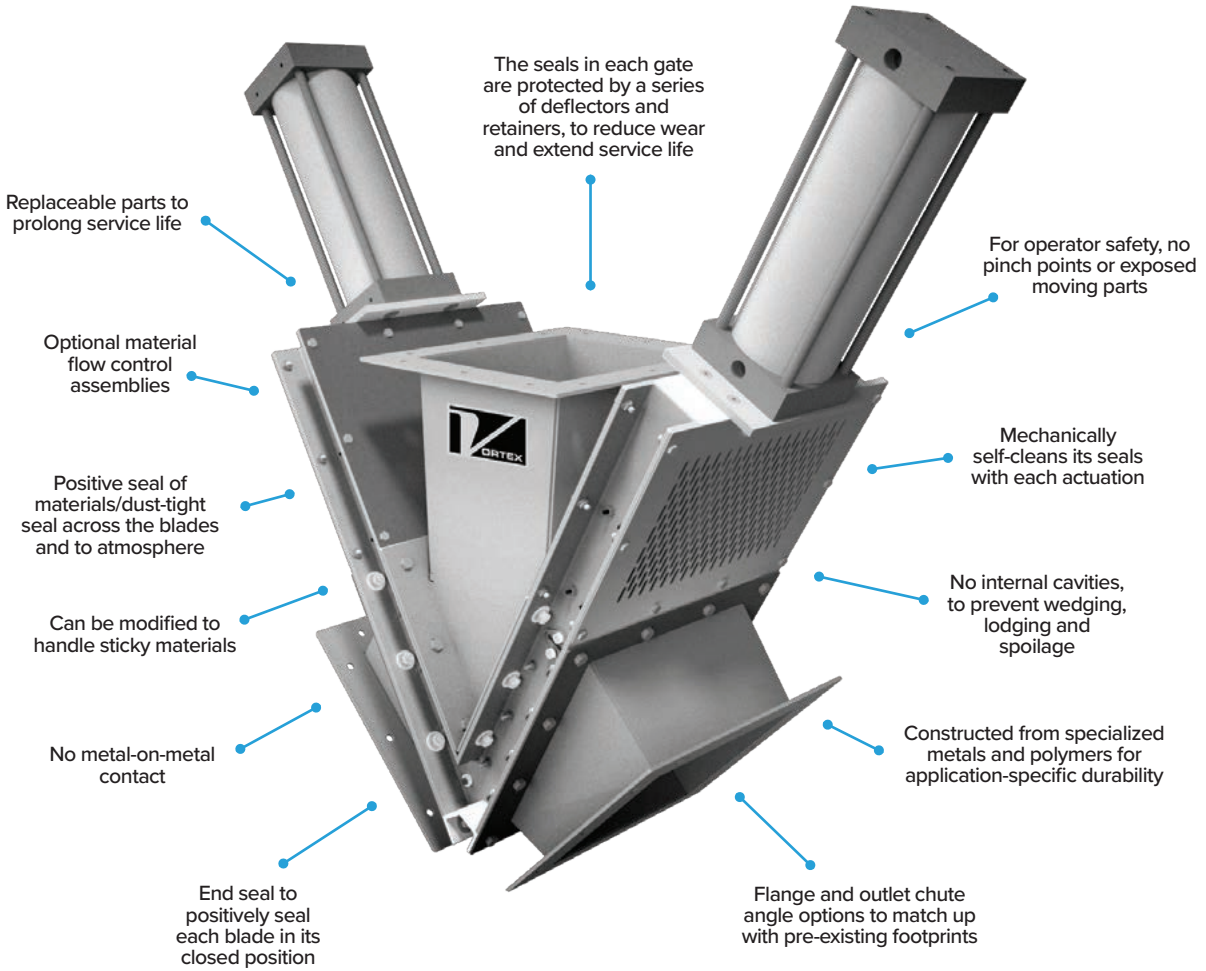
Model No. VXX

GRAVITY VEE DIVERTER

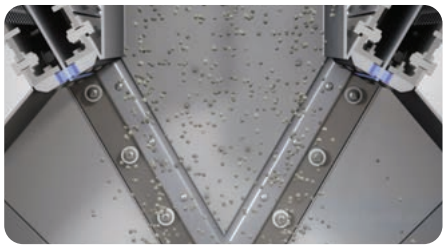
Ideal application: Replacement for conventional bucket diverters and flap diverters used to divert dry bulk solid materials from one source toward two destinations in gravity flow applications. The Vortex® Gravity Vee Diverter™ is ideal for use in high cycle applications.

Purpose: The Gravity Vee Diverter incorporates a "dual gate" design with independent controls. This allows material flow to be diverted **through both outlet chutes simultaneously, each chute individually, or a complete material shut-off**. For total control over flow rates, the Gravity Vee Diverter is also compatible with Vortex material flow control assemblies (see pages **65 & 66**), in order to achieve proper batchweights, ensure accuracy and provide repeatability in the manufacturing process.

Round

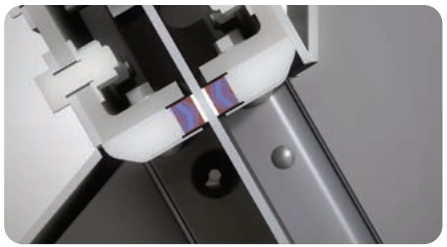


KEY FEATURES



Allows material flow through both outlet chutes simultaneously, each chute individually, or a complete material shut-off

Replaceable bonnet seals for in-line maintenance



Live loaded, wear compensating hard polymer bonnet and side seals

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only. Contact us to discuss suitability for use in low pressure/vacuum applications.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling sticky and/or corrosive materials & for wash-down.
Standard Sizes	6 – 24 in | 150 – 610 mm Contact us for custom sizes
Inlet & Outlets	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	25 – 60 in | 660 – 1,525 mm
Weight	130 – 400 lb | 60 – 180 kg
Outlet Chute Angle Options	45° or 60° from center Contact us for custom angles
Flange Options	Standard flange, ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	180°F | 80°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Options	6061-T6 aluminum, 304 or 316L stainless steel
Material Contact Options	304 or 316L stainless steel, carbon steel
Bonnet & Side Seal Options	PET, 25% glass-filled PTFE
Load Seal Construction	Silicone rubber
Roller Options	PET, hardened steel 25% glass-filled PTFE, stainless steel and bronze available by request
End Seal Options	UHMW-PE, polyurethane, PET, 25% glass-filled PTFE
Drive/Actuation	Double-acting air cylinder, hand wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches, and/or clear bonnet covers for visual indication (see page 63)
Material Flow Controls	AVP, IVP, VPO, VPC (see pages 65 & 66)
Other Options	Dual cylinder actuators (see page 61) Sealed body air purge (see page 64)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Gravity Vee Diverter vs. Alternatives

- Flap diverters should not be shifted through a flowing column of material. Doing so can damage the blade and blade shaft. Instead, it is recommended to shut off material flow before shifting the flapper blade. To do so often requires an additional isolation gate above the diverter valve. The Vortex® Gravity Vee Diverter™ is a dual-purpose valve, used as both a diverter valve and as an isolation gate. Both gates can be open to divert through both outlet chutes simultaneously, one gate can be open to divert through one outlet chute independently, or both gates can be closed for a positive material shut-off. It is an ideal solution because it eliminates the need to purchase an additional gate above, and it improves processing speeds by shifting through a flowing column of material, rather than closing off the system to shift a bucket or flap diverter.

- To eliminate metal-on-metal contact, the Gravity Vee Diverter incorporates hard polymer bonnet seals and side seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the blades. This design maintains the diverter's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- A problem inherent in alternative diverter designs is material packing along the bucket or flapper blade and its seals, resulting in actuation and sealing issues. To ensure positive material shut-off, the Gravity Vee Diverter's sliding blades are designed to mechanically clear materials away from the sealing surfaces with each actuation. With each closing stroke, the sliding blades mechanically self-clean their side seals. With each opening stroke, each gate's bonnet seals prevent the blade from carrying materials back into the bonnet area. Both of these design features ensure migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

- If materials and dusts begin to migrate and collect in either gate's bonnet area, it indicates that the gate's bonnet seals have partially worn and the compression load is lessened, causing the seals to no longer be forced against the sliding blade as they should be. With this maintenance indication, both gates feature access slots on each side of the gate that allow bonnet seal replacement while the diverter remains in-line. Using simple tools, new bonnet seals are driven into one access port as the worn bonnet seals are simultaneously ejected on the other side of the gate, through the opposite access port.

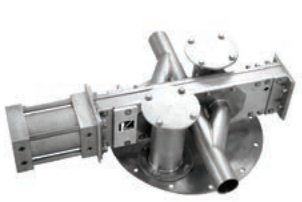
- When the gates are closed, if materials and dusts begin to leak past the sliding blades, it indicates that the gate's side seals have partially worn and the compression load is lessened, causing the blade to no longer be forced against the side seals as it should be. With this maintenance indication, the Gravity Vee Diverter's gates feature cam-adjustable rollers that can be utilized to restore the gate's dust-tight seal. Using simple tools, the cam rollers can be adjusted to lift the sliding blade against the side seals and restore the compression load. This maintenance process can be performed while the diverter remains in-line, and can be repeated several times before the side seals must be replaced.

For more information & technical resources, please visit: **www.vortexglobal.com**

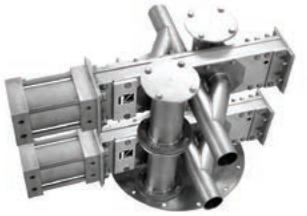
Model No. DXX

FILL PASS DIVERTER

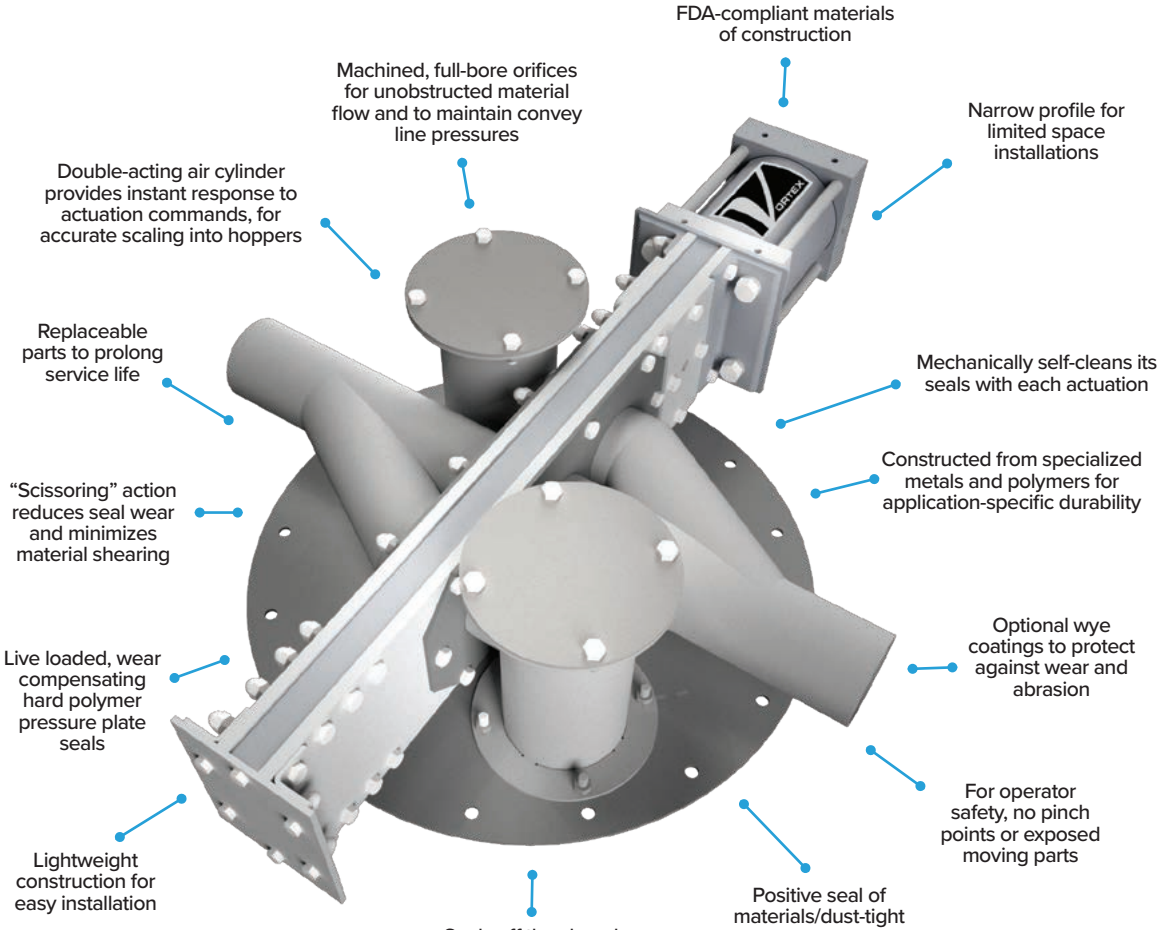
Ideal application: Filling one or more tanks or scale hoppers when pneumatically conveying dry bulk solid materials via a closed loop system. Vortex® Fill Pass Diverters™ are stackable so that several convey lines can be compacted to route toward a common source.



Single

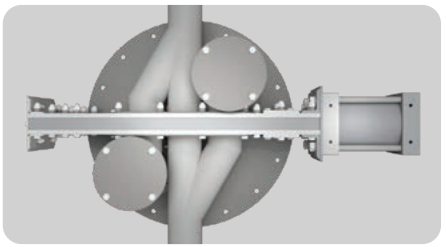


Stacked



KEY FEATURES

Shimming system for in-line maintenance



The diverter's spread stack offers better separation of air and materials

Material deflector to direct material flow and minimize material carryover

TECHNICAL SPECIFICATIONS

Conveyance Type	Dilute phase pneumatic conveying applications. Can handle differential pressures up to 15 psig | 1 barg | 0.1 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Non-abrasive to moderately abrasive powders, pellets and granules. Modifications available for handling corrosive materials and/or for wash-down.
Standard Sizes	2 – 6 in | 50 – 150 mm ID & OD diameters are available. Schedule pipe sizes are also available.
Inlet & Outlets	Available in round sizes
Overall Height	7 – 13 in | 90 – 165 mm
Weight	60 – 115 lb | 25 – 50 kg
"Fill" Angle Options	30° or 45° from center Contact us for custom angles
Connection Options	Compression couplings
Material Temperatures	180° F | 80° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Construction	Aluminum
Weldment Options	304 or 316L stainless steel
Material Contact Options	304 or 316L stainless steel
Pressure Plate Options	Nylon, PET, 25% glass-filled PTFE
Load Seal Options	Natural rubber and/or silicone rubber
Drive/Actuation	Double-acting air cylinder (see pages 61 & 62)
Position Confirmation	Magnetic reed or proximity switches, and/or clear bonnet cover for visual indication (see page 63)
Other Options	Sealed body air purge (see page 64)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Fill Pass Diverter vs. Alternatives

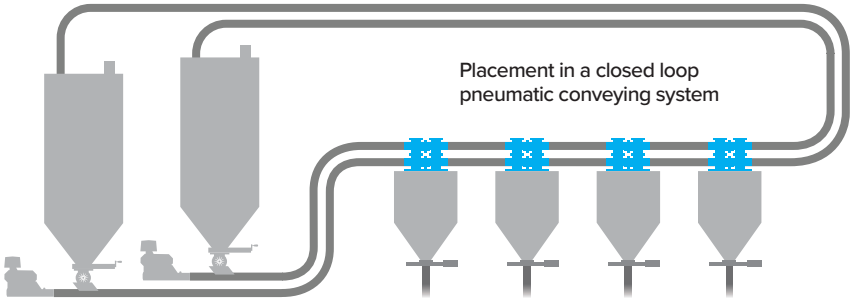
- Many alternative pneumatic diverters rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service, which allows materials and dusts to leak into the opposite line(s) and to atmosphere. Seal damage can also cause actuation issues and several other maintenance concerns. The Vortex® Fill Pass Diverter™ addresses these issues by incorporating "live loaded" hard polymer pressure plate seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the blade. The seals are also shielded from the material flow stream, to protect them from abrasion. This design maintains the diverter's positive seal of materials/dust-tight seal with infrequent maintenance intervention.
- The Fill Pass Diverter is specifically designed to provide a positive seal of materials/dust-tight seal, in order to prevent material leakage into hoppers below. Especially in applications where batchweights are critical, the Fill Pass Diverter ensures accurate scaling of materials. Also lending to fill accuracy, the Fill Pass Diverter can be quickly shifted on a flowing column of materials – also known as, "shifting on the fly." *Note: Please consult an application engineer before doing so.*
- Alternative pneumatic diverters can pack and grind materials against the seals. This causes seal wear, material degradation and damaged product quality. Materials may also wedge in the seals, causing the diverter to seize and bind. To address these issues, the Fill Pass Diverter's "scissoring" action tapers off material flow as it shifts between lines. In keeping the pressure plate seals clear of materials, their service life is also extended.
- Many alternative pneumatic diverters used in closed loop systems are poorly designed to exhaust air pressure from inside the hopper(s) below. This causes inefficient filling and inaccurate batchweights. To address this concern, the Fill Pass Diverter is designed with a "stack" inlet and outlet. As materials are pneumatically conveyed into the hopper through the inlet stack, the spent air is immediately exhausted back out of the hopper through the outlet stack. This allows exhausted air pressure to continue downstream, away from the hopper(s).
- The Fill Pass Diverter incorporates a spread stack concept. A cyclonic effect is created in the inlet stack for better separation of air and materials as they enter the hopper(s) below. Below the inlet stack, a material deflector intervenes to prevent material carryover. The spread stack concept ensures efficient material movement and reduced fill times.
- The Fill Pass Diverter's FDA-compliant materials of construction make it an ideal solution for the Food & Beverage industries – most notably, bakeries and confectionary manufacturers.
- The Fill Pass Diverter features flanged inlet and outlet stacks. This makes Fill Pass Diverters stackable so that several convey lines (of uniform or differing sizes) can be connected to route several material types toward a common source via a compact and efficient process. This capability is especially beneficial in applications where several materials must be blended, mixed or compounded in a common batch.
- The Fill Pass Diverter's double-acting air cylinder provides instant response to actuation commands. This allows for highly accurate and repeatable scaling, based on desired weights, fill levels or time intervals.

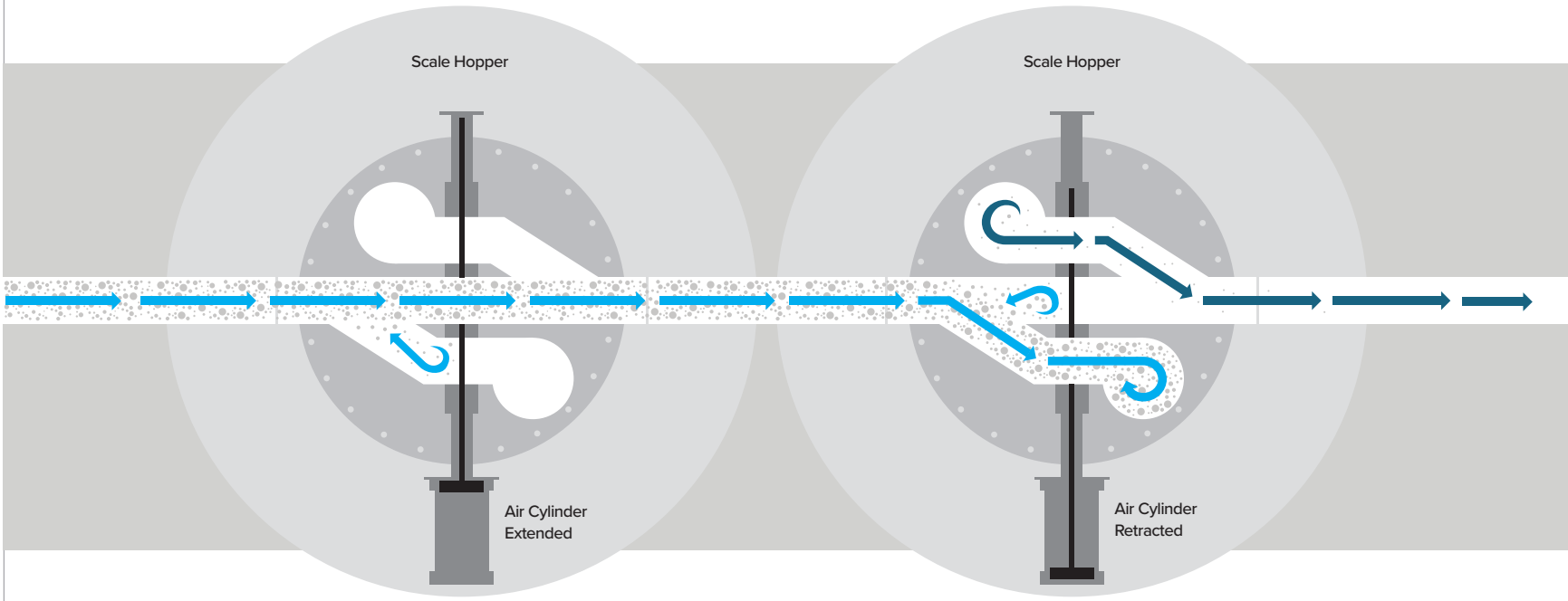
For more information & technical resources, please visit: **www.vortexglobal.com**

(Continued)

FILL PASS DIVERTER

Ideal application: Filling one or more tanks or scale hoppers when pneumatically conveying dry bulk solid materials via a closed loop system.





PASS MODE

Air and materials are conveyed past the hopper when weight or volume is attained

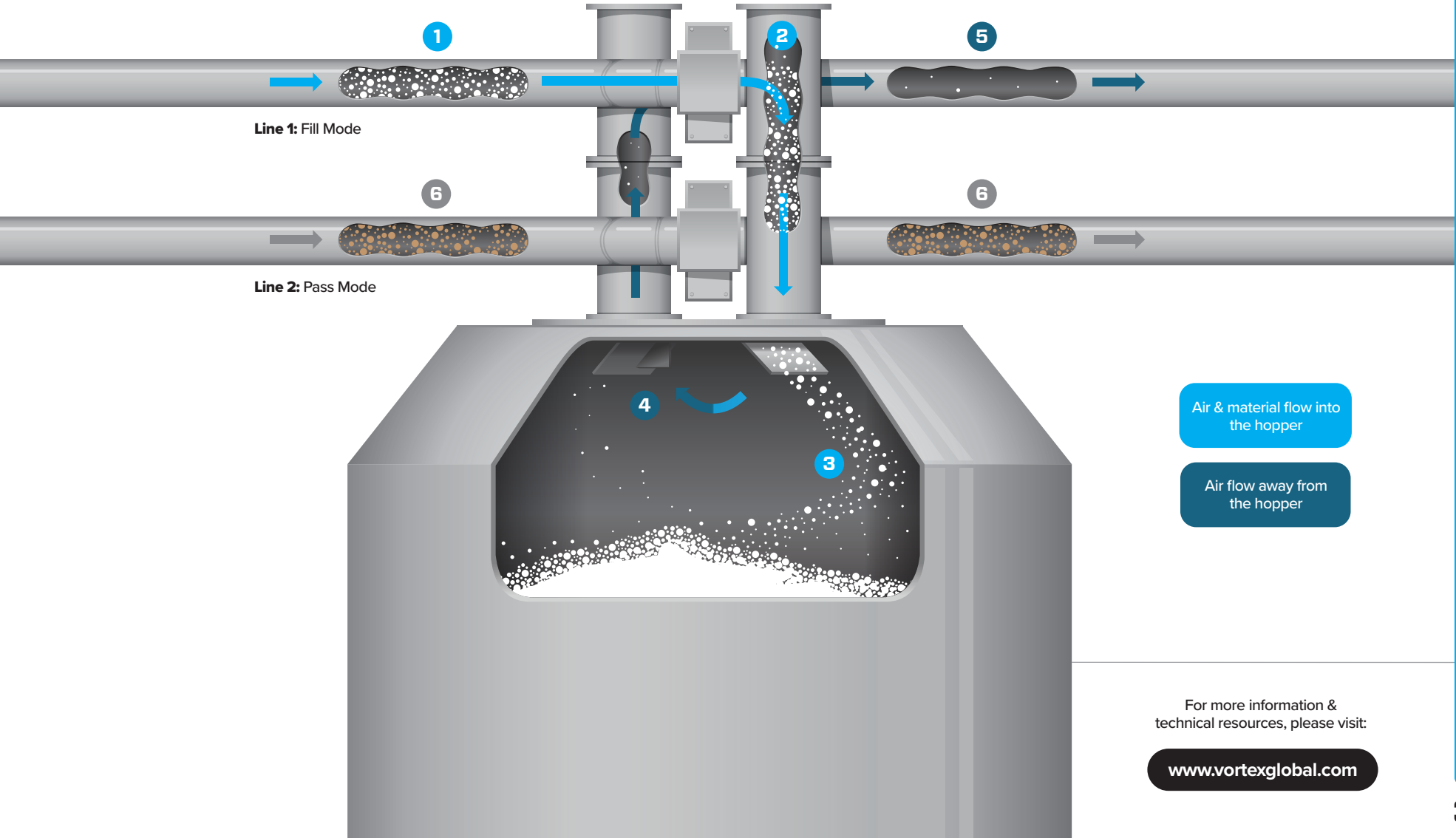
FILL MODE

Materials are conveyed into the scale hopper as air pressure is exhausted downstream, back to the source

STACKABLE FILL PASS DIVERTERS

Connecting multiple convey lines to route various material types toward a common source

1. In Line 1, air and material X convey toward the hopper
2. Air and material X are diverted down into the hopper via the inlet stack
3. Material X is deflected away from the vent as it fills the hopper
4. Air is exhausted back out of the hopper via the outlet stack
5. Air continues downstream in Line 1, back to the source
6. In Line 2, air and material Z convey past the hopper and back to the source



For more information & technical resources, please visit:

www.vortexglobal.com

CASE STUDY

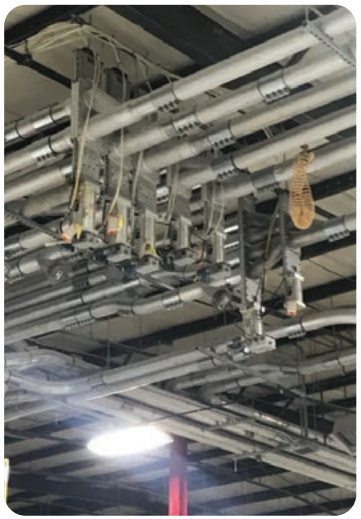
Multi-Port Diverter Handling Flour

Client: Pasta producer

Application: Pneumatically convey/divert flour from a main supply line into 8 silos. Eash silo feeds a separate production line. Each line produces a different pasta type.

Results:
The client previously used a manual hose switching station in this process. They were concerned about labor intensity, workplace safety, profitability, explosion potential, waste reduction and maintenance costs, among other things.

With the Vortex Multi-Port Diverter, the automated system ensures the different grades of flour are conveyed into their proper silo. The client has already saved dollars and labor hours, plus avoided potential porcessing errors and improved plant safety.



CASE STUDY

Gates & Diverters Handling Plastics

Client: Manufacturer of styrofoam cups, plates & bowls

Application:
• Reintroduce plastic scrap/regrind into the extrusion process.
• Convey resins/compounds into the extrusion process.
• Converge resins from various holding bins into a common convey line.

Valves:
• 7 Roller Gates
• 31 Wye Line Diverters
• 32 Orifice Gates

Results:
This client operates 5 shifts, 24 hours per day — and all but two days each year.

With the addition of Vortex gates and diverters, this client has a solution for automated material transport — and has reduced their manufacturing waste to less than 1%.

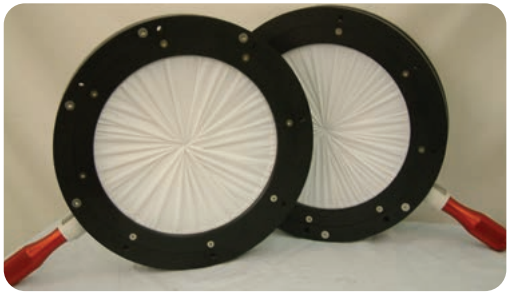
CASE STUDY

Seal Tite Diverter Handling Pet Food

Quantity: 4

Special Features: Spin knobs, for easy in-line access without using tools.

Application: Divert kibble into two disc conveyors, to be transported to a packaging line.



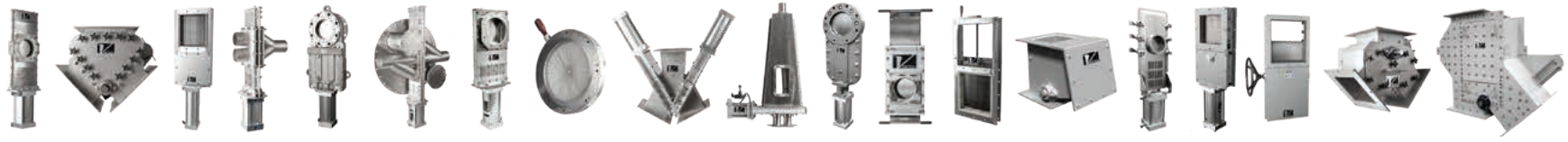
CASE STUDY

Iris Valve Handling Powdered Drink Mix

Quantity: 2

Application: Avoid contamination when handling food & beverage materials.

Special Features: A Teflon-coated body was specified because Teflon does not chemically react or corrode from material contact, which would otherwise compromise taste and create contamination. Teflon also assures food purity because it does not absorb preservatives. Because Teflon is non-stick, it also provides ease of maintenance.



TECHNICAL ARTICLE

How to Select a Valve for Solids & Bulk – Handling

Valve suppliers should have the application engineering knowledge and experience to know what valves and modifications should be applied for certain application parameters. Make sure your supplier is asking the right questions.

Many people think that selecting a slide gate or diverter valve for handling dry bulk solid materials is a relatively simple process. They typically assume the only information needed is:

- Opening shape & size
- Available stack-up height
- Matching connections or bolt hole patterns

But in reality, valve suppliers need much more information to be able to identify the right valve for the application. The more information a valve supplier has about the application parameters, costly mistakes are avoided. Misinformation can put you on either end of the spectrum — whether it be using an expensive valve for a simple application, or an inexpensive valve that is poorly designed for the application.

1. Valve Selection

The most critical questions are:

- What is the valve intended to do?
- Is a slide gate, diverter valve, iris valve or butterfly valve needed to best fulfill the application?

Follow-up questions include:

- What is the valve's opening size? Is the opening square, round or rectangular?
- What is the shape and size of the conveying line? Are the lines tube or pipe? If the lines are pipe, is it schedule 10 or 40?
- Will the valve be used in a pressure, vacuum or gravity flow application? If pressure or vacuum, how much? If pressure, will the system convey material in dilute or dense phase?
- Will the valve be installed indoors or outside?
- What is the temperature of the air and materials being conveyed?
- What should the valve be constructed from (aluminum, stainless steel, carbon steel, etc.)?
- Will the valve be subject to wash-downs? If so, will it be washed with hot water or a caustic liquid?
- If the valve is installed below a bin or silo — Will there be flow aides (aeration, vibration, etc.)? What is the sequence of operations for the system (e.g. When are the flow aides activated, in relation to the cycle of the gate valve)? How is material conveyed into the bin or silo?

Then, you must consider material characteristics:

- What is the material?
- Is it in powder, pellet or granular form?
- What is its particle size?
- What is its weight per cubic foot?
- Is it sticky? Abrasive? Corrosive?
- Is there sanitary or spoilage concerns?
- If multiple materials will pass through a common conveying line, is there cross-contamination concerns?

2. Actuator Selection

The most critical questions are:

- What is your power availability? Is compressed air available?
- What is the cycle frequency?
- Will the valve close on material? If yes, will the material be a standing or flowing column?
- Does actuation speed matter?
- If only intended for maintenance purposes, can I use manual actuation?
- If installed outside, will the valve be subject to cold temperatures?
- What are the cost variables for replacement and repair?
- Will the valve operate in a potentially explosive environment?

3. Standard Modifications

Your valve supplier should offer standard modifications to suit your application/material-specific requirements.

When selecting valve modifications, some application-specific factors that should be considered are:

- Is the application high-cycle?
- Is the material handled abrasive duty? Corrosive? Friable? Food-specific?
- Is chemical compatibility a concern?
- How often will the valve be serviced? Are in-line maintenance features desired?

4. Valve Location & Orientation

The most critical questions are:

- Where will the valve be installed (e.g. below a bin/silo, etc.)?
- Will it be installed in a vertical or horizontal orientation?

This helps determine which accessories may be required for your application. For example, if a slide gate is mounted below a surge hopper, a variable positioning assembly may be required to meter material into the weigh hopper.

5. Features Selection

Common modifications include:

- Abrasion-resistant blade & liners
- Adjustable blade rollers
- Custom valve sizes
- Sealed body with an air purge assembly
- Replaceable seals, liners & wetted parts
- Wear-compensating seals
- Wear-reducing material deflectors
- Wear-resistant blade, bucket blade or pivoting chute

...to name a few.

6. Accessory Selection

When specifying valve accessories, there are four distinct areas:

- Variable positioning assemblies — Vortex offers a VPO/VPC (relay control with manual adjustability); AVP (PLC control with manual adjustability); and an IVP (infinite positioning via a 4-20mA signal).
- Feedback — Vortex offers push-button control panels, and valve/sensor manifold technologies with a variety of PLC interfaces.
- Safety devices — A vented ball valve should always be installed in front of the air control valve, in order to bring the slide gate or diverter valve to a "zero mechanical" state before servicing.This type of ball valve bleeds off any residual downstream pressure contained in the air lines supplying the air cylinder. The ball valve should always be installed within arm's reach of the air control.
- Fabricated accessories — Fabricated transitions provide flexibility when mating up to existing equipment. This includes matching special bolt hole patterns, tube stubs, or blind flanges that allow in-the-field hole placement and installation.

Titan SERIES

VALVES FOR DRY BULK PROCESSING & CONVEYING

Staying true to the Vortex design philosophy, we identified a need in the heavy-duty and abrasive material handling industries. When handling such materials, the most common causes of equipment maintenance or replacement are erosive wear and impact wear, which cause damage to a valve's internal parts. The Vortex Titan Series is specifically designed to protect against these forms of wear and abrasion. Characterized by unique design and robust metal materials of construction, the Vortex Titan Series features slide gates and diverters built for durability, reliability, ease of maintenance and prolonged service life.

Model No. TSXX

TITAN SLIDE GATE

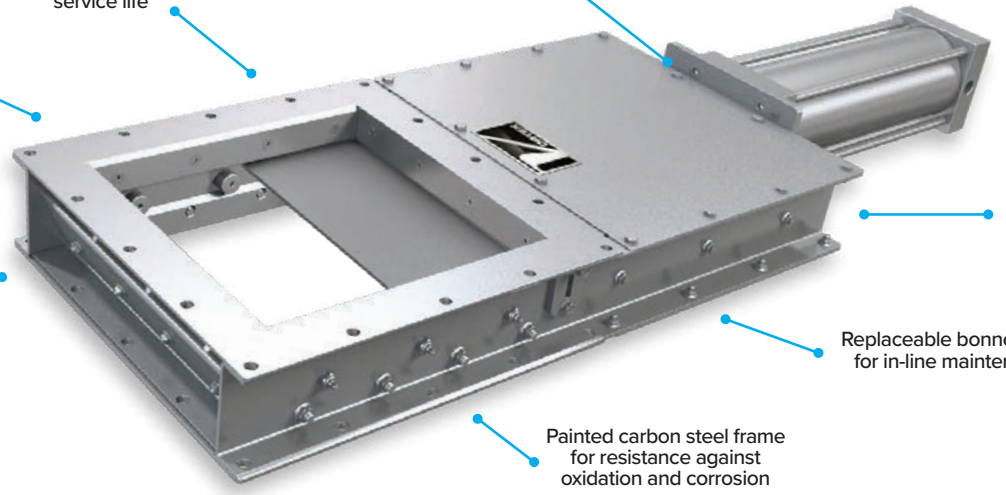
Ideal application: Installations above or below gravity-fed hoppers/silos, mixers, and augers/screw conveyors. Custom sizes are available to accommodate any combination of gate stroke or width.

Purpose: A robust roller-supported slide gate featuring bonnet seals and side seals to provide a better seal of fine materials and dusts across the blade and to atmosphere.


Square


Rectangle

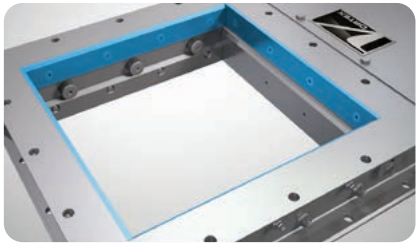

Dual Cylinder



KEY FEATURES


Live loaded, wear compensating hard polymer bonnet and side seals


Displacement pocket prevents wedging and packing into an end seal. For fine materials, standard end seal is available.


Seals are protected by a series of deflectors and retainers to reduce wear and extend service life


Cam-adjustable rollers for in-line maintenance

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Heavy-duty and/or abrasive powders, pellets and granules. Modifications available for handling abrasive, fine materials.
Standard Sizes	6 – 36 in | 150 – 915 mm Contact us for custom sizes
Opening	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	4 – 6 in | 100 – 150 mm
Weight	50 – 560 lb | 25 – 255 kg
Flange Options	Standard flange Custom flanges are available
Material Temperatures	250°F | 120°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Construction	Carbon steel
Material Contact Options	400 BHN abrasion-resistant steel, carbon steel, 304 stainless steel
Bonnet & Side Seal Options	PET, 25% glass-filled PTFE
Load Seal Construction	Silicone rubber
Roller Options	Hardened steel, 304 stainless steel, bronze bushings
End Seal Construction	25% glass-filled PTFE
Drive/Actuation	Double-acting air cylinder (see pages 61 & 62)
Position Confirmation	Proximity switches, magnetic reed switches and/or clear bonnet cover for visual indication (see page 63)
Material Flow Controls	AVP, IVP, VPO, VPC (see pages 65 & 66)
Other Options	Dual cylinder actuators (see page 61) Return pan & Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Titan Slide Gate vs. Alternatives

The Vortex® Titan Slide Gate™ provides significant advantages over alternative roller-supported slide gates:

- Many alternative roller-supported slide gates rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. Others rely on bonnet packing, which can relax and allow material packing in the bonnet area. These deficiencies promote leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Titan Slide Gate addresses these issues by incorporating "live loaded" hard polymer bonnet seals and side seals. Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seals are "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seals against the sliding blade. When equipped with a Special Service Inlet, the seals and rollers are also shielded from the material flow stream, to protect them from abrasion. This design maintains the gate's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

- If materials and dusts begin to migrate and collect in the gate's bonnet area, it indicates that the gate's bonnet seals have partially worn and the compression load is lessened, causing the seals to no longer be forced against the sliding blade as they should be. With this maintenance indication, the Titan Slide Gate features access slots on each side of the gate that allow bonnet seal replacement while the gate remains in-line. Using simple tools, new bonnet seals are driven into one access port as the worn bonnet seals are simultaneously ejected on the other side of the gate, through the opposite access port.

- Many alternative slide gates allow metal-on-metal sliding, which creates galling. This causes a gate to seize and bind, and can create foreign metal fragment contamination. The Titan Slide Gate's hard polymer seals eliminate metal-on-metal contact to resolve each of these concerns.

- Many alternative roller-supported slide gates have open cavities where materials can wedge and prevent positive material shut-off. Wedging can also create seal wear and material degradation, and cause a gate to seize and bind. Wedged materials also create risk for cross-contamination and spoilage. To prevent wedging and ensure positive gate closure, the Titan Slide Gate's sliding blade is designed to mechanically clear materials away from the sealing surfaces with each actuation. With each closing stroke, the Titan Slide Gate mechanically self-cleans its side seals. With each opening stroke, the gate's bonnet seals prevent the blade from carrying materials back into the bonnet area. Both of these considerations ensure migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

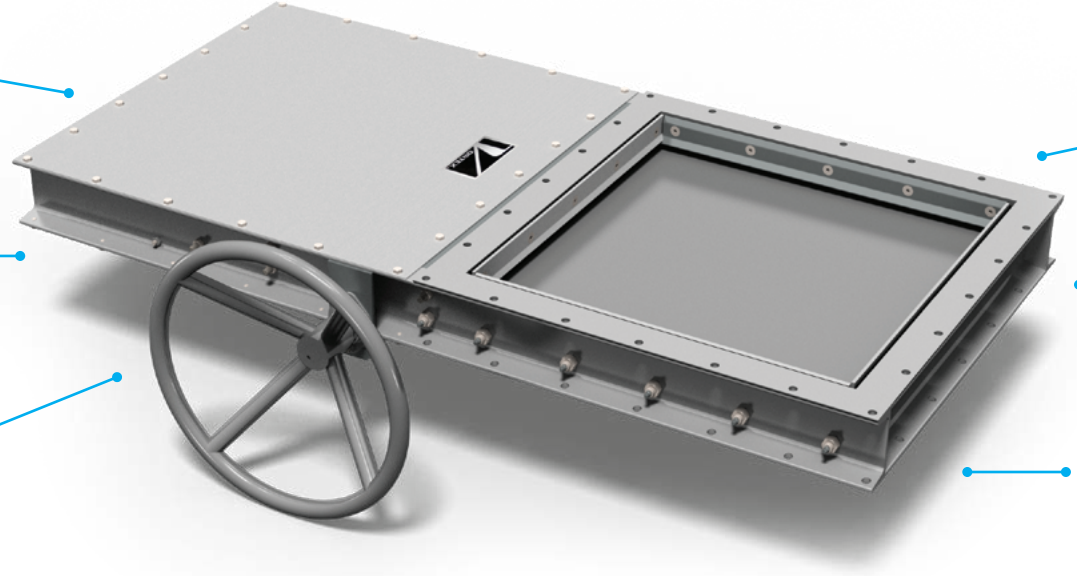
- Many alternative slide gates pack materials into an end seal, preventing positive closure. This promotes material leakage through the valve, can cause blade damage, and can cause other actuation issues. In the Titan Slide Gate, the leading edge of the sliding blade is beveled. The gate is also designed with a displacement pocket, rather than a true end seal. Both of these features ensure that materials remaining at the leading edge of the blade can fall away into the process line below, rather than packing into an end seal.

For more information & technical resources, please visit: **www.vortexglobal.com**

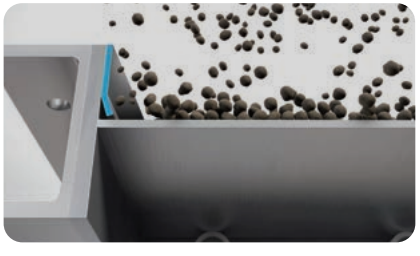
Model No. AXX

AGGREGATE GATE

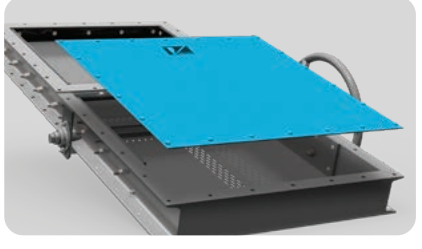
Ideal application: Similar in design to the Vortex® Titan Slide Gate™ but vastly different in scope, the Vortex® Aggregate Gate™ is ideal for handling larger-size, abrasive dry bulk solid materials in applications where fine materials and dusts are of less concern.



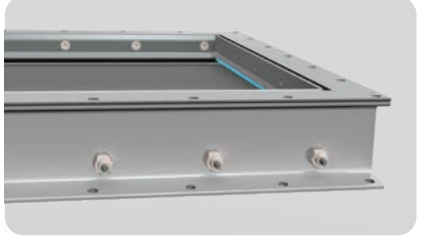
KEY FEATURES



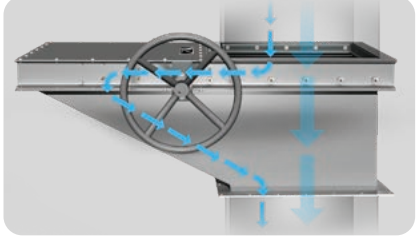
Seals are protected by a series of deflectors and retainers to reduce wear and extend service life



Removable bonnet cover for in-line maintenance



Displacement pocket prevents wedging and packing into an end seal



Optional return pan redirects migrant materials in the bonnet area back into the material flow (see *Accessories* page 67)

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials with large particle sizes, such as minerals, coal and aggregates
Standard Sizes	6 – 24 in | 150 – 610 mm Contact us for custom sizes
Opening	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	4 in | 110 mm
Weight	85 – 395 lb | 40 – 180 kg
Flange Options	Standard flange Custom flanges are available
Material Temperatures	180°F | 80°C for standard gate, with modifications that allow up to 550°F | 290°C
Body/Frame Options	Carbon steel, stainless steel
Material Contact Options	Carbon steel, 304 stainless steel, 235 BHN abrasion-resistant steel, SAE 660 bronze
End, Bonnet & Side Seal Options	Belted rubber, chute rubber, bronze
Roller Options	Hardened steel, 304 stainless steel & bronze, 25% glass-filled PTFE, nylon, bronze
Drive/Actuation	Double-acting air cylinder, hand wheel, chain wheel, electric actuator, hydraulic actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches (see page 63)
Other Options	Return pan & Special Service Inlet (see page 67)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Aggregate Gate vs. Alternatives

The Vortex® Aggregate Gate™ offers many distinct advantages over alternative slide gates used in abrasive material handling applications:

- Many alternative slide gates allow metal-on-metal sliding, which creates galling. This causes a gate to seize and bind, and can create foreign metal fragment contamination. The Aggregate Gate's internal nylon gate liners and blade guides eliminate metal-on-metal contact to resolve each of these concerns.
- Unlike other roller-supported slide gates used in abrasive material handling applications, the Aggregate Gate's resilient rubber seals provide a positive material shut-off.
- Many alternative slide gates cannot be maintained while in-line. This can lead to expensive and extensive production downtime. The Aggregate Gate features blade rollers that can be externally greased while the gate remains in-line.
- Many alternative slide gates pack materials into an end seal, preventing positive closure. This promotes material leakage through the valve, can cause blade damage, and can cause other actuation issues. The Aggregate Gate is designed to trap larger material against a rubber seal until the gate is reopened.
- Many alternative roller-supported slide gates have open cavities where materials can wedge and prevent positive material shut-off. Wedging can also create seal wear and material degradation, and cause a gate to seize and bind. Wedged materials also create risk for cross-contamination and spoilage. To prevent wedging and ensure positive gate closure, the Aggregate Gate's sliding blade is designed to mechanically clear materials away from the sealing surfaces with each actuation. With each closing stroke, the Aggregate Gate mechanically self-cleans its side seals. With each opening stroke, a rubber scraper seal hinders the blade from carrying materials back into the bonnet area. Both of these considerations ensure migrant materials are forced back out of the seals and are discharged into the process line, rather than packing in the seals and causing actuation issues.

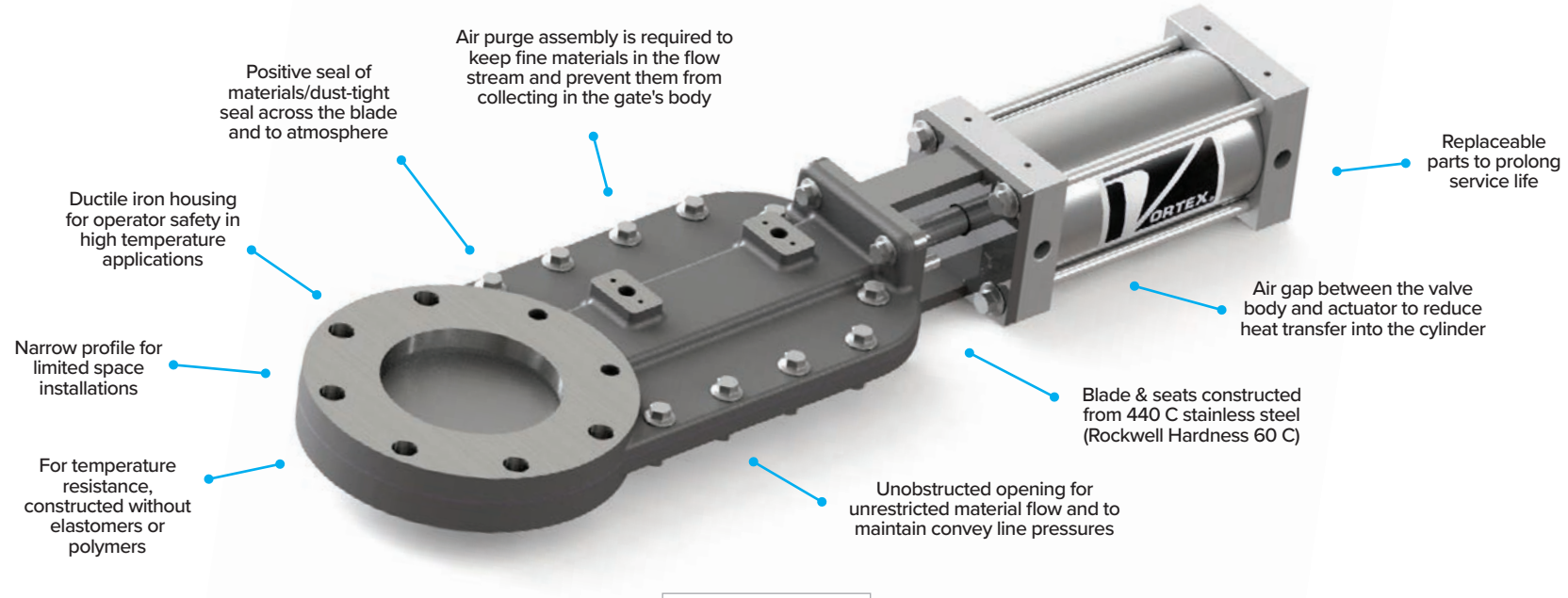
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. TPVXX

TITAN PRESSURE VALVE

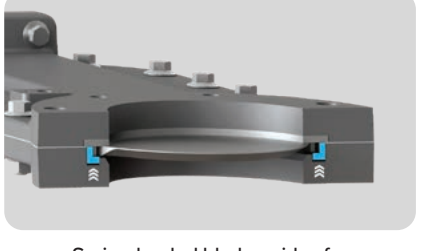
Ideal application: Higher-temperature and/or higher-pressure applications handling highly abrasive dry bulk solid materials. The Vortex® Titan Pressure Valve™ often replaces deficient slide gates and butterfly valves used in such environments.

Purpose: The Titan Pressure Valve's unique "rising blade" is designed to close into an end seat. This provides an optimal seal of high pressures and a positive material shut-off.

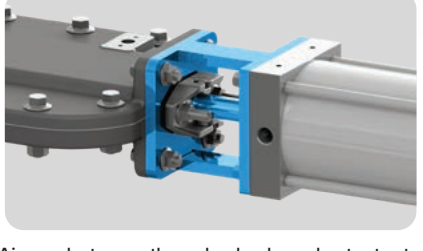


KEY FEATURES

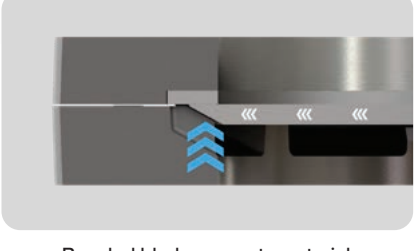
Replaceable packing gland for in-line maintenance



Spring-loaded blade guides for positive gate closure



Air gap between the valve body and actuator to reduce heat transfer into the cylinder



Beveled blade prevents material packing into the end seat

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow, dilute phase and dense phase pneumatic conveying applications. Can handle differential pressures up to 100 psig | 6.8 barg | 0.69 MPa, depending on gate size. Can be used in pressure or vacuum systems.
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials
Standard Sizes	2 – 12 in | 50 – 305 mm Contact us for custom sizes
Opening	Available in round sizes
Overall Height	2 – 3 in | 50 – 75 mm
Weight	45 – 250 lb | 20 – 115 kg
Flange Options	ANSI #125/150, DIN PN10
Material Temperatures	Up to 660° F | 350° C
Body/Frame Construction	Cast ductile iron
Material Contact Construction	440C stainless steel (Rockwell Hardness 60 C) & ductile iron
Seat Construction	440C stainless steel (Rockwell Hardness 60 C)
Drive/Actuation	Double-acting air cylinder (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches (see page 63)
Material Flow Controls	AVP (see pages 65 & 66)
Required Accessories	Sealed body air purge (see page 64)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external)

THE POWER OF COMPARISON

Vortex Titan Pressure Valve vs. Alternatives

- Many alternative slide gates and butterfly valves rely on seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. This deficiency promotes leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. To address these issues, the Vortex® Titan Pressure Valve™ is designed without polymer or elastomer seals. This ensures the gate's seal is not compromised by extreme pressure, temperature or abrasion. This design maintains the gate's positive seal with infrequent maintenance intervention.

- Many alternative slide gates pack materials into an end seal, preventing positive closure. This promotes material leakage through the valve, can cause blade damage, and can cause other actuation issues. Upon gate closure, the Titan Pressure Valve's sliding blade "rises" upward into a seat, rather than a true end seal, so that materials remaining at the leading edge of the blade can fall away into the process line below, rather than packing into an end seal. This design provides a better seal of materials and dusts in high pressure applications.

- A butterfly valve's rotating disc is directly exposed to the material flow steam, which creates wear to the disc itself. The exposed disc also disrupts convey line pressures and obstructs material flow as they pass through the valve, which can cause line plugs and other maintenance concerns. To resolve these issues, when the Titan Pressure Valve is open, its sliding blade is recessed to create an unobstructed opening that maintains convey line pressure and allows unrestricted material movement.

- The Titan Pressure Valve features spring-loaded blade guides along the full stroke of the gate to ensure the blade is kept in constant contact with the seals throughout each actuation. The blade guides also assist in “lifting” the blade into its end seat. This design ensures the gate’s positive seal of materials and dusts over time. The Titan Pressure Valve also features an additional spring-loaded blade guide that runs perpendicular to the sliding blade. This strengthens the center of the blade to further ensure the gate’s positive seal.

- In high pressure applications, the Titan Pressure Valve’s required air purge assembly is essential to keeping fine materials in the flow stream and out of the body of the valve.

INSTALLATION REQUIREMENTS

The Vortex® Titan Pressure Valve™ must be installed so that the actuator is parallel to the horizontal plane.

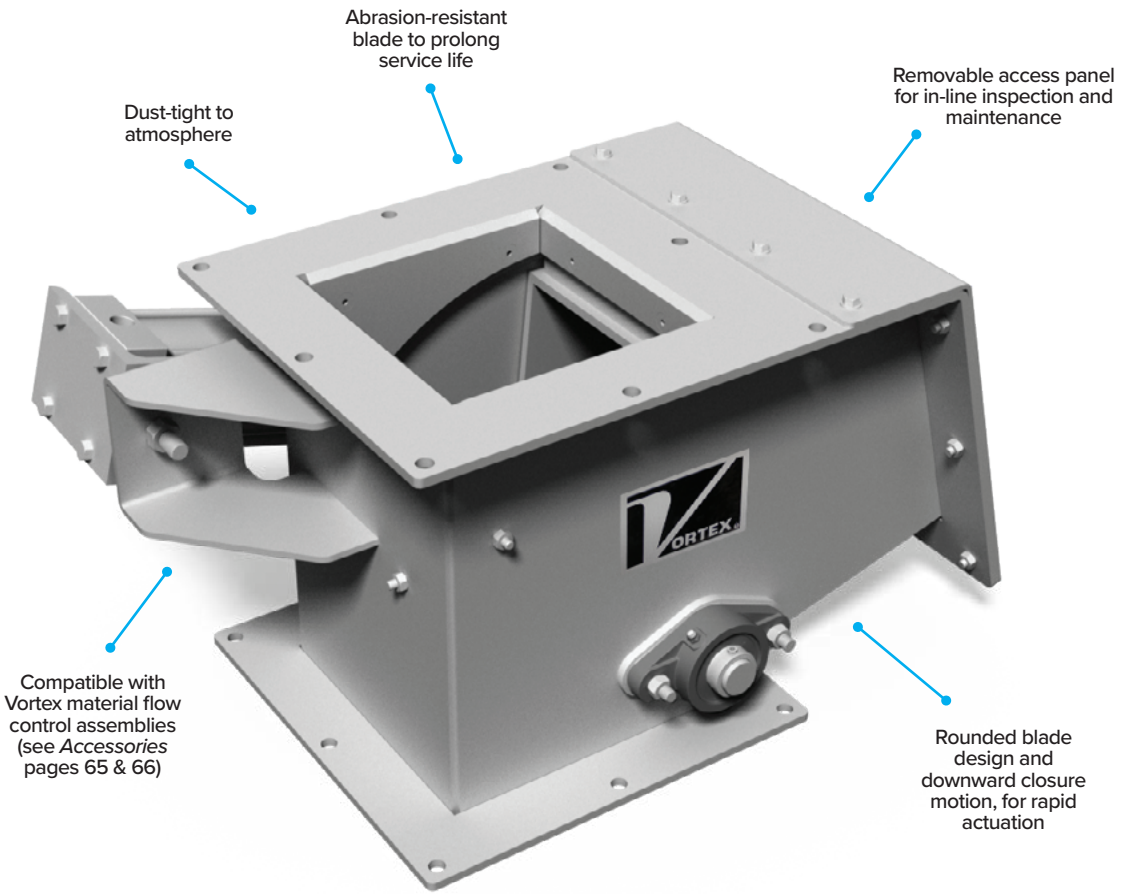
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. RBGXX

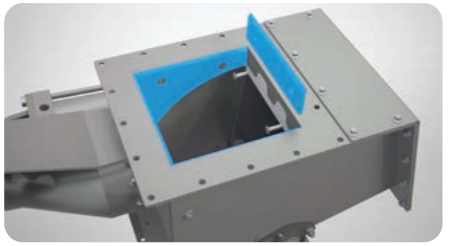
ROUNDED BLADE GATE

Ideal application: Above a storage bin or loadout station. Often used to meter flow and hold back large heads of material.

Purpose: Fast actuation for accurate metering control and quick material shut-off.



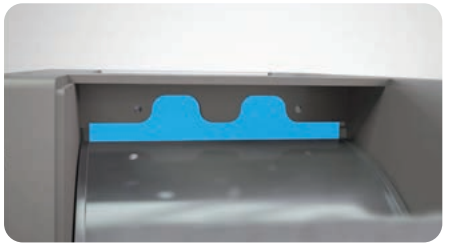
KEY FEATURES



Replaceable liners for added abrasion resistance

True arc design for a more precise sealing surface that prevents wedging, lodging and spoilage

Positive seal of materials/dust-tight seal across the gate and to atmosphere



Replaceable bonnet seal for in-line maintenance

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials
Standard Sizes	6 – 24 in | 150 – 610 mm Custom sizes available
Opening	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	9 – 34 in | 230 – 865 mm
Weight	95 – 965 lb | 40 – 435 kg
Flange Options	Standard flange Custom flanges are available
Material Temperatures	250°F | 120°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Construction	Carbon steel
Material Contact Options	400 BHN abrasion-resistant steel, carbon steel
Arc Seal Construction	Polymer & rubber
Drive/Actuation	Double-acting air cylinder, electric actuator, hydraulic actuator (see pages 61 & 62)
Position Confirmation	Proximity switches (see page 63)
Material Flow Controls	AVP, IVP (see pages 65 & 66)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Rounded Blade Gate vs. Alternatives

- Compared to conventional slide gates, the Vortex® Rounded Blade Gate™ actuates with much quicker speed and greater closing force. Generally speaking, the Rounded Blade Gate can actuate 2x faster than a conventional, pneumatically actuated slide gate. The purpose is to provide a quicker material shut-off.
- When filling to specific batchweights, actuation limitations can impose on accuracy. The Rounded Blade Gate is compatible with Vortex's many material flow control assemblies, to accommodate blade actuation into several intermediate positions. This allows total flow control for proper metering, which lends accuracy and repeatability to a manufacturing process.
- Other curved blade gates have sealed bodies, which limits interior access. In order to perform inspection and/or maintenance, the gate must be removed from the process line so that its internal mechanisms can be accessed. This can lead to expensive and extensive production downtime. To allow in-line inspection and/or maintenance, the Rounded Blade Gate is designed with a removable access panel that can be removed using simple tools. This feature is especially beneficial in abrasive applications where frequent interior access is required for wear part maintenance. The removable access panel feature significantly reduces downtime by accelerating the maintenance process.
- Many conventional slide gates allow leakage of materials and dusts to atmosphere. The Rounded Blade Gate is dust-tight to atmosphere, meaning it is a self-contained unit specifically designed to contain materials and dusts within the system. Therefore, the Rounded Blade Gate supports workplace safety initiatives, reduces product loss, and addresses atmospheric dust emissions and other potential environmental hazards.

For more information & technical resources, please visit: **www.vortexglobal.com**

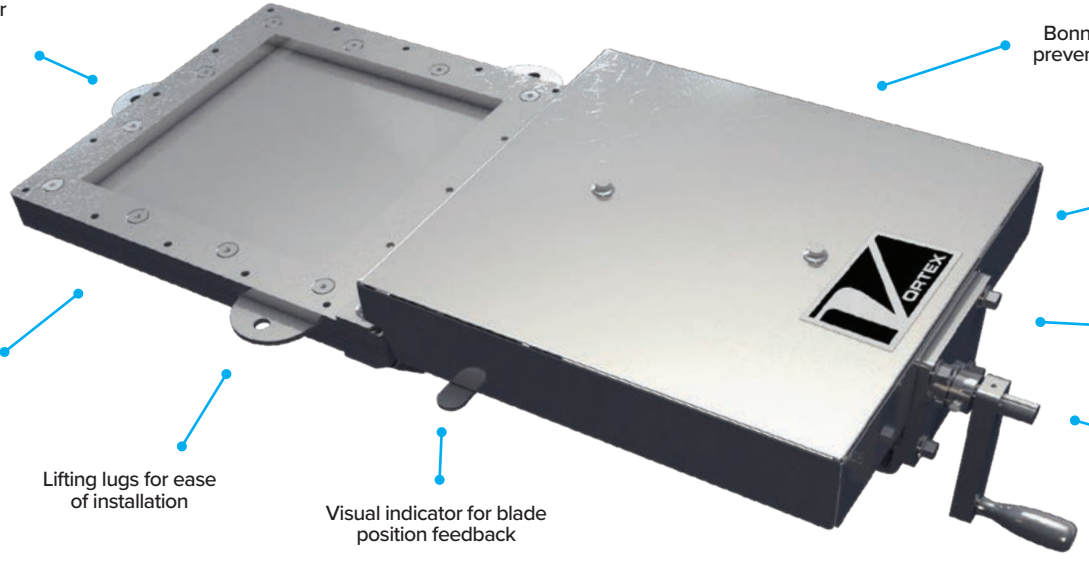
Model No. GRXX

TITAN MAINTENANCE GATE

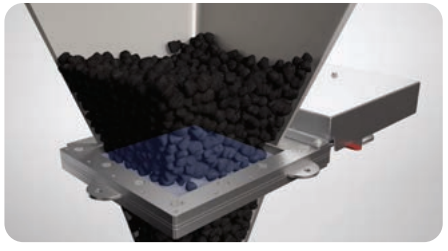
Ideal application: Shut off material flow when maintenance of downstream equipment is required or if an upset condition occurs.

Square

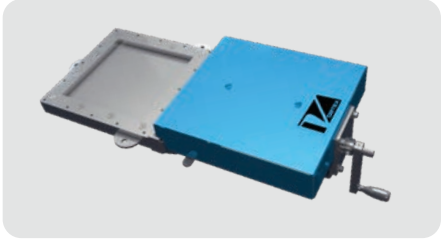
Round



KEY FEATURES



Designed to close through a standing column of material in the case of an upset condition



Bonnet cover for operator safety and to protect the gate from its environment

Narrow profile for limited space installations

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only. In the open position, will seal to atmosphere against slight differential pressure.
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials
Standard Sizes	6 – 20 in | 150 – 510mm Contact us for custom sizes
Opening	Available in square, round or rectangular sizes. Transition options are available (see page 67)
Overall Height	less than 2 in | 50 mm
Weight	95 – 440 lb | 45 – 200 kg
Flange Options	Standard flange, ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	250° F | 120° C for standard gate, with modifications that allow up to 400° F | 205° C
Body/Frame Construction	Carbon steel
Material Contact Construction	304 stainless steel, carbon steel
Bonnet Seal Construction	PTFE-treated packing
Clevis Construction	ACME threaded rod, 5:1 or 11.5:1 ratio, depending on gate size
Drive/Actuation	Double-acting air cylinder, hand wheel/crank, chain wheel (see pages 61 & 62)
Position Confirmation	Proximity switches (see page 63)
Compliance	Machinery Directive 2006/42/EC

THE POWER OF COMPARISON

Vortex Titan Maintenance Gate vs. Alternatives

The design and construction of the Vortex® Titan Maintenance Gate™ offers significant advantages over traditional maintenance gates.

- The Titan Maintenance Gate can be built with either a square or round opening. This allows the Titan Maintenance Gate to be adapted to almost any convey line shape or size.
- With less than 2 inches | 50 millimeters of overall flange-to-flange height, the Titan Maintenance Gate is narrow profile for easier installation when available space is limited.
- The Titan Maintenance Gate's carbon steel body and frame make it durable and resistant to abrasion, wear and corrosion – both from the material(s) handled and from the environment.
- Many alternative maintenance gates rely on soft rubber seals which are directly exposed to the material flow stream. These seals rapidly erode or tear away in service. This deficiency promotes leakage of materials and dusts past the gate and to atmosphere, in addition to actuation issues and several other maintenance concerns. The Titan Maintenance Gate addresses these issues by incorporating a bonnet seal cartridge, which houses a PTFE-treated packing gland. PTFE-treated packing gland provides greater wear resistance and longer service life than alternative sealing materials. Within the bonnet seal cartridge, the packing gland expands to create a dust-tight seal around the vertical perimeter of the blade. The bonnet seal cartridge shields the packing gland from the material flow stream, to protect it from abrasion. This design maintains the gate's positive seal with infrequent maintenance intervention. Once the packing gland has experienced significant frictional wear, it can be removed and replaced to restore the gate's dust-tight seal. This maintenance process can be performed while the gate remains in-line.
- Many alternative maintenance gates use less durable sealing materials which are ill-equipped for handling abrasive and/or higher-temperature materials. For greater temperature- and abrasion-resistance, the Titan Maintenance Gate is designed without polymer seals.

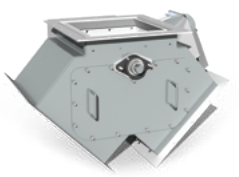
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. BDXX

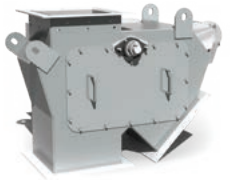
AGGREGATE DIVERTER

Ideal application: Used to divert heavy-duty and/or abrasive dry bulk solid materials from one source toward two destinations in gravity-fed applications. The Vortex® Aggregate Diverter™ often replaces conventional "bucket" diverters used in such environments.

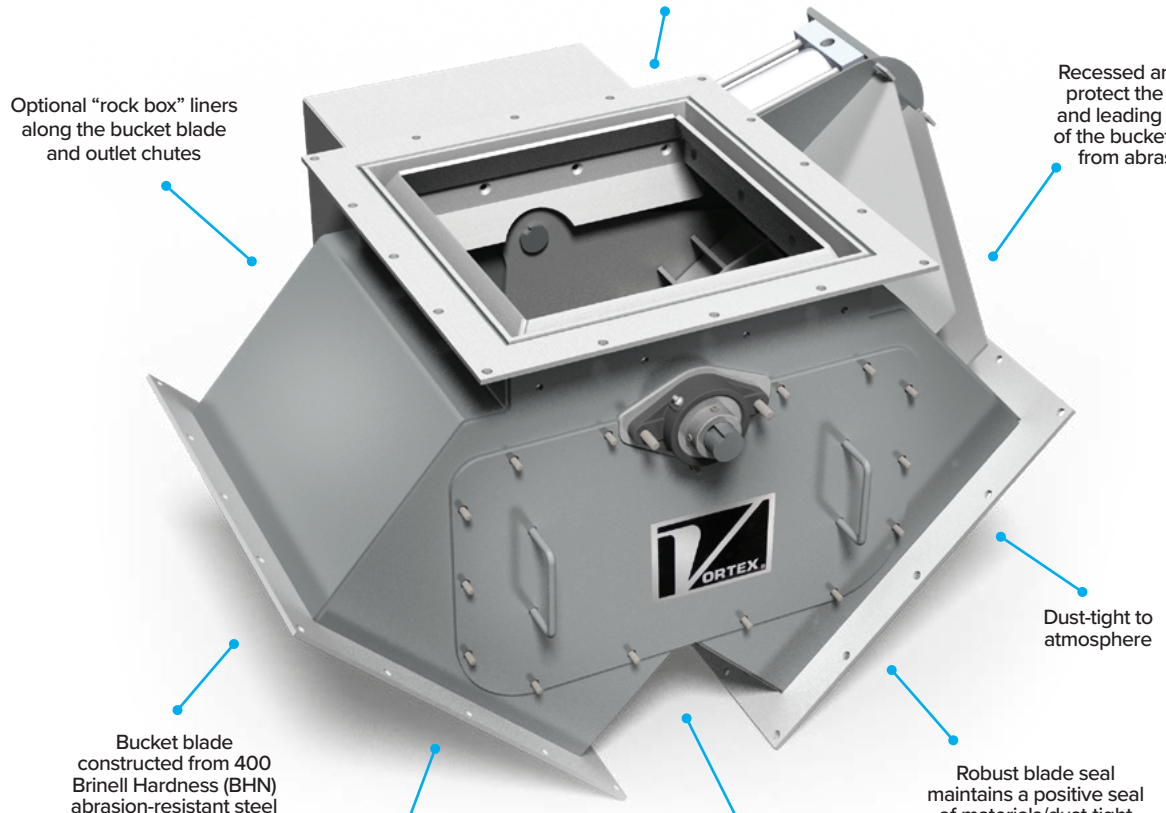
Purpose: In-line maintenance features and durable materials of construction to reduce downtime and prolong service life.



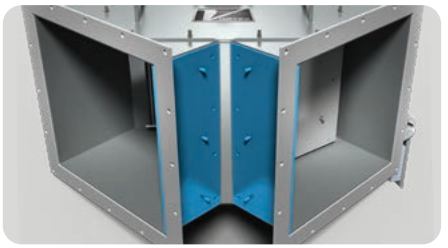
A- Style



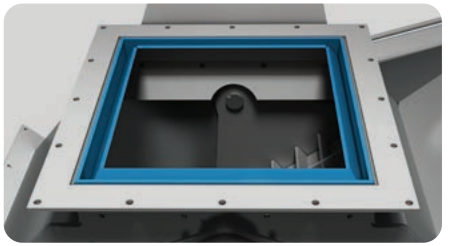
Straight Leg



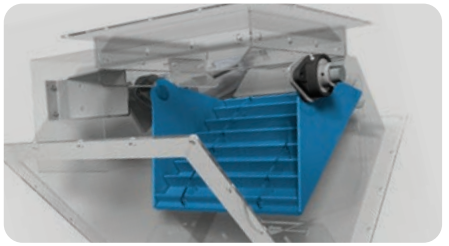
KEY FEATURES



Optional chute liners to protect against wear and abrasion



Optional dead pocket inlet allows materials to abrade upon themselves as they pass through the inlet



Optional "rock box" liners allow materials to collect and abrade upon themselves, rather than continuously abrading upon the diverter's material contact areas

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials
Standard Sizes	6 – 24 in | 152 – 610 mm Contact us for custom sizes
Inlet & Outlets	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	15x24 in — 50x73 in | 380x610 mm — 1,270x1,855 mm
Weight	70 – 1,275 lb | 30 –580 kg
Outlet Angle Options	30° or 45° from center Contact us for custom angles
Flange Options	Standard flange, ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	250°F | 120°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Construction	Painted carbon steel
Material Contact Options	400 BHN abrasion-resistant steel, carbon steel
Liner Options	400 BHN abrasion-resistant steel, UHMW, rubber, “rock box”
Bucket Seal Options	Chute rubber, silicone rubber, Kryptane® abrasion-resistant polyurethane
Drive/Actuation	Double-acting air cylinder, hand lever, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches (see page 63)
Other Options	Spin knobs (see page 68)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex Aggregate Diverter vs. Alternatives

- Many alternative bucket diverters are constructed from less durable metal materials of construction. When handling heavy-duty and/or abrasive dry bulk solid materials, rapid wear and abrasion will result in frequent maintenance and diverter replacement. To address this concern, the body of the Vortex® Aggregate Diverter™ is constructed from carbon steel. Its bucket blade is constructed from 400 Brinell Hardness Number (BHN) abrasion-resistant steel.

- Many alternative bucket diverters have thin elastomer seals adhered to the perimeter of the blade. Over time, the thin seals erode or tear away from the blade and allow material leakage into the opposite chute. The Aggregate Diverter addresses this concern by incorporating a bucket seal constructed from a full sheet of durable rubber. Rather than adhering thin seal strips around the perimeter of the bucket, the robust seal sheet is bolted beneath the bucket and secured by a bolt-in metal plate. This design ensures the bucket seal will not tear away in service, and will provide a positive seal of materials/dust-tight seal over time.

- Many alternative bucket diverters are designed so that the leading edges of the bucket are constantly exposed to the material flow stream, creating wear and abrasion to the blade and bucket seal. If wear is significant, it can allow material leakage into the opposite chute, in addition to frequent wear part maintenance. To address these concerns, the Aggregate Diverter is designed with recessed areas so that the leading edges of the bucket are shielded from the material flow stream.

- Many alternative bucket diverters are designed with irreplaceable wetted parts. Once a primary wetted part is worn significantly, the entire diverter must be replaced. To resolve this cost-effectiveness issue, the Aggregate Diverter is designed with replaceable wetted parts that can be accessed in-line. This includes actuator, bucket, and bucket seal, among others. If maintained and operated as recommended, these should be the diverter's only wear parts. In several cases, this has allowed an Aggregate Diverter to remain in service for many years – and sometimes, even decades.

- Many alternative bucket diverters have sealed bodies, which limits interior access. In order to perform inspection and/or maintenance, the diverter must be removed from the process line so that its internal mechanisms can be accessed. This can lead to expensive and extensive production downtime. To allow in-line inspection and/or maintenance, the Aggregate Diverter is designed with a removable access panel that can be removed using simple tools. This feature is especially beneficial in abrasive applications where frequent interior access is required for wear part maintenance. The removable access panel feature significantly reduces downtime by accelerating the maintenance process.

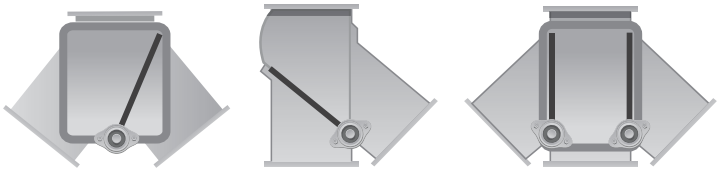
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. ZXX

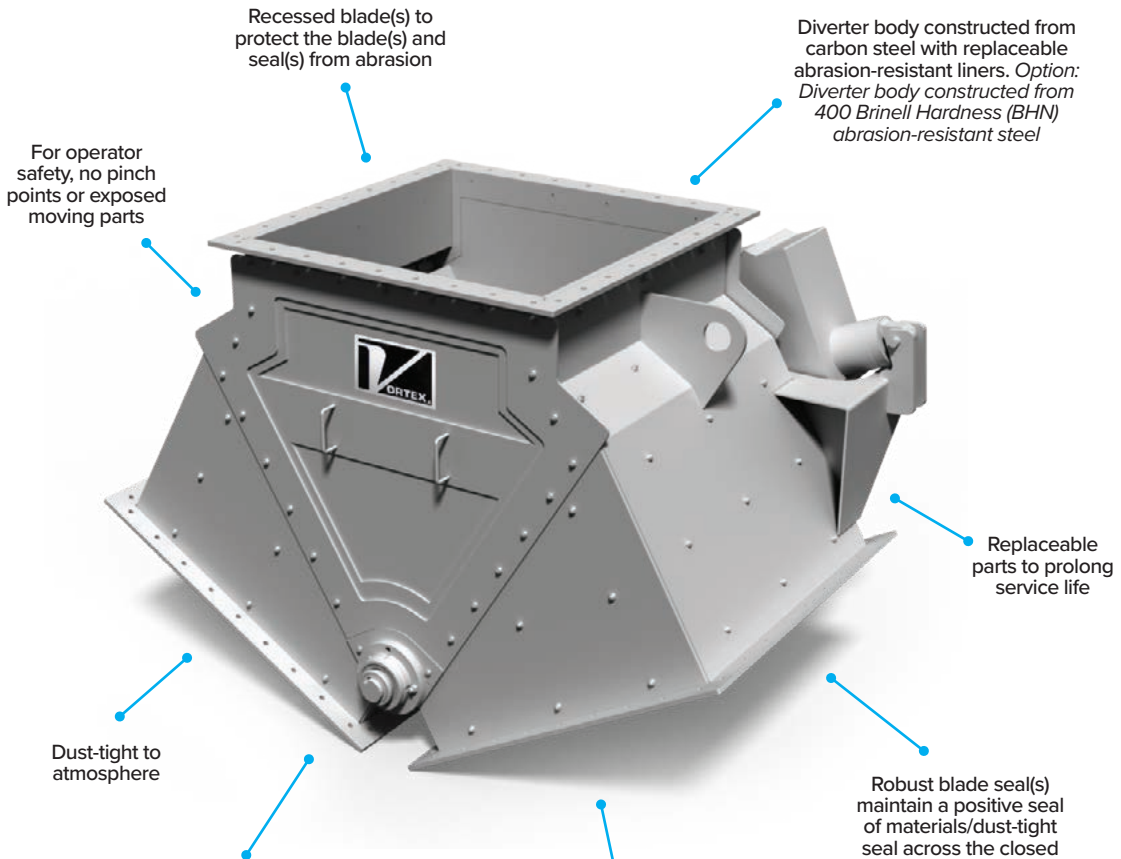
TITAN LINED DIVERTER

Ideal application: Used to divert heavy-duty and/or abrasive dry bulk solid materials from one source toward two or three destinations in gravity-fed applications.

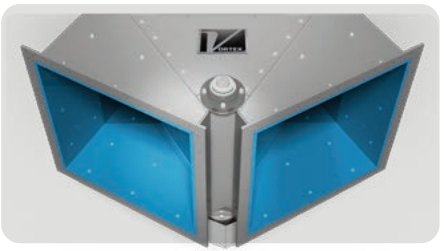
Purpose: The Vortex® Titan Lined Diverter™ offers in-line maintenance features, durable materials of construction, reduced downtime, prolonged service life and many other significant advantages over alternative flap diverters.



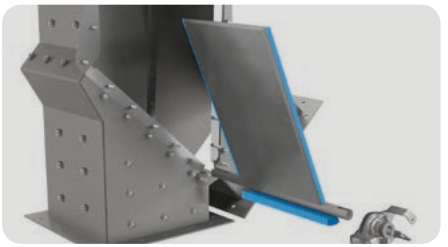
Two-Way | Straight Leg | Three-Way



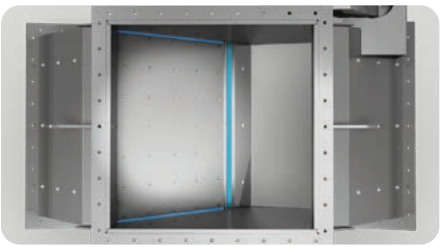
KEY FEATURES



Replaceable abrasion-resistant liners protect against wear and abrasion to prolong service life



Removable access panel for in-line inspection and maintenance



Robust blade seal(s) maintain a positive seal of materials/dust-tight seal across the closed chute(s), to prevent material leakage into the opposite chute(s)

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials
Standard Sizes	16 – 36 in | 400 – 900mm Contact us for custom sizes
Inlet & Outlets	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	25 – 75 in | 650 – 1,905 mm
Weight	140 – 1,265 lb | 65 – 575 kg
Outlet Angle Options	30° or 45° from center Contact us for custom angles
Flange Options	Standard flange, ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	250°F | 120°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Construction	400 BHN abrasion-resistant steel
Material Contact Options	400 BHN abrasion-resistant steel, carbon steel
Liner Options	400 BHN abrasion-resistant steel, UHMW, rubber
Blade Seal Options	Buna-N nitrile rubber, silicone rubber, polyurethane, EPDM rubber
Shaft Seal Options	PET, 25% glass-filled PTFE
Load Seal Construction	Silicone rubber
Drive/Actuation	Double-acting air cylinder, hand lever, chain wheel, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed, proximity or mechanical limit switches (see page 63)
Other Options	Spin knobs (see page 68)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

THE POWER OF COMPARISON

Vortex® Titan Lined Diverter vs. Alternatives

- Many alternative flap diverters have sealed bodies, which limits interior access. In order to perform inspection and/or maintenance, the diverter must be removed from the process line so that its internal mechanisms can be accessed. This can lead to expensive and extensive production downtime. To allow in-line inspection and/or maintenance, the Vortex® Titan Lined Diverter™ is designed with a removable access panel that can be removed using simple tools. This feature is especially beneficial in abrasive applications where frequent interior access is required for wear part maintenance. The removable access panel feature significantly reduces downtime by accelerating the maintenance process.

- Many alternative flap diverters are constructed from less durable metal materials of construction. When handling heavy-duty and/or abrasive dry bulk solid materials, rapid wear and abrasion will result in frequent maintenance and diverter replacement. To address this concern, the body of the Titan Lined Diverter is constructed from carbon steel with replaceable abrasion-resistant liners, or (optional) body constructed from 400 Brinell Hardness Number (BHN) abrasion-resistant steel. For added protection, the Titan Lined Diverter can feature (optional) replaceable abrasion-resistant liners. By incorporating abrasion-resistant liners, it ensures materials are abrading upon replaceable parts, rather than wearing the underlying material contact areas. The addition of abrasion-resistant liners significantly prolongs a diverter's service life.

- Many alternative flap diverters are designed so that the leading edge of the blade(s) is constantly exposed to the material flow stream, creating wear and abrasion to the blade(s) and seal(s). If wear is significant, it can allow material leakage into the opposite chute(s), in addition to frequent wear part maintenance. To address these concerns, the Titan Lined Diverter is designed with recessed areas so that the leading edge of the blade(s) is shielded from the material flow stream.

- Many alternative flap diverters are designed with irreplaceable wetted parts. Once a primary wetted part is worn significantly, the entire diverter must be replaced. To resolve this cost-effectiveness issue, the Titan Lined Diverter is designed with replaceable wetted parts that can be accessed in-line. This includes actuator(s), flapper blade(s) and blade seal(s), the blade shaft seal(s), and the (optional) abrasion-resistant liners, among others. If maintained and operated as recommended, these should be the diverter's only wear parts. In several cases, this has allowed a Titan Lined Diverter to remain in service for many years – and sometimes, even decades.

- Many alternative flap diverters do not have seals beneath the blade shaft(s). This creates a significant opening for material migration into the opposite chute(s). Especially in perishable applications, this can foster cross-contamination and spoilage beneath the blade shaft(s). Also, without blade shaft seals, the blade shaft(s) is subjected to material-assisted abrasion, resulting in frequent wear part maintenance. The Titan Lined Diverter addresses these issues by incorporating "live loaded" hard polymer blade shaft seal(s). Hard polymer provides greater wear resistance and longer service life than alternative sealing materials. The hard polymer seal(s) is "live loaded" with compressed rubber backing to ensure even as the polymer experiences frictional wear from many actuations over time, the rubber load seals continuously force the polymer seal(s) upward against the blade shaft(s). The seal(s) is also shielded from the material flow stream, to protect it from abrasion. This design maintains the diverter's positive seal of materials/dust-tight seal with infrequent maintenance intervention.

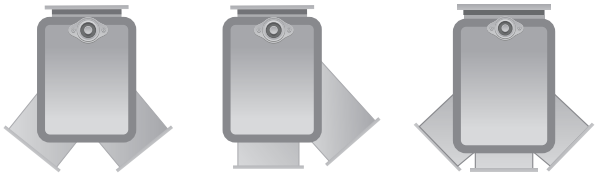
For more information & technical resources, please visit: **www.vortexglobal.com**

Model No. PCXX

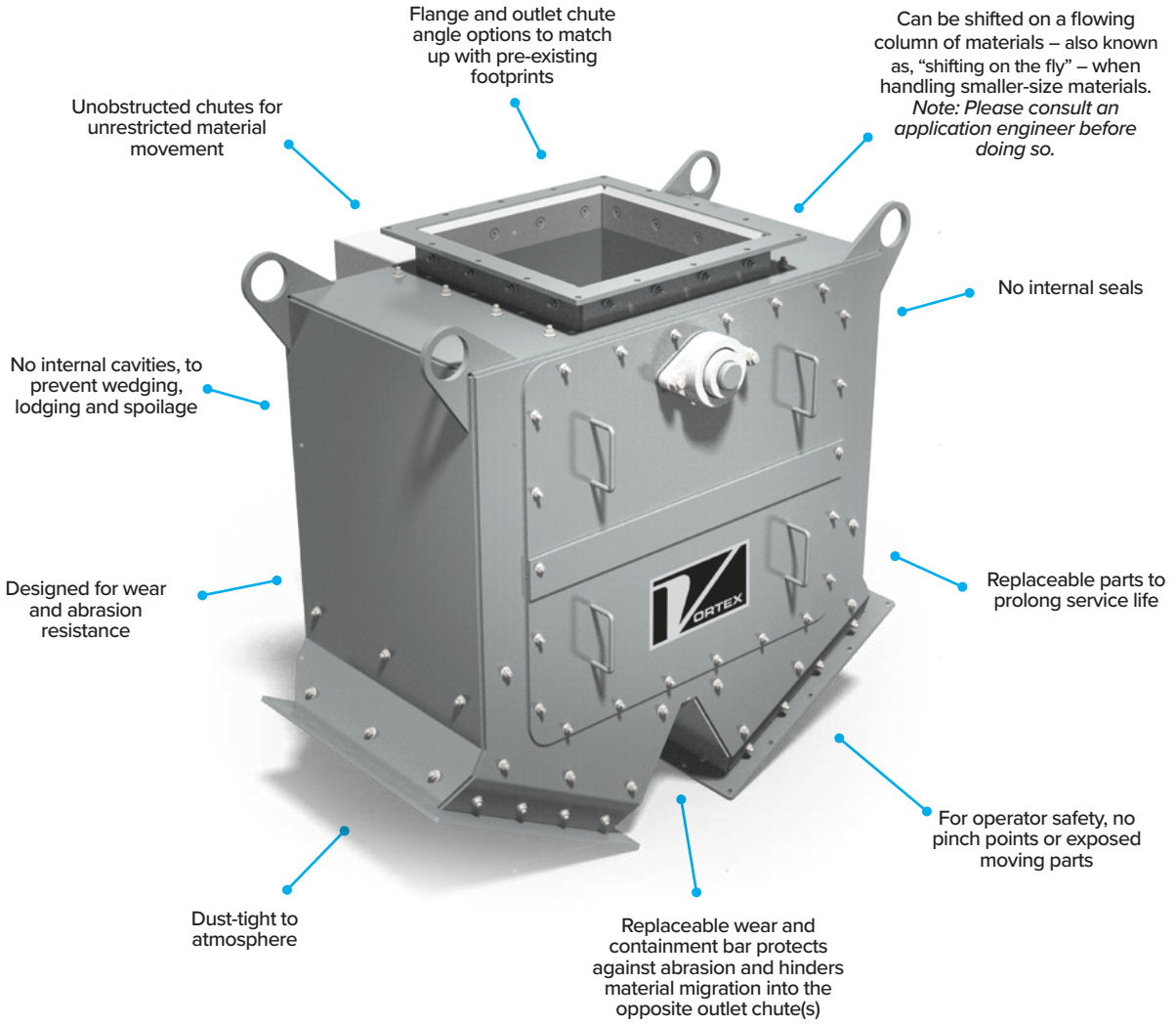
PIVOTING CHUTE DIVERTER

Ideal application: Used to divert heavy-duty and/or abrasive dry bulk solid materials from one source toward two or three destinations in gravity-fed applications.

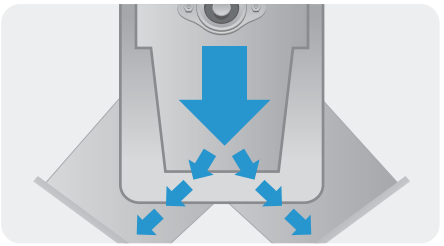
Purpose: The Vortex® Pivoting Chute Diverter™ offers in-line maintenance features, durable materials of construction, reduced downtime, prolonged service life and many other significant advantages over flap diverters and bucket diverters.



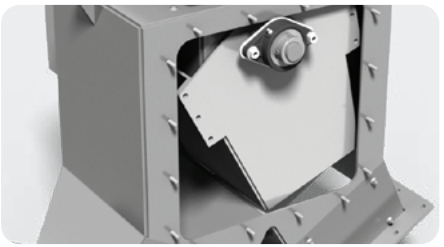
Two-Way | Straight Leg | Three-Way



KEY FEATURES



Can be used to split flow



Removable access panel for in-line inspection and maintenance

Inlet chute to better direct material flow through the pivoting chute

TECHNICAL SPECIFICATIONS

Conveyance Type	Gravity flow only
Materials Handled	Heavy-duty and/or abrasive dry bulk solid materials
Standard Sizes	6 – 24 in | 150 – 600 mm Contact us for custom sizes
Inlet & Outlets	Available in square or rectangular sizes. Round transition options are available (see page 67)
Overall Height	29 1/2 – 80 in | 750 – 2,030 mm
Weight	425 – 3,600 lb | 195 – 1,635 kg
Outlet Angle Options	30° or 45° from center Contact us for custom angles
Flange Options	Standard flange, ANSI #125/150, DIN PN10 Custom flanges are available
Material Temperatures	Up to 400°F | 205°C
Body/Frame Construction	Carbon steel
Chute Options	400 BHN abrasion-resistant steel, chromium carbide
Material Contact Options	400 BHN abrasion-resistant steel, chromium carbide
Liner Options	400 BHN abrasion-resistant steel, chromium carbide
Drive/Actuation	Double-acting air cylinder, electric actuator (see pages 61 & 62)
Position Confirmation	Magnetic reed or proximity switches (see page 63)
Other Options	Spin knobs (see page 68)
Compliance	ATEX Zone 20 (internal), ATEX Zone 21 (external), FDA

KEY FEATURE: Wear & Containment Bar

- The wear and containment bar is exclusive to the Vortex® Pivoting Chute Diverter™. Because the Pivoting Chute Diverter does not have any internal seals, material migration and dusting into the opposite chute(s) is possible. To reduce this risk, the Pivoting Chute Diverter is designed with a replaceable wear and containment bar at the interior juncture between the diverter's outlet chutes. This aids in directing errant materials through the desired outlet, rather than migrating into the opposite chute(s). Its chromium carbide construction also protects against wear and abrasion from the material handled.

THE POWER OF COMPARISON

Vortex Pivoting Chute Diverter vs. Alternatives

- Many alternative gravity-fed diverters have sealed bodies, which limits interior access. In order to perform inspection and/or maintenance, the diverter must be removed from the process line so that its internal mechanisms can be accessed. This can lead to expensive and extensive production downtime. To allow in-line inspection and/or maintenance, the Vortex® Pivoting Chute Diverter™ is designed with a removable access panel that can be removed using simple tools. This feature is especially beneficial in abrasive applications where frequent interior access is required for wear part maintenance. The removable access panel feature significantly reduces downtime by accelerating the maintenance process.

- Many alternative gravity-fed diverters are constructed from less durable metal materials of construction. When handling heavy-duty and/or abrasive dry bulk solid materials, rapid wear and abrasion will result in frequent maintenance and diverter replacement. To address this concern, the body of the Pivoting Chute Diverter is constructed from carbon steel. For added protection, the Pivoting Chute Diverter features replaceable abrasion-resistant wetted parts. By using abrasion-resistant wetted parts, it ensures materials are abrading upon replaceable parts, rather than wearing the underlying material contact areas. The addition of abrasion-resistant wetted parts significantly prolongs a diverter's service life.

- Many alternative gravity-fed diverters are designed with irreplaceable wetted parts. Once a primary wetted part is worn significantly, the entire diverter must be replaced. To resolve this cost-effectiveness issue, the Pivoting Chute Diverter is designed with replaceable wetted parts that can be accessed in-line. This includes actuator, pivoting chute, inlet chute, wear and containment bar, and the abrasion-resistant liners, among others. If maintained and operated as recommended, these should be the diverter's only wear parts. In several cases, this has allowed a Pivoting Chute Diverter to remain in service for many years – and sometimes, even decades.

- Flap diverters should not be shifted through a flowing column of material. Doing so can damage the blade and blade shaft. Instead, it is recommended to shut off material flow before shifting the flapper blade. To do so often requires an additional isolation gate above the diverter valve. Oppositely, the Pivoting Chute Diverter is designed to "pivot" so that it can direct materials toward many destinations without significantly altering the flow path. When handling smaller-size materials, this allows the Pivoting Chute Diverter to be shifted through a flowing column of material. When handling larger-size materials, an isolation gate would still be necessary – or the diverter must be between runs – before shifting the Pivoting Chute Diverter's "pivoting" chute. Contact us to discuss further recommendations.

- Because the flapper blade and seals would be directly exposed to wear and abrasion from the material flow stream, flap diverters should not be used to split flow. The Pivoting Chute Diverter is compatible with Vortex's many material flow control assemblies, to accommodate blade actuation into several intermediate positions. This allows total flow control toward a single destination, or split flow toward two destinations.

- For larger valve sizes, the Pivoting Chute Diverter can be modified to accommodate optional chute removal assist rods. These allow the heavy chutes to be slid out of the valve for easier handling during inspection, maintenance or replacement. If this option is selected, the chute removal assist rods will come factory supplied.

For more information and technical resources please visit: **www.vortexglobal.com**

CASE STUDY

Gates Used in Cement Production

End Product: Cement/mortar ready mix

Valves:
• 6 Aggregate Gates
• 5 Titan Slide Gates

Special Features:
• Material contact areas constructed from 400 BHN AR steel, to address the abrasiveness of cement materials.
• Gate body constructed from carbon steel.

Application:
All gates are installed below surge hoppers.
• The Aggregate Gates are used to feed sand into a mixer.
• The Titan Slide Gates are used to feed mortar mix onto a scale. Once weighed, the mixes are packaged in 5-gallon bulk bags and buckets.

Results: The Aggregate Gates were installed in 2006. The Titan Slide Gates were installed in 2015. Since then, the gates have required no maintenance.

CASE STUDY

Titan Series Handling Industrial Sand

Applications:
• Diverting from an initial duct line toward various production processes.
• Diverting into screeners. Sand is sized and transferred into holding bins.
• Process gates below each holding bin, for truck loadout.
• Maintenance gates throughout the process, for upset condition or if downstream maintenance is required.

Valves:
• 17 Pivoting Chute Diverters
• 9 Titan Lined Diverters
• 5 Titan Slide Gates
• 14 Titan Maintenance Gates

Special Features:
• Material contact areas constructed from 400 BHN AR steel, to address the abrasiveness of sand.
• Titan Slide Gates modified for fine material handling
• Diverters feature round inlet/outlet transitions with ANSI patterns.

CASE STUDY

Titan Lined Diverter Handling Raw Grains

End Product: Animal feed

Special Features:
• Three-way diverting
• Material contact areas constructed from 400 BHN AR steel, to address the abrasiveness of raw grains.
• Replaceable abrasion-resistant liners.

Application: Divert raw grains toward a pelletizing process.

CASE STUDY

Titan Slide Gate Handling Roofing Granules

Special Features:
• Diamond-shaped inlet (pictured upper right)
• Blanchard-ground V-notch blade (pictured lower right)
• Infinite variable positioner (IVP) for +/- 2% positioning accuracy on the opening and closing strokes.
• Electric actuator for improved variable positioning accuracy.
• Blade & inlet constructed from chromium carbide.

Application: Accurate metering of roofing granules helps achieve uniform coloring in asphalt shingles. Roofing granules block ultraviolet (UV) rays and protect the shingle from its environment.

TECHNICAL ARTICLE

Techniques for Preventing Wear & Abrasion

The Physics: Conveying Abrasive Materials
Whether it be a gravity flow or pneumatic conveying application, the physics of dry bulk material movement will significantly impact the degree of wear a system is subjected to. Process engineers must ask themselves: "What areas of the system are most susceptible to wear and abrasion?" This will guide system design, in order to protect those areas.

Generally speaking, a system's highest degree of wear will likely be in areas where material flow pattern and/or air pressure are subjected to dramatic change or disruption. This includes elbows in system ductwork, directional changes from diverting or converging, sudden halt in material flow, aspiration of displaced air, and many other variables in system design.

Depending on application parameters, several techniques can be utilized to protect the system from rapid wear and abrasion.

1. Materials of Construction
When handling abrasive dry materials, a valve's material contact areas should be constructed from robust metals. This includes carbon steel, various grades of AR steel, and chromium carbide, among others.
Several gauges of steel exist; so when selecting valve materials of construction, you must first assess the handled material's characteristics. This will help determine which Brinell Hardness Number (BHN) of steel is necessary to withstand abrasion from the material handled.

2. Diverter Angles
A material's flowability has much to do with its bulk density. These variables can also play into the severity of wear and abrasion.

In gravity flow applications, certain materials achieve optimal flow rates if they are processed through a diverter with steeper outlet leg angles. If a diverter has more subtle outlet leg angles (approximately 45° from vertical), material velocity will slow. This causes materials to "drag" along the bottom of the diverter as they flow through. Alternatively, steeper angles (approximately 30° from vertical) are typically used to flow heavier, denser materials. With steeper outlet angles, material is able to suspend and flow freely through the channel. This reduces the likelihood of material plugs. Additionally, when materials are suspended, materials make little contact with the diverter and thus, it is subjected to less wear and abrasion.

3. Abrasion-Resistant Liners
The material contact areas in flap diverters and bucket diverters, as well as the inlet in slide gates, can be protected with replaceable abrasion-resistant liners. Abrasion-resistant liners are often constructed from robust metals, such as carbon steel, various grades of AR steel, or chromium carbide, among others. In some applications, rubber and polymer liners are more effective materials for abrasion resistance. While the valve's material contact areas may be capable of handling the abrasion, abrasion-resistant liners ensure materials abrade upon replaceable parts, rather than the valve itself. This significantly extends the valve's service life. For return-on-investment purposes, abrasion-resistant liners are a great value because they are the difference between maintaining replaceable parts or replacing a whole valve.

Rock Box/Honeycomb Liners
Specific to bucket diverters, a honeycomb ("rock box") design allows materials to accumulate in specially designed areas along the blade and outlet legs — so that material impacts upon itself as it flows, rather than continuously abrading upon the diverter's mechanical parts. This decreases wear and prolongs a diverter's useful life.

4. Replaceable Parts
Vortex slide gates and diverter valves all feature replaceable parts to significantly prolong service life. In Vortex gravity diverters, a removable access panel allows inspection and maintenance to be performed while the diverter remains in-line.

5. Straight Leg Diverting
In A-style diverters, rapid wear and abrasion is a concern because as materials flow through the inlet, they often make direct impact where the outlet legs meet.In flap-style diverters, this form of abrasion can cause significant damage to the blade shaft and to the outlet legs. For pneumatic conveying diverters, such as the Vortex Wye Line Diverter, this form of continuous abrasion will rapidly wear through the valve's inlet, leaving holes in the valve body. If left unaddressed, holes in the valve body will facilitate material leakage and – in pneumatic conveying applications – air loss.

To avoid continuous abrasion to the inlet, diverters can instead be constructed using a straight leg (K-style) design. The K-style diverting design is preferred because it allows a straight-through channel for material flow. This also makes it so that the outlet legs do not meet in the direct path of travel as materials flow through the inlet.

Generally, A-style diverters are used when similar material quantities are being diverted toward each destination. Oppositely, K-style diverters are generally used when the majority of materials are being routed toward a single destination.

Which Techniques are Best?
Selecting proper equipment is critical to the success of any manufacturing process. Misapplied components and deficient designs can cause unexpected maintenance costs and process inefficiencies that negatively impact a company's overall profitability and performance.

The characteristics of dry bulk materials are endless, so there is no all-encompassing solution for every application. Opinions on these concepts differ, so it is advised to consult with industry professionals to determine which valve designs are most suitable for use in your specific application.

With more than 300 years of combined experience in the dry bulk material handling industry, Vortex application engineers will develop the right solutions for even the most demanding applications.

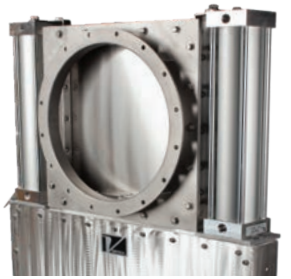
PNEUMATIC ACTUATION

Operates by forcing compressed air into a full-bore air cylinder. Inside the cylinder, a piston rod is housed. Air pressure from an external compressor is forced into the cylinder to create linear movement of the piston rod, either forward or backward. The piston rod is attached to a blade's clevis or shaft. This assembly works in tandem to actuate the valve's blade into a specified position.

Single Cylinder Actuators

Technical Specifications

- Double-acting air cylinder
- Designed with a magnetic piston to accommodate magnetic switches, for position indication.
- Oversized option for greater closing force.
- Double-stage option to accurately reach the middle position in three-way diverter valves.
- Cylinder construction options: Aluminum, epoxy-coated (for corrosive environments), 304 or 316L stainless steel
- High temperature modification: Cylinder constructed with fluoroelastomer seals
- Can be built to ATEX compliance



Dual Cylinder Actuators

For limited space installations and/or greater closing force. A dual cylinder design can reduce a valve's overall footprint by 30%.

Technical Specifications

- Compatible Vortex products: Roller Gate, Titan Slide Gate, Gravity Vee Diverter
- Size: Contact us for sizing options

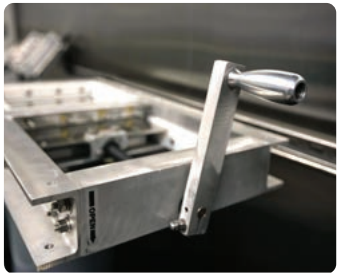
Benefits:

- Simple design for easy maintenance.
- Other actuators require a manual override or alternative power sources to prepare for electrical loss. A pneumatic actuator's solenoid valve can be programmed so that the gate/diverter will fail closed or remain idle in its current position.
- Metering options.
- Can be PLC-operated.

Disadvantages:

- Cannot be actuated in the case of air supply failure.
- Typically, additional accessories are needed in order to accurately hit intermediate positions. These add cost and complexity.
- Not practical for larger valves because of inefficient compressed air consumption.

MANUAL ACTUATION



Hand Crank – For standard manual actuation.

Hand Wheel – For quicker manual actuation.

Chain Wheel – To manually actuate out-of-reach valves.

Rack & Pinion
Allows rapid actuation of especially large sized valves.

ACME-threaded rod
5:1 or 11.5:1 ratio with a rising action to adequately close through a column of material.

Benefits:

- Does not require a power source. This also makes them more reliable.
- Inexpensive.
- Because they are human-operated, it is easier to identify actuation issues.

Disadvantages:

- Not automated; requires a human operator for each actuation.
- Slower actuation, compared to powered actuator types.
- Intended for low-actuation applications.

HYDRAULIC ACTUATION

Operates using hydraulic fluid, rather than compressed air. Inside the cylinder, a piston rod is housed. Hydraulic fluid from an external reservoir is forced into a full-bore cylinder to create linear movement of the piston rod, either forward or backward. The piston rod is attached to a blade's clevis or shaft. This assembly works in tandem to actuate the valve's blade into a specified position.

Benefits:

- Intended for high-force applications. A hydraulic actuator is capable of forces up to 25x greater than that of a double-acting air cylinder of equal size.
- Can hold constant force and torque without the pump supplying more hydraulic fluid or pressure.
- Can be PLC-operated.

Disadvantages:

- Will leak hydraulic fluid, which creates concern for cleanliness, environmental contamination and other safety issues.
- More systematic and complex, compared to other powered actuator types.

ELECTRIC ACTUATION

Operates using an electric motor. Inside the housing, a lead screw is attached to the motor. Once the motor is started, the lead screw will begin to rotate. Also attached to the lead screw is a lead nut, which is threaded to move oppositely to the lead screw. The lead nut is attached to a blade's clevis or shaft. Similar to a power drill, depending on the direction of actuation, the lead screw will spin one direction or the other. This creates linear movement and causes the valve's blade to actuate into a specified position.

Electric Actuators

Options:

- Explosion-proof electric linear actuator
- Potentiometer: Provides continuous variable feedback signal directly proportional to the actuator's stroke. This allows the actuator to be connected to control equipment, to provide positioning of the actuator stroke at any point – from full extension to full retraction.

Benefits:

- Can include encoders for total control of velocity, position, torque and applied force.
- In terms of noise, electric actuators are the quietest of the powered actuator types.
- No leakage of air or fluids, so environmental hazards are eliminated.
- Can be PLC-operated.
- Compressed air is not needed.
- More suitable for use in cold, outdoor climates. With pneumatic actuators, compressed air moisture can freeze in the air lines, causing actuation failure.

Disadvantages:

- In case of electrical loss, an electric actuator requires manual override or an alternative power source in order to fail closed.
- If left running continuously, the electric motor can overheat and wear on the reduction gear.
- The motors for electric actuators can be large, which creates installation difficulties.
- In terms of force, thrust and speed, the motor is non-adjustable. In order to improve or reduce actuator performance, the motor must be changed.

PROOF OF POSITION

Proximity Switches

Provide blade position indication.
Are installed on the body of the valve.

Benefits:

- More accurate reading, compared to other magnetic switch types.
- Because it is a magnetic reading, there is almost no switching noise.
- Versatile; can be used with any actuator type.

Disadvantages:

- Non-adjustable; grounded into the body of the valve.

Technical Specifications

- Function: SPST – NO, SPDT – NO/NC
- Sensing range: 18mm Barrel 5 mm, 5/8-18 Barrel 2.5 mm
- Compliance/approvals: NEMA 3 (IP54), NEMA 4x (IP56), NEMA 6P (IP67), UL Class I Div. 1 Group A, CSA Class I Div. 2 Group A, CE, ATEX
- Temperature rating: -40 – 220° F | -40 – 105° C
- Voltage ratings: 24-240 VAC/VDC (300 mAmps max.; 5 mAmps min.), 5-240 VAC/VDC (2 Amp max.)

Magnetic Reed Switches

Provide piston position indication.
Are installed on the tie rods of a pneumatic actuator.

Benefits:

- Adjustable to operator preferences.
- Illuminates for visual indication at-the-valve.
- Because it is a magnetic reading, there is almost no switching noise.

Disadvantages:

- Can provide inaccurate readings in the instance of actuation error.
- Requires a pneumatic actuator with a magnetic piston in order to operate.

Technical Specifications

- Function: SPST – normally open
- Compliance/approvals: NEMA 6 (IP67), CSA Class I Div. 2 Group A, CE
- Temperature rating: -5 – 175° F | -20 – 80° C
- Voltage ratings: 24-240 VAC (4 Amps max.), 5-240 VAC/VDC (1 Amp max.; 5 mAmps min.), 0-120 VAC/VDC (0.5 Amps max.)
- Explosion-proof options available

Mechanical Limit Switches

Provide piston position indication.
Are installed directly onto the actuator.

Benefits:

- More accurate reading because it is a mechanical process versus a magnetic reading.

Disadvantages:

- Mechanical reading, so switching can be noisy.
- Non-adjustable; grounded to the actuator.

Technical Specifications

- Function: SPDT – NO/NC, DPDT – 2NO/2NC
- Compliance/approvals: NEMA 4 (IP56), NEMA 6P (IP67), UL Class I Div. 1 Group B, CSA Class I Div. 2 Group A, CE, ATEX
- Temperature rating: -20 – 185° F | -30 – 85° C
- Voltage ratings: 0-600 VAC/VDC (10 Amps max.)
- Connection options: ½ NPT conduit

AIR CONTROL ACCESSORIES

Single-Coil Solenoid Valve

Commands equipment to fail-closed in the instance of electrical loss. Single-coil solenoid valves are often used on slide gates in order to close down the system. This forbids materials from moving any further in the manufacturing process until power is restored.

Disadvantages of an open system:

- Bad batches, caused by materials skipping over stages of the manufacturing process.
- Damaged product, as a result of materials traveling through the system at uncontrolled velocities.
- Damaged equipment, as a result of materials making forceful impact upon contact.
- Product loss from spillage at the end of a process.

Solenoid Valve – Technical Specifications

- Compliance/Approvals: NEMA 6 (IP67), ATEX
- Pressure rating: 29 – 145 psig | 2 – 10 barg (Note: 80 psig | 5.5 barg recommended to operate a slide gate or diverter valve)
- Temperature rating: 25 – 120° F | -5 – 50° C
- Voltage ratings: 24VDC, 24VAC, 110 VAC, 220 VAC 50/60 Hz
- Lubrication not required (*Medium range aniline oil is recommended, if used*)

Double-Coil Solenoid Valve

Commands equipment to remain idle in its current position in the instance of electrical loss. Double-coil solenoid valves are often used on diverter valves in order to prevent the blade from shifting. Otherwise, if the blade is shifted, materials can route toward incorrect destinations – which can result in bad batches and product loss.

Vented Ball Valve

For safety reasons, vented ball valves are essential to ensure a slide gate or diverter valve will not actuate out of command, which can result in serious injury.

Fail Safe Air Tank

Stores a compressed air reserve, so that a pneumatic actuator has sufficient air pressure available to fail-closed in the instance of plant air loss.

Quick-Dump Exhaust

Accelerates valve open/close times when using a pneumatic actuator. Spent air pressure is exhausted to atmosphere at the air cylinder, rather than traveling back to be exhausted at the solenoid valve.

Sealed Body Air Purge

Solid aluminum covers are gasketed with silicone rubber. A purge port is tapped into the upper cover. An air purge assembly introduces differential pressure to prevent fine materials from migrating past the seals and accumulating in the body of the valve. Otherwise, material packing and actuation issues may occur.

Technical Specifications

- Purge port size: ¼" NPT | G ¼
- Purge pressure: Must be greater than convey line pressure. Contact us to discuss further recommendations.
- Compatible Vortex products: Orifice Gate, Roller Gate, Clear Action Gate, HDP Gate, Wye Line Diverter, Gravity Vee Diverter, Flex Tube Diverter, Multi-Port Diverter, Fill Pass Diverter, Titan Slide Gate, Titan Pressure Valve (*see product pages for additional information*)

MATERIAL FLOW CONTROLS

Material flow control assemblies are used to:

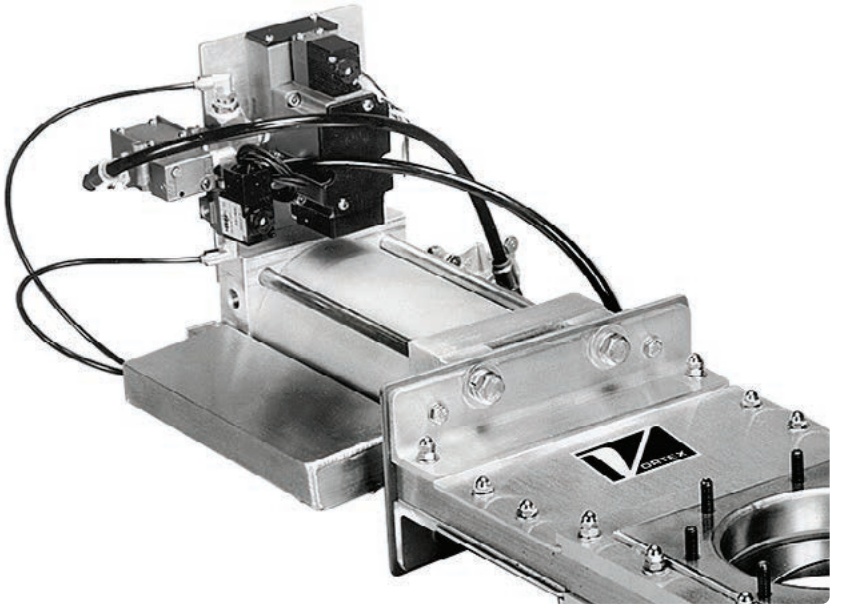
- Meter the volume and flow rate of materials.
- Improve accuracy with more precise batchweight calculations.
- Reduce fill times between workstations.
- Control flow when handling floodable materials which fill very quickly.

Common applications include:

- Batching
- Metering into screw conveyors, mixers or blenders
- Dribble flow
- Loss-in-weight feeders
- Scaling operations
- Maintaining flow rates
- Truck and/or railcar loadout

Compatible Vortex products:

- Orifice Gate
- Roller Gate
- Clear Action Gate
- Titan Slide Gate
- Rounded Blade Gate
- Gravity Vee Diverter



Variable Position Open (VPO) Assembly

The VPO allows a gate to (Step 1) begin in the closed position, (Step 2) actuate into a variable position on the opening stroke, then (Step 3) either return to a full closed position or continue to the full open position.

However, the VPO is not backwards compatible – meaning if the blade is in the full open position, it cannot be actuated into a variable position on the closing stroke. Instead, it must first be actuated back to the full closed position before it can be reopened into a variable position.

The VPO also allows traditional full open-to-full closed actuation, and vice versa.

Variable Position Close (VPC) Assembly

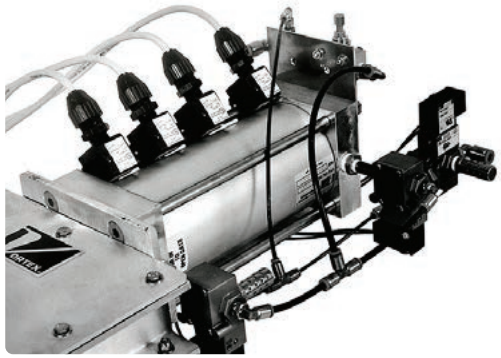
The VPC allows a gate to (Step 1) begin in the open position, (Step 2) actuate into a variable position on the closing stroke, then (Step 3) either return to a full open position or continue to the full closed position.

However, the VPC is not backwards compatible – meaning if the blade is in the full closed position, it cannot be actuated into a variable position on the opening stroke. Instead, it must first be actuated back to the full open position before it can be reclosed into a variable position.

The VPC also allows traditional full open-to-full closed actuation, and vice versa.

Technical Specifications

- Infinitely adjustable pneumatic trip switch allows the intermediate position to be manually adjusted to operator preferences.
- Standard assembly allows for one intermediate position, with modifications that allow up to three intermediate positions. *Contact us to discuss options*
- Accuracy/repeatability: +/- 1/16” from set point
  Note: In the case of multiple set points, controls do not allow for modulation between set points



Adjustable Variable Positioner (AVP)

The AVP is the most common and customizable of the Vortex material flow control assemblies. It is often regarded as the most universal and cost-effective option for material flow control.

Unlike the VPO and VPC, the AVP can be used to control flow on both the opening and closing strokes. The AVP also allows more accurate positioning than the VPO and VPC.

Also unlike the VPO and VPC, which are limited in number of intermediate positions, the AVP can accommodate many intermediate positions. For AVP assemblies, the number of intermediate positions is dictated by the number of magnetic reed switches which are mounted to the pneumatic actuator. Therefore, the number of AVP intermediate positions is only limited by magnetic reed switch size, available space along the pneumatic actuator's tie rods, and ensuring the sensing ranges of the magnetic reed switches do not overlap.

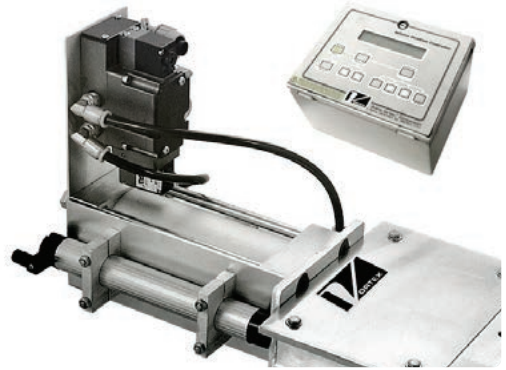
Required Accessories:

- Programmable Logic Controller (PLC)
- Pneumatic actuator with a magnetic piston
- A three-position, spring-centered four-way solenoid valve

Note: Though the AVP is controlled using a PLC, intermediate position adjustments must be made manually at-the-valve by adjusting the magnetic reed switches.

Technical Specifications

- Accuracy/repeatability: +/- 3/16" from set point



Infinite Variable Positioner (IVP)

Unlike other material flow control options, the IVP allows total control of variable positioning on both the opening and closing strokes. Using a linear output transducer, the IVP relays blade position feedback along the entire stroke of the blade. With this immediate feedback capability, the IVP allows a gate to be moved into any position at any time.

The gate is operated using a remote control, which can either be manually operated at-the-valve or synchronized with a PLC to automate operations. Unlike other material flow control assemblies, the IVP's variable positions are adjusted using technology, rather than making manual adjustments at-the-valve.

Required Accessories:

- Linear output transducer and IVP remote controller

Technical Specifications

- Accuracy/repeatability:
  - Automated: +/- 2% of the blade's total stroke
  - Manually controlled: +/- 4% of the blade's total stroke

ELECTRICAL ACCESSORIES

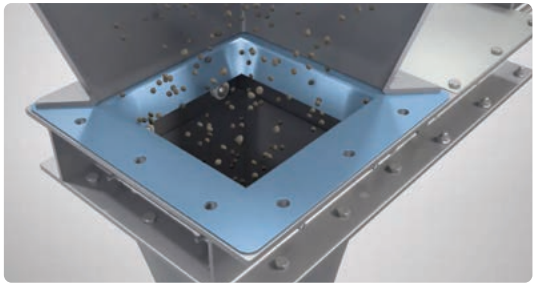
Pre-Wired Terminal Boxes

Rather than wiring limit switches and solenoid valves independently, the purpose of a terminal box is to pre-wire these accessories into a common unit. As a convenience to customers and to reduce electrical installation costs, terminal boxes provide quick installation and a direct connection to a Programmable Logic Controller (PLC).

KPAN

Synchronized with a slide gate or a diverter to allow push-button control at-the-valve. In particular, KPANs are used to operate valves which are not tied back to a programmable logic controller (PLC). Above the push-buttons on a KPAN, a valve illustration gives instruction on which push-button corresponds with each valve position. For position confirmation, proximity switches or magnetic reed switches must be installed to the valve.

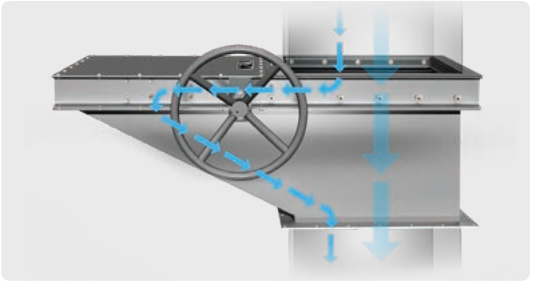
INLETS, OUTLETS & TRANSITIONS



Special Service Inlet

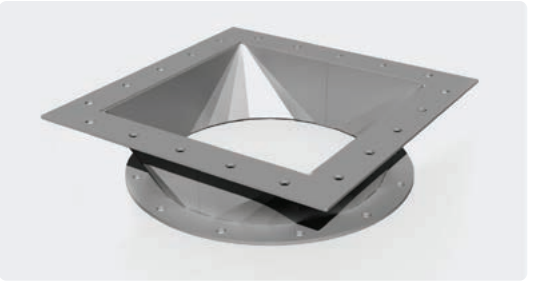
A Special Service Inlet acts as a funnel to direct material flow through the center of a gate's opening. It is designed to create a slight void between the blade, seals and the material flow stream. This creates a "dead pocket" that allows residual materials remaining at the leading edge of the blade to fall away into the process line below, prior to the blade entering its end seal. By reducing material packing upon gate closure, a Special Service Inlet provides a better seal of materials and dusts, extends seal service life, and reduces maintenance frequency and spare part requirements.

Note: Primarily used in gravity flow applications.



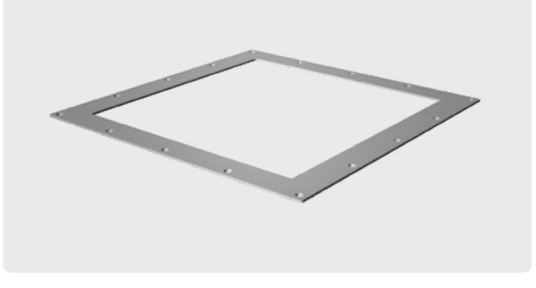
Return Pan

A Return Pan is intended for roller-supported slide gates in applications where sealing materials is challenging. Such situations may include material particle size (especially fine materials), large gate size, abrasive materials (necessitating frequent seal maintenance), and/or difficult installations (can limit a gate's ability to be accessed and maintained). The purpose of a Return Pan is to redirect migrant materials in the gate's bonnet area back into the flow stream.



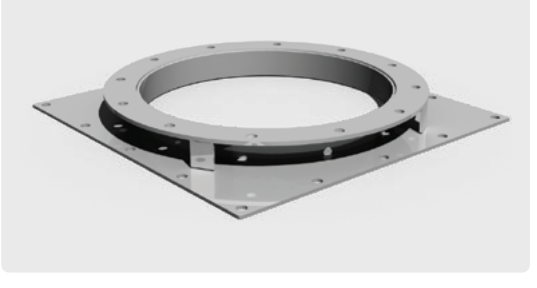
Square-to-Round Transitions

Allows a valve's square outlet flange to mate up to equipment containing a round flange.



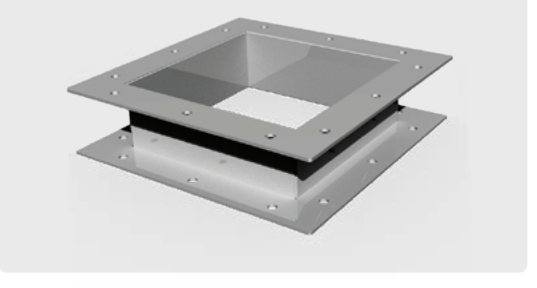
Flat (Companion) Flange

Utilized to match a standard Vortex gate flange or bolt hole pattern to mount to existing equipment.



Round-to-Square Transitions

Allows a valve's square inlet flange to mate up to equipment containing a round flange.



Spacers & Tube stubs

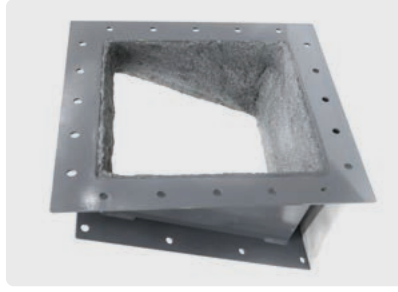
Utilized to address different flange hole mounting patterns, or to take up extra space created by previous equipment removal.

OTHER ACCESSORIES

Ceramic backing

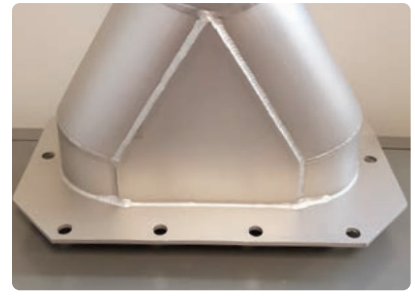
Ceramic backing is used on the inlet weldment of Vortex pneumatic diverters. Its purpose is to provide an additional layer of protection against continuous wear and abrasion, which is typical in dilute phase pneumatic conveying applications. Once materials have worn through the steel weldment, thick layers of ceramic remain to prevent material leakage and maintain conveying pressure. In essence, ceramic backing allows a pneumatic diverter to continue operations in the midst of wear and abrasion, rather than constantly replacing components in troublesome areas.

To avoid turbulence or friction against material flow – which could damage product or accelerate wear to the ceramic – the layers of ceramic are smoothed in the direction of material flow. On average, ceramic backing will enhance steel durability for a 30-40% longer service life.



Ceramic/epoxy coating

Ceramic/epoxy coating is used on the inlet weldment of Vortex pneumatic diverters. Similar to ceramic backing, the purpose of ceramic/epoxy coating is to provide an additional layer of protection against continuous wear and abrasion, which is typical in dilute phase pneumatic conveying applications. The primary difference is that ceramic/epoxy coating is intended to protect against fine particle abrasion only; it is less effective when handling larger particle sizes. Once materials have worn through the steel weldment, thick layers of ceramic/epoxy remain to prevent material leakage and maintain conveying pressure. In essence, ceramic/epoxy coating allows a pneumatic diverter to continue operations in the midst of wear and abrasion, rather than constantly replacing components in troublesome areas. On average, ceramic/epoxy coating will enhance steel durability for a 20-30% longer service life.



Reinforced inlet weldment

An alternative to abrasion-resistant coatings is to construct a pneumatic diverter with a reinforced inlet weldment. In essence, a reinforced inlet weldment is a standard inlet weldment with the addition of a thick, triangular piece of welded steel. Once materials have worn through the standard steel weldment, thick layers of welded steel remain to prevent material leakage and maintain conveying pressure. In essence, a reinforced inlet weldment allows a pneumatic diverter to continue operations in the midst of wear and abrasion, rather than constantly replacing components in troublesome areas.

On average, a reinforced inlet weldment will enhance steel durability for a 10-20% longer service life.

Spin Knobs

Several Vortex diverters feature a removable access panel. For quick and easy interior access without tools, the removable access panel can be secured with spin knobs.

Compatible Vortex products: Seal Tite Diverter, Flex Tube Diverter, Aggregate Diverter, Titan Lined Diverter, Pivoting Chute Diverter

Food-Friendly Modifications

For especially sanitary applications, Vortex offers many additional food-friendly modifications. Such modifications include electropolishing, specialty roughness average (RA) finishes and continuous welds to reduce surface imperfections; quick-lock access doors to meet the highest safety standards; and additional removable access panels for enhanced interior access. Contact us to discuss further details.

NEMA & IP Ratings

Contact us to discuss ratings and area classifications.

Technical Specifications

- Conveyance type: Dilute phase pneumatic conveying applications
- Compatible Vortex products: Wye Line Diverter, Fill Pass Diverter, Multi-Port Diverter

Loading SOLUTIONS

DUSTLESS LOADING SPOUTS AND EQUIPMENT

As knowledge surrounding the hazards of dust becomes increasingly available, innovations are necessary to address these health, safety and environmental concerns. In response, Vortex Loading Solutions are specifically designed to manage displaced air and dusts at the source. From retractable loading spouts to countless accessories, Vortex offers a complete line of versatile components specifically designed to improve loadout efficiencies, accelerate the loading process, prevent material waste, ensure plant and environmental safety, and promote automation in the dry bulk loading process. When used in tandem with one another, Vortex Loading Solutions create an integrated loading system which effectively controls discharged materials and fugitive dusts throughout the loading process. Featuring in-line maintenance capabilities and high-quality materials of construction, Vortex Loading Solutions provide long-term reliability and reduced maintenance costs. Thousands of Vortex Loading Solutions have been supplied worldwide – and today, can be found on six of the seven continents.

LOADING TYPES:

TRUCK & RAIL

When loading dry bulk solid materials into trucks and railcars, loadout speed is the primary concern. For optimal performance, the Vortex Loading Spout can be used in tandem with accessories specifically designed to accelerate the loading process.

KEY FEATURES

- Stacking, cone-in-cone spout design.
- Open or enclosed loading capabilities.
- Outer sleeve to contain fugitive dusts.
- For enclosed loading applications, the spout's outlet scavenger "seats" into the hatch to address dusting to atmosphere. For loading slotted railcars or vehicles with non-standard hatches, optional hatch adaptors can be easily removed and interchanged.
- For open loading applications, a Dust Control Skirt encompasses the peak of the material pile to address dusting to atmosphere.
- Vortex In-Line Filtration System at the material feed inlet to collect fugitive dusts by means of air withdrawal. Fugitive dusts are captured in pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load.
- Single- and Dual-Axis Positioners to laterally move the spout. Positioners save time by allowing trucks and railcars to make approximated pulls into the loading station, rather than pulling in and out of the loading station several times before properly positioning itself beneath the spout. Instead, the spout's position is quickly adjusted.
- In open loading applications, a Material Level-Sensing Device complements an Auto-Raise System to automate the retraction process. Throughout the loading process, the spout maintains its proximity between the point of discharge (i.e. the outlet scavenger) and the material pile – even as the pile grows. Because of the outlet scavenger's close proximity to the material pile, dust control is enhanced. The automated retraction process also keeps the outlet scavenger from becoming buried in the material pile, which in turn prevents material build-up in the spout. In enclosed loading applications, a Material Level-Sensing Device is synchronized with a process gate or belt conveyor above to automatically halt flow once the specified load is achieved. This automates the loading process to avoid vessel overfilling and eliminate the need for visual monitoring.
- Option of installing a Vortex process gate above. When used in conjunction with a Vortex material flow control assembly, it allows metering through the spout.
- For enclosed loading applications, an optional Self-Sealing Discharge seals off the outlet scavenger to prevent dusting to atmosphere between loading cycles.
- Optional Aero-Bin Bottom. If a spout is mounted to a hopper or silo, an Aero-Bin Bottom can be installed between the hopper/silo and the spout. Its purpose is to fluidize a large area of material for easier flow.

LOADING TYPES:

STOCKPILING

When stockpiling dry bulk solid materials, stockpile size, spout length/retraction height, and handled material characteristics/service conditions are the primary concerns. The Vortex Loading Spout can be used in tandem with accessories designed to contain fugitive dusts and prevent dusting to atmosphere.

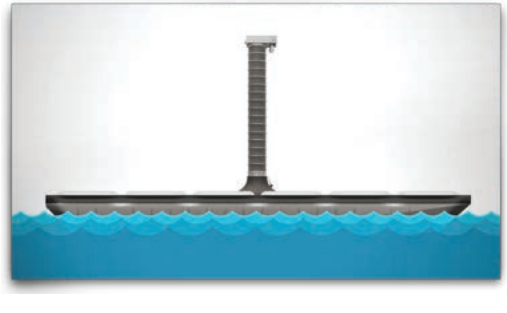
KEY FEATURES

- A stacking, cone-in-cone spout design can be used in tandem with a Vortex In-Line Filtration System at the material feed inlet. The In-Line Filtration System is designed to collect fugitive dusts by means of air withdrawal. The outer sleeve is intended to contain fugitive dusts. Fugitive dusts are captured in pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load.
- A telescoping, tube-in-tube spout design can be used in tandem with a Vortex Discharge Filtration System at the point of discharge. The Discharge Filtration System is designed to collect fugitive dusts by means of high volume exhaust blowers. Fugitive dusts are captured in pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load. The purpose of a Discharge Filtration System is to better collect fugitive dusts originating near the point of discharge.
- A Dust Control Skirt encompasses the peak of the material pile to address dusting to atmosphere.
- A Material Level-Sensing Device complements an Auto-Raise System to automate the retraction process. Throughout the loading process, the spout maintains its proximity between the point of discharge (i.e. the outlet scavenger) and the material pile – even as the pile grows. Because of the outlet scavenger's close proximity to the material pile, dust control is enhanced. The automated retraction process also keeps the outlet scavenger from becoming buried in the material pile, which in turn prevents material build-up in the spout.

LOADING TYPES:

BARGE LOADING

When loading dry bulk solid materials into barges, spout length, product dispersion and loadout speed are the primary concerns. For optimal performance, the Vortex Loading Spout can be used in tandem with accessories specifically designed for loading efficiency.



KEY FEATURES

- For spouts with shorter length, a stacking, cone-in-cone design can be used in tandem with a Vortex In-Line Filtration System at the material feed inlet. The In-Line Filtration System is designed to collect fugitive dusts by means of air withdrawal. An outer sleeve is intended to contain fugitive dusts. Fugitive dusts are captured in pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load.
- For spouts with greater length, a telescoping, tube-in-tube design provides greater stability than the standard, stacking, cone-in-cone spout design. A telescoping, tube-in-tube spout design can be used in tandem with a Vortex Discharge Filtration System at the point of discharge. The Discharge Filtration System is designed to collect fugitive dusts by means of high volume exhaust blowers. Fugitive dusts are captured in pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load. The purpose of a Discharge Filtration System is to better collect fugitive dusts originating near the point of discharge.
- Material Level-Sensing Device, to be used in tandem with an Auto-Raise System. At the outlet scavenger, a Material Level-Sensing Device automatically indicates when the material pile has grown to a specified level. When used in tandem with an Auto-Raise System, this triggers an automatic, incremental retraction of the spout. This automates the loading process to prevent material build-up in the spout, eliminate the need for visual monitoring, and avoid vessel overfilling.
- A Dust Control Skirt encompasses the peak of the material pile to address dusting to atmosphere.

CONE-IN-CONE

LOADING SPOUTS

Ideal Applications: Truck, railcar and barge loading applications. Can also be used in stockpiling applications.

TECHNICAL SPECIFICATIONS

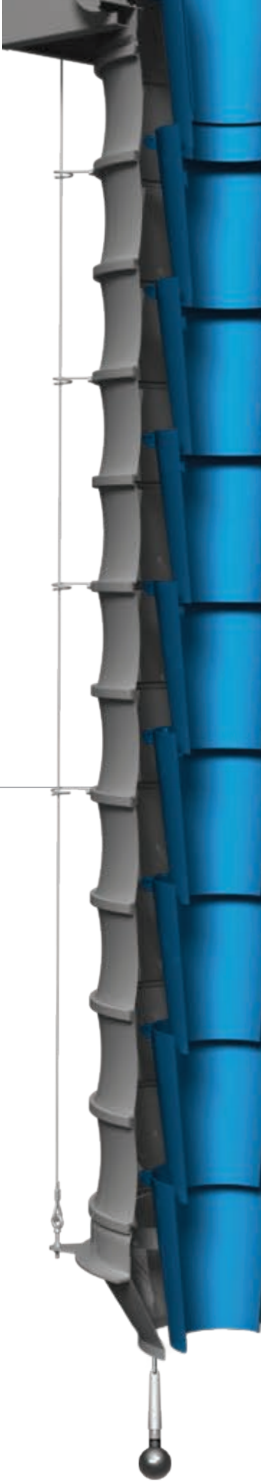
Spout Type	Stacking, cone-in-cone
Loading Type	Open and/or enclosed loading applications
Conveyance Type	Gravity drop in the presence of slight negative pressure
Material Temperatures	250°F | 120°C for standard spout, with modifications that allow up to 400°F | 205°C
Extended Travel	Spout lengths will vary, based on models and application. Contact us to discuss custom sizing options.
Overall Height (Retracted)	Overall height (retracted) will vary, based on models and application. Designed to be low profile, paying mind to clearance available overhead and extended travel required to reach the necessary vessel(s).
Considerations	Standard options are available. Some Vortex Loading Spouts may require additional design considerations to ensure their success in a given application.

Hoist Drive System

Four cable hoist drive system offers enhanced stability and improved cable service factor over traditional two and three cable hoist drive systems.

Power of Comparison: Because four cable hoist drive systems have one or two additional lifting cables, compared to traditional two and three cable hoist drive systems, it creates a more even weight distribution across a greater number of lifting cables. This results in less stress on each lifting cable, which reduces cable wear, increases cable service factor and prolongs cable service life.

Vortex lifting cables are breakage-resistant. Individually, they can withstand up to 400 lb | 180 kg of tension. Collectively, a spout's four lifting cables provide total breakage resistance of 1,600 lb | 725 kg of tension.

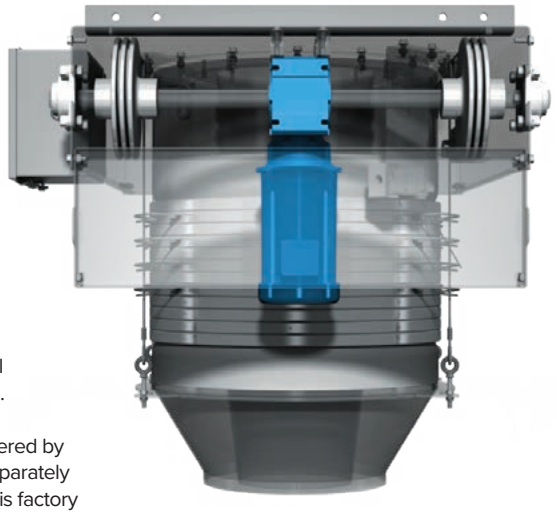


Center Mount Motor

Mounted beneath the main pan housing for better protection from the elements of its surrounding environment. The main pan housing is constructed from A36 mild steel.

Motor Voltage Options:
- 400 volt/50 hertz
- 460 volt/60 hertz
- 575 volt/60 hertz

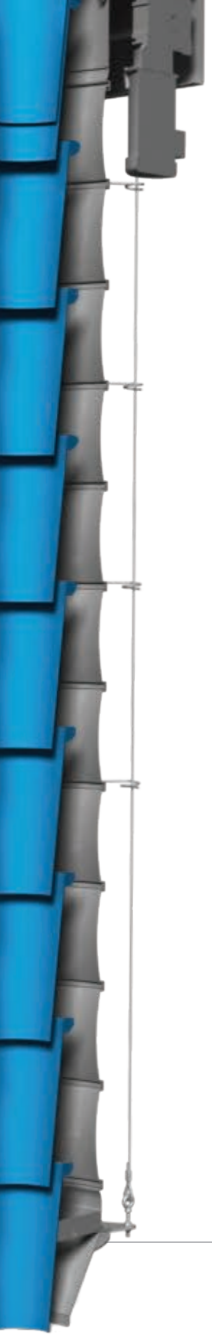
***Other motor voltage options available upon request.*



Vortex® Loading Spout motors are three-phase motor/reducer drive units which feature an integral braking system. Single-phase motors are available.

Power of Comparison: In other loading spouts offered by the industry, a braking system must be sourced separately from the spout's motor. The Vortex Loading Spout is factory supplied with an integral braking system, as a standard.

**One year warranty on all motor and electrical components.*



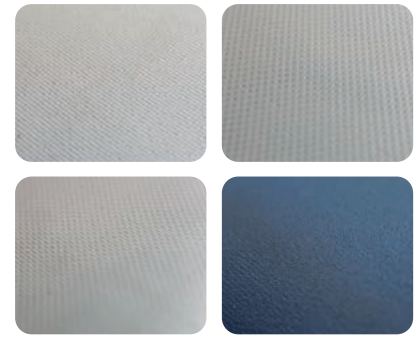
Machined Pulleys

The Vortex® Loading Spout's three-piece pulleys are computer numerical control (CNC) machined with rounded edges and precision cable grooves.

Power of Comparison: Many alternative loading spouts offered by the industry feature standard pulleys as part of their hoist drive systems. Often, these standard pulleys have rough edges which cause the lifting cables to fray. To eliminate cable fraying, the Vortex Loading Spout features two CNC-machined three-piece pulleys with rounded edges and precision cable grooves. This design prevents cable failure and other costly downtime for cable repair. Vortex is confident in the durability of their lifting cables, compared to other industry suppliers; so much so that Vortex Lifting Cables carry a 10-year warranty for wear, tear and workmanship. With less cable wear comes reduced maintenance cost, which allows for more efficient loading operations.

In other loading spouts offered by the industry, fabricated pulley grooves can be inconsistent, which can cause the lifting cables to bind or overlap. This results in poor lifting performance, accelerated cable wear, spout imbalances and backlash. To address this concern, the Vortex Loading Spout's CNC-machined pulleys are also designed with precision cable grooves to ensure smooth, balanced spout extensions and retractions.

**Travel or rotary limit switches are available to set boundaries on spout full-extension and full-retraction. An absolute encoder is available to set boundaries for intermediate positions.*

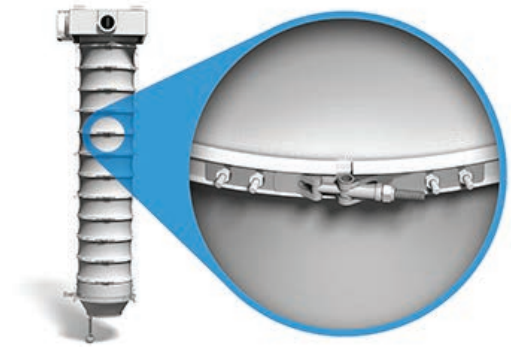


Outer Sleeve Material Options

The purpose of the Vortex Loading Spout's outer sleeve is to encompass the spout's internal stacking cones and contain fugitive dusts generated during the loading process. Vortex outer sleeve material construction options are flexible and durable, allowing the spout to extend and retract without creating tears or other wear points along the outer sleeve.

Options:

- Vinyl (PVC)-coated polyester (18 & 22 oz.)
- Hypalon synthetic rubber
  Static dissipative for potentially explosive materials
  Material Temperatures:
  -40° F – 220° F | -40° C – 105° C
- Silicone fiberglass
  For high temperature materials
  FDA compliant to 21CFR170-199
- Neoprene Polyester (ATEX)



Sleeve Support Rings Construction

The Vortex Loading Spout incorporates low profile inner support rings, used in conjunction with extruded outer support rings. The rings are fastened together using a high performance clamping method. Both the inner and outer support rings are constructed from aluminum.

Power of Comparison:
Many alternative loading spouts offered by the industry feature inner and outer support rings which are fastened together using rivets, nuts, bolts and/or screws. In order to thread these fasteners, punctures must be made in the outer sleeve material. This creates vulnerable areas where the outer sleeve can cut, tear or experience other forms of failure early on in the spout's lifecycle. To resolve this issue, Vortex's high performance clamping method eliminates punctures in the outer sleeve material.

Also, over time, the mechanical fasteners used in alternative loading spout designs can break and/or loosen, allowing them to fall away into the material load. To eliminate this potential source of foreign metal fragment contamination, the Vortex Loading Spout's high performance clamping method rids the inner support rings of exposed mechanical fasteners.

Motor Starter Panel

As a convenience to the end user, all Vortex Loading Spouts can be factory supplied with a Motor Starter Panel. The Vortex Motor Starter Panel is specifically designed to be compatible with the Vortex Loading Spout's three-phase motor requirements, as well as the spout's other electrical components. Without a Vortex Motor Starter Panel, end users must supply a motor starter panel before the spout can be operated, which can be a timely and expensive process.

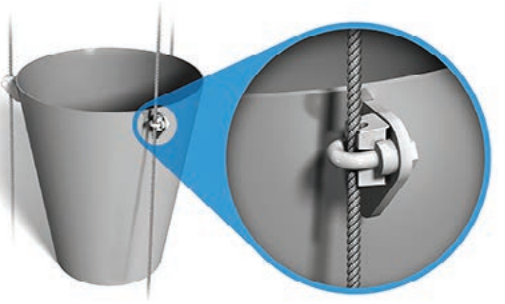
Stacking Cones

Vortex® Loading Spouts are designed with internal cones which stack upon one another as the spout retracts. In doing so, the spout's overall height is condensed to a low profile that maximizes clearance available overhead.

Cone Material Construction Options

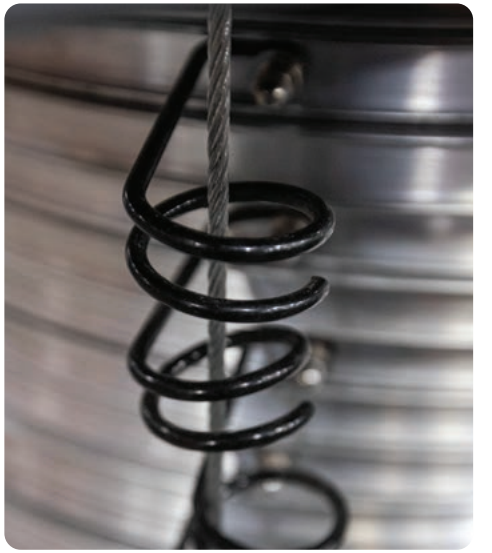
- 304 stainless steel
- 316L stainless steel
- 235 BHN abrasion-resistant steel
- 400 BHN abrasion-resistant steel
- Polyurethane
- Ceramic-lined steel

FOOD FRIENDLY OPTIONS



Cone Cable Clips Construction

The Vortex Loading Spout's stacking cones are suspended from three internal cables. As a standard, each cone is fastened to the internal cables by a series of u-bolt and nut harness guides. This fastening method provides ease of maintenance. If a cone must be maintained or replaced, that cone's u-bolts and nuts can be simply unfastened and the cone removed from service without manipulating other cones above or below it.



Outer Cable Guides Construction

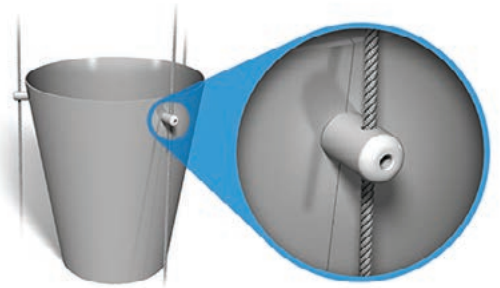
The Vortex Loading Spout is designed with spiral cable guides to assist with lifting cable and/or outer sleeve maintenance and replacement. For strength and durability, the spiral cable guides are constructed from spring steel.

Power of Comparison: Many alternative loading spouts offered by the industry incorporate eyebolts to guide the sleeve support rings during spout extension/retraction. The primary disadvantage to eyebolts is their maintainability. If either the lifting cables or the outer sleeve must be replaced, eyebolts must either be:

1) Removed from the sleeve, which is challenging while the lifting cables are still connected; or

2) Physically distorted (i.e. "opened") in order to free the sleeve from the lifting cables.

To resolve this maintainability issue, the Vortex Loading Spout incorporates four spiral-shaped cable guides along the circumference of each outer support ring. The primary advantage of spiral guides over eyebolts is that the lifting cables and/or the outer sleeve can be removed without having to manipulate the spiral guides. The lifting cables can be extracted from the spiral guides while the guides remain connected to the sleeve support rings.



Food Friendly Cone Cable Clips

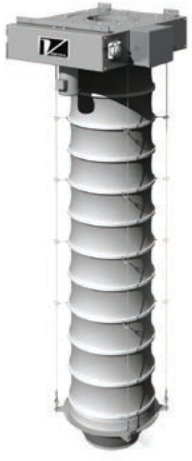
The Vortex Loading Spout's standard u-bolt and nut harness guides are replaced with steel pegs. Each steel peg features a precision-drilled hole for the cable to pass through. The peg is locked in place along the internal cables using a Loctite®-treated set screw.

Power of Comparison: When using u-bolt and nut harness guides in food grade applications, either of the fasteners can break and/or loosen, allowing them to fall away into the material load. To eliminate this potential source of foreign metal fragment contamination, machined steel pegs are welded to the outside of each stacking cone to replace the standard u-bolt and nut harness guides.

An added benefit to steel pegs is they reduce the number of crevices and pockets where materials can become lodged as they pass through the spout. This brings ease to sanitation procedures.

Cone-in-Cone
Loading Spout

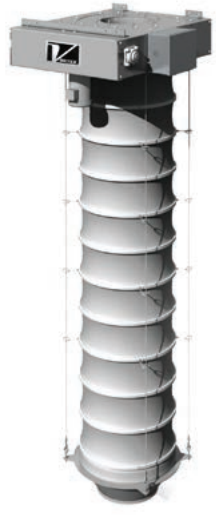
SIZING OPTIONS



VES-10/VOS-10

Load rate capacity:
- 100 ft³/min (CFM) | 3 m³/min (CMM)
- 6,000 ft³/hr (CFH) | 170 m³/hr (CMH)
- 4,820 bushels/hr

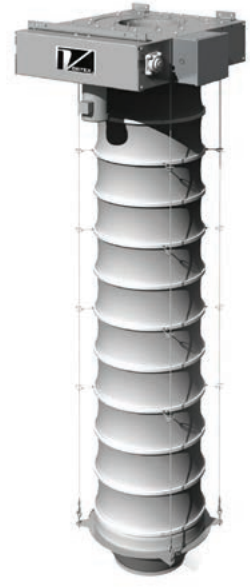
Material feed inlet size: 10 in | 255 mm
Outlet scavenger size: 13 in | 330 mm



VES-25/VOS-25

Load rate capacity:
- 250 ft³/min (CFM) | 7 m³/min (CMM)
- 15,000 ft³/hr (CFH) | 425 m³/hr (CMH)
- 12,055 bushels/hr

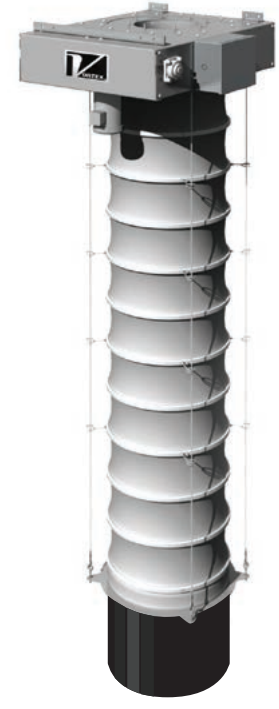
Material feed inlet size: 14 in | 355 mm
Outlet scavenger size: 16 in | 405 mm



VES-40/VOS-40

Load rate capacity:
- 400 ft³/min (CFM) | 11 m³/min (CMM)
- 24,000 ft³/hr (CFH) | 680 m³/hr (CMH)
- 19,285 bushels/hr

Material feed inlet size: 20 in | 510 mm
Outlet scavenger size: 23 in | 585 mm

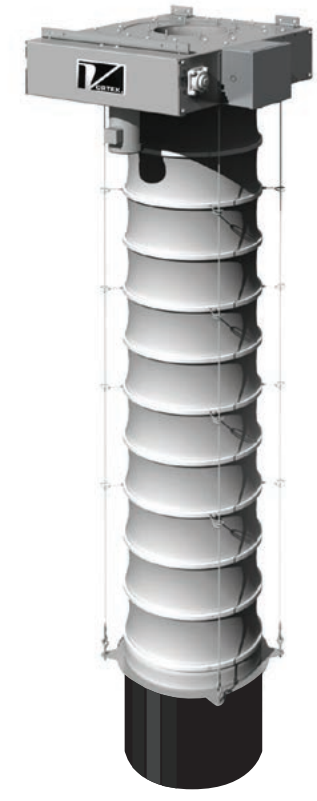


VOS-70

Load rate capacity:
- 700 ft³/min (CFM) | 20 m³/min (CMM)
- 42,000 ft³/hr (CFH) | 1,190 m³/hr (CMH)
- 33,750 bushels/hr

Material feed inlet size: 24 in | 610 mm
Outlet scavenger size: 43 in | 1,090 mm

**VOS-70 Vortex® Loading Spouts are limited for use in open loading applications only*



VOS-120

Load rate capacity:
- 1,200 ft³/min (CFM) | 35 m³/min (CMM)
- 72,000 ft³/hr (CFH) | 2,040 m³/hr (CMH)
- 57,855 bushels/hr

Material feed inlet size: 30 in | 760 mm
Outlet scavenger size: 52 in | 1,320 mm

**VOS-120 Vortex® Loading Spouts are limited for use in open loading applications only*

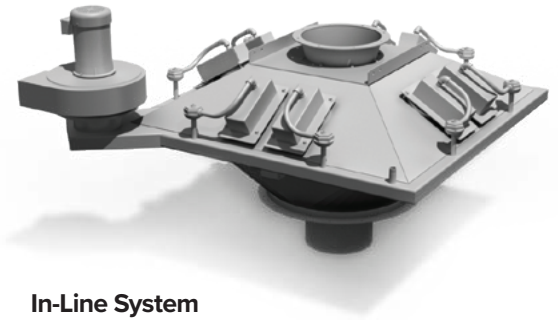
CONE-IN-CONE

FILTRATION SYSTEMS

Vortex® Filtration Systems are specifically designed to:

1) Displace dust-laden air from its source;
2) Separate dusts from the air;
3) Exhaust the cleaned air to atmosphere; and
4) Re-entrain the filtered dusts back down into the load.

Vortex Filtration Systems are “active units,” meaning an air withdrawal forcibly pulls displaced air and dusts through the filter cartridges to initiate the filtration process.



In-Line System

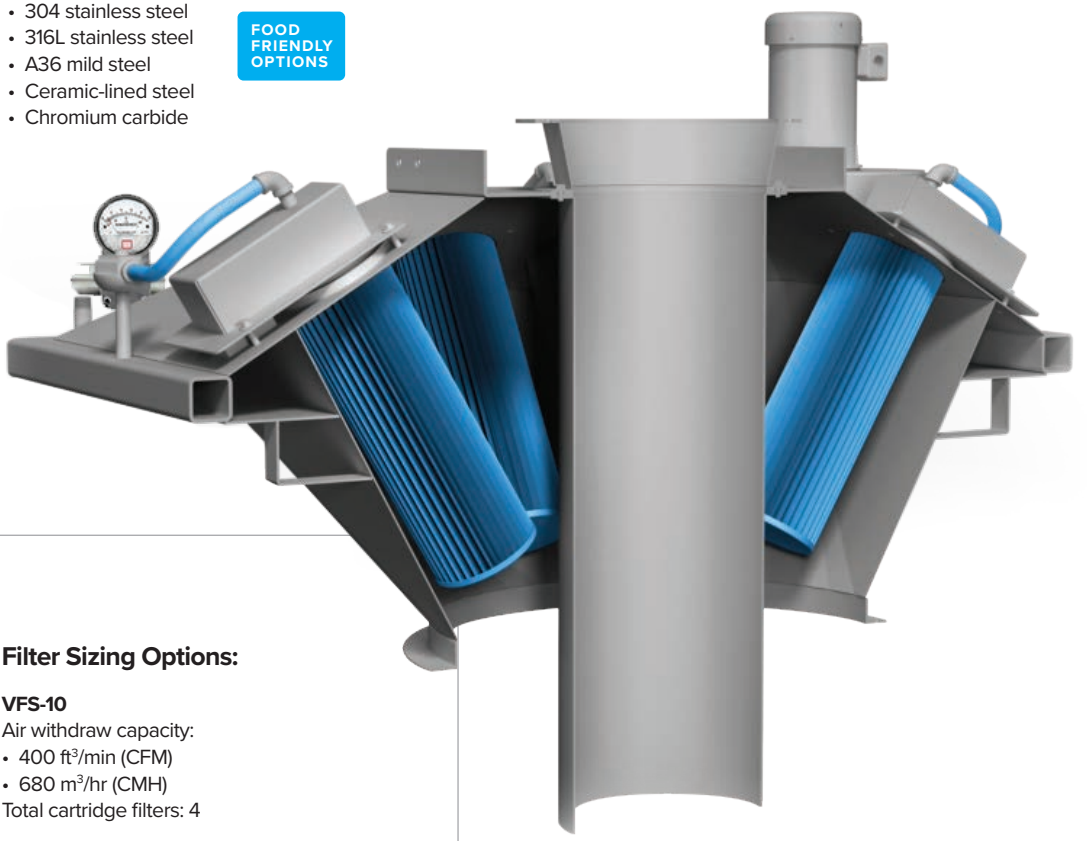
Designed to collect fugitive dusts by means of air withdrawal. Once the loading process begins, the attached blower draws up fugitive dusts as they are generated by the material flow stream. Once arriving at the In-Line Filtration System, the fugitive dusts are captured in a series of pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load. Thus, the In-Line Filtration System is designed to minimize product loss and prevent dusting to atmosphere.

**To reduce energy consumption, compressed air is only forced through the reverse pulse jet system during loading operations. It is not a continuously running system.*

Material Contact Options:

- 304 stainless steel
- 316L stainless steel
- A36 mild steel
- Ceramic-lined steel
- Chromium carbide

FOOD FRIENDLY OPTIONS



Filter Sizing Options:

VFS-10
Air withdraw capacity:
- 400 ft^3/min (CFM)
- 680 m^3/hr (CMH)

Total cartridge filters: 4

VFS-25
Air withdraw capacity:
- 1,000 ft^3/min (CFM)
- 1,700 m^3/hr (CMH)

Total cartridge filters: 8

VFS-40
Air withdraw capacity:
- 1,600 ft^3/min (CFM) | 45 m^3/min (CMM)
- 96,000 ft^3/hr (CFH) | 2,720 m^3/hr (CMH)
- 77,140 bushels/hr

Total cartridge filters: 8

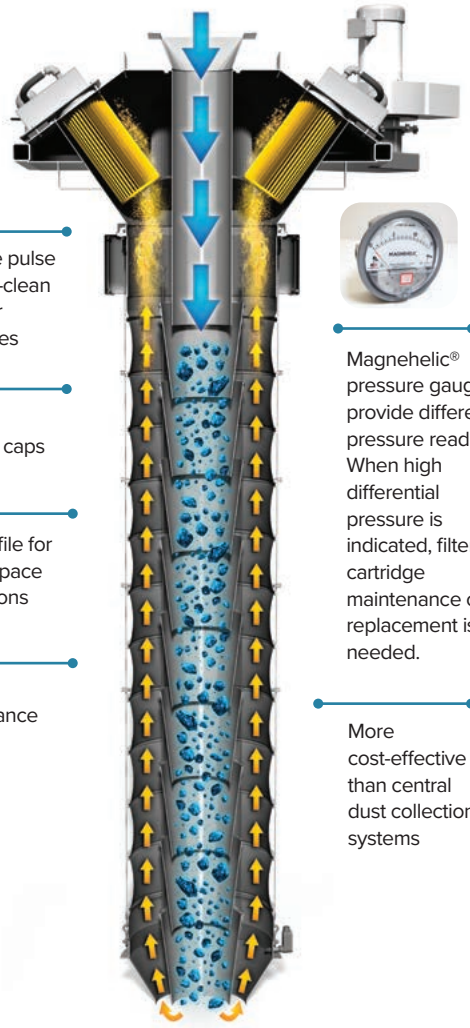
Filter Cartridge Options:

Pleated, spun-bound polyester media
Efficiency ratings (based on dry dust particle sizes):
- ½ micron: 99.7% efficiency
- 1 micron: 99.8% efficiency
- 2 micron: 100% efficiency

Emission ratings (based on dry dust particle sizes):
- ½ micron & larger: No more than 0.005 grains/dscf of air

PTFE-coated media
Emission ratings (based on dry dust particle sizes):
- ½ micron & larger: No more than 0.004 grains/dscf of air

KEY FEATURES



Reverse pulse jets self-clean the filter cartridges

Filter air exhaust caps

Low profile for limited space installations

In-line maintenance features

Magnehelic® pressure gauges provide differential pressure readings. When high differential pressure is indicated, filter cartridge maintenance or replacement is needed.

More cost-effective than central dust collection systems

Quick-lock filter cartridge access
Panels are hinged and secured by a handled, stationary clamping mechanism to accelerate the inspection and maintenance processes, and for interior access without tools.

POWER OF COMPARISON

- Central dust collection systems often require the installation of additional ductwork, a discharge airlock, and some way to dispose of collected dusts – or, some way to reintroduce collected dusts back into the manufacturing process. The Vortex® In-Line Filtration System is more cost-effective than central dust collection systems because it is a self-contained unit.

- Compared to central dust collection systems, the Vortex In-Line Filtration System is a better performing unit. This is because central dust collection systems are exactly that: centralized. Often times, the central dust collector is located away from the point of loading. A central dust collector also supports other equipment throughout the process, which creates multiple "pick-up points" in the dust collection system. In order for the central dust collector to be connected to each of these processes, ductwork can become lengthy and with many bends. In addition, faulty connections may allow air and dusts to escape to atmosphere. Each of these variables can impact the strength and balance of air withdrawal, which limits the overall performance of a dust collection system. Because the Vortex In-Line Filtration System is a self-contained unit which keeps captured dusts at the point of loading, it ensures that air withdrawal strength and other performance factors are kept constant.

- Central dust collection systems often incorporate larger-sized exhaust blowers, typically ranging from 20-100 horsepower (HP) – and sometimes, even larger. Because central dust collection systems also support other stages in the process, the exhaust blowers are running almost constantly – even when loading operations are not being performed. This results in high electrical consumption. Alternatively, the Vortex In-Line Filtration System features a stand-alone exhaust blower which runs only when loading operations are being performed. Therefore, the Vortex In-Line Filtration System significantly reduces energy costs.

- Other in-line filtration systems offered by the industry have bulky designs, making them challenging to install in limited space applications. The Vortex In-Line Filtration System's compact, square-shaped design is ideal for limited space installations.

- Other in-line filtration systems offered by the industry have horizontally mounted filter cartridges, which allow heavy, high density dusts to build up in the filters. These dusts may not be dislodged by pulse cleaning. To address this issue, the filter cartridges can be periodically accessed and maintained to help dislodge dusts – but this recreates the original workplace safety problem of employee dust exposure and its potential health risks. The Vortex In-Line Filtration System's filter cartridges are vertically mounted to allow dusts to release from the filter pleats without having to fight gravity. This reduces the load on a filter cartridge and helps extend its service life. Vertical mounting also reduces employee dust exposure, since the filter compartments must only be opened for filter cartridge replacement or infrequent maintenance.

- The Vortex In-Line Filtration System is not a dust "collector"; it is a dust "filter." The primary difference being that with the Vortex In-Line Filtration System, dusts are temporarily captured before being purged back out of the filter cartridges and back into the material flow stream. By better managing dusts at the point of loading instead of routing them to a central dust collection system, it results in the following benefits:

- Improved profitability by loading out the dusts as product, rather than moving them to a central dust collector as waste.

- By continuously purging dusts back out of the filters, it keeps the filters clear and increases their service life.

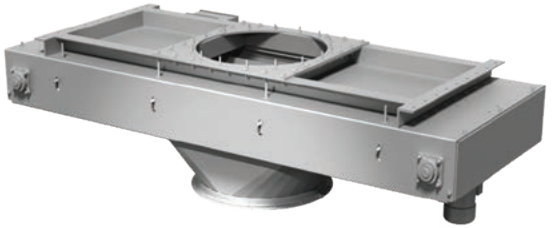
- If a central dust collection system's waste storage container is not regularly emptied, dusts may back up in the system and create clogs. This can result in dust overflow, which may cause dusts to escape to atmosphere and can create potential hazards in the workplace. Because the Vortex In-Line Filtration System is a self-contained unit which continuously filters and reintroduces dusts back into the material flow stream, rather than collecting dusts, this concern is addressed.

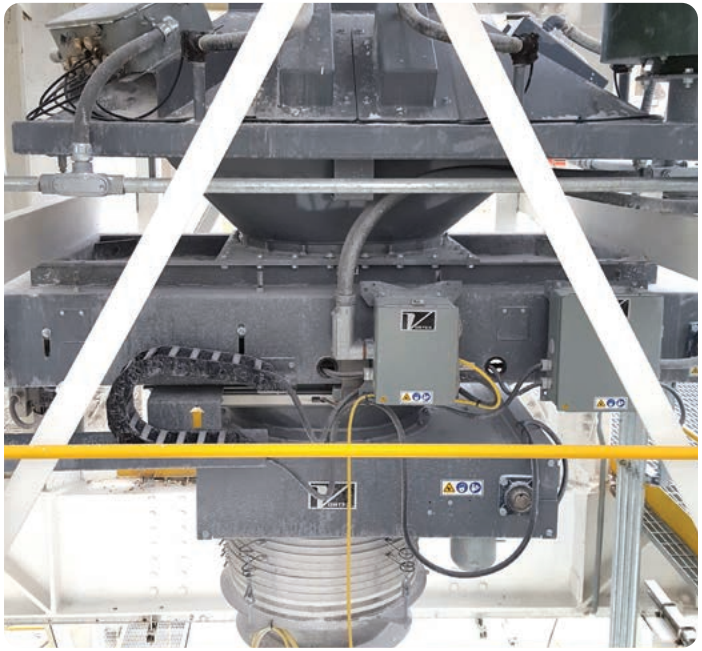
- Many in-line filtration systems incorporate two spiral hoses at each filter cartridge: one hose to force compressed air into the filter cartridges, and a second hose to exhaust spent air back out of the filter cartridges. Over time, these hoses can rot and crack, which may cause failures in the reverse pulse jet system. To reduce spare parts necessity and other maintenance costs, the Vortex In-Line Filtration System has replaced the second (exhaust) hose with an exhaust cap. The exhaust cap draws spent air directly through the filter cartridge before it is exhausted to atmosphere.

CONE-IN-CONE

SPOUT POSITIONERS

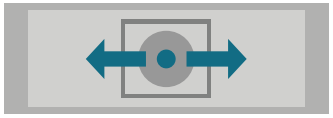
Vortex® Spout Positioners are designed so that materials pass through a fixed inlet. Below, a traversing hopper slides across a fixed support pan. A loading spout is attached beneath the traversing hopper to allow exact positioning of the spout above a truck or railcar waiting below.





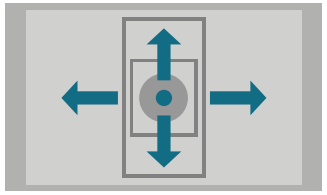
Single-Axis Positioner

The Vortex Single-Axis Positioner allows spout movement along either an X-axis or a Y-axis. Depending on orientation, a Single-Axis Positioner can either be moved from front-to-back or side-to-side above a loading vessel.



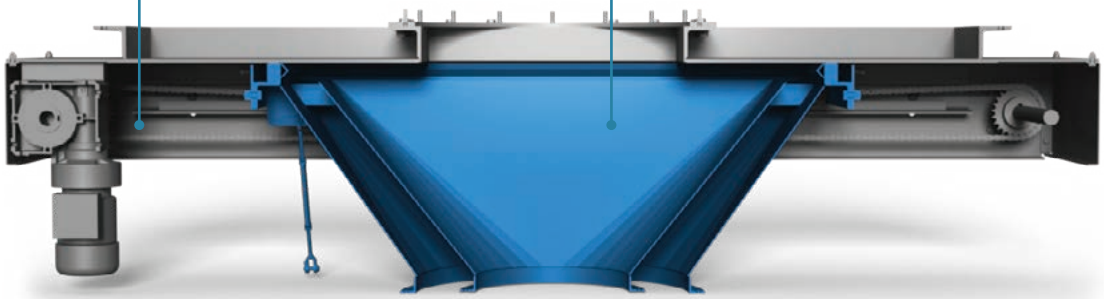
Dual-Axis Positioner

The Vortex Dual-Axis Positioner allows spout movement along both an X- and Y-axis, allowing it to traverse from front-to-back and side-to-side above a loading vessel.



Fixed Support Pan
The support pan stays stationary, allowing the hopper to easily slide and find its destination.

Traversing Hopper
The traversing hopper connects to the spout and allows for exact positioning.



Materials of Construction
The inlet cone and traversing hopper are constructed from the same metal material(s) as specified for the loading spout's material contact areas (i.e. stacking cones). The fixed support pan is constructed from A36 mild steel.

Options:
- 235 BHN abrasion-resistant steel
- 400 BHN abrasion-resistant steel
- 304 stainless steel
- 316L stainless steel

FOOD FRIENDLY OPTIONS

Motor Specifications
- Single-Axis Positioner: (qty. 1) 1 HP motor with 80:1 gear reducer
- Dual-Axis Positioner: (qty. 2) 1 HP motors with 80:1 gear reducers

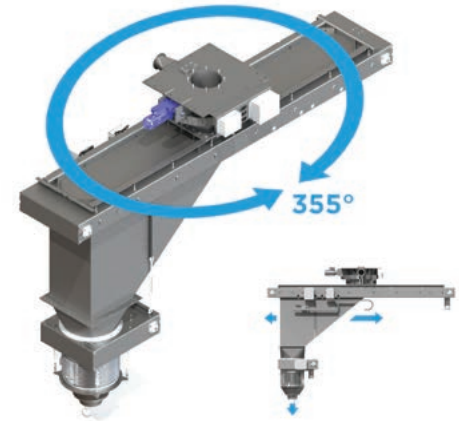
Vortex® Spout Positioner motors are three-phase motor/reducer drive units which feature an integral braking system. Single-phase motors are available.

Standard Sizes
- Single-Axis Positioners: 2 – 10 ft | 0.6 – 3 m
- Dual-Axis Positioners: 2x2 – 6x4 ft | 0.6x0.6 – 1.8x1.2 m

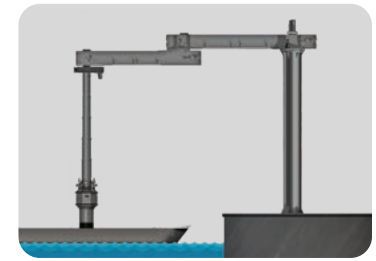
Aerial Camera System
For added visibility throughout the loading process, the Vortex Loading Spout can be equipped with an Aerial Camera System. At the main pan housing, a video camera is installed externally to provide an aerial view of the spout's position, relative to the loading vessel below. The live video feeds back to a monitor for real-time observation as the operator moves the spout into position.

Rotating Positioner
The Vortex Rotating Positioner rotates 355° and travels horizontally, allowing the loading zone to be a diameter. This allows the loading spout to be positioned over a vehicle hatch and eliminates the need for a driver to reposition the vehicle. Compared to a Dual-Axis Positioner with a similar loading zone, the Rotating Positioner may weigh less, which can be critical when replacing current installations.

Vortex Spout Positioners are internally vented, allowing for dust control during the loading process. While the hopper and spout remain attached to the Rotating Positioner, hopper seal replacement can be easily performed.



Articulating Arm Consult a Vortex engineer



CONE-IN-CONE LOADING

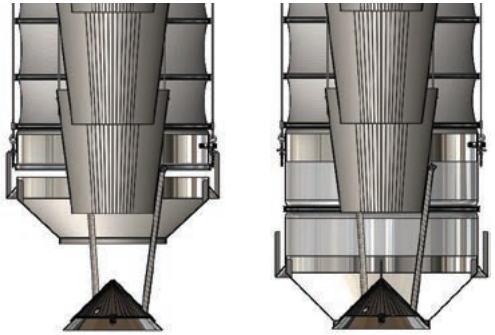
ACCESSORIES

A wide variety of options and accessories are available for your Vortex® Loading Spout. For improved efficiency and functionality, consider...

Dust Control Skirt

The Vortex Dust Control Skirt is intended for open loading applications. It is constructed from heavy, durable neoprene rubber. Rather than flaring the skirt from a common piece of neoprene rubber, each flared section is a stand-alone neoprene rubber strip. Each strip of rubber is overlapped to prevent pathways for dust emissions to atmosphere. By flaring larger, the Vortex Dust Control Skirt is able to fully encompass the peak of the material pile, to better contain fugitive dusts.

Power of Comparison: Alternative loading spouts offered by the industry are specifically constructed for use in either an open or enclosed loading application. For clients that require both open and enclosed loading from a single source, those spout designs limit their capabilities – and often require the purchase of two loading spouts. To address this issue, Vortex offers an optional detachable Dust Control Skirt. By including this option, a spout can be supplied with an outlet scavenger to accommodate enclosed loading applications; then, to properly equip for open loading applications, the Dust Control Skirt can be attached along the upper perimeter of the outlet scavenger. Because of this capability, a Vortex Loading Spout can serve dual purposes.



Self-Sealing Discharge

A dust collection system is able to collect the majority of fugitive dusts generated during the loading process. However, once loadout is complete, trace amounts of material and dusts may remain within the spout's outer sleeve. As the spout extends and retracts, those materials and dusts can shake loose and create material spillage and/or dusting to atmosphere. To address this in enclosed loading applications, a Self-Sealing Discharge (SSD) can be installed beneath the spout's outlet scavenger.

By design, the Self-Sealing Discharge is simply a closure cone that extends and retracts to allow or forbid materials from discharging through the outlet scavenger. Between loading cycles, the SSD is retracted to create a "lid" over the loading spout's outlet scavenger. As the loading spout is extended toward an enclosed truck or railcar, the SSD remains closed. Once the spout's outlet scavenger is seated into the loading hatch, the SSD extends to allow material discharge. As the spout begins to retract out of the loading hatch, the SSD immediately closes to once again seal off the outlet scavenger.

The Self-Sealing Discharge does not require power and operates automatically, without operator command.

Spin Loader

Mounted beneath the outlet scavenger. The purpose of a spin loader's disc-shaped vane is to evenly disperse lightweight materials over a large surface area.

Material Sampling Unit

The Vortex Manual Material Sampling Unit allows a small material sample to be manually extracted as materials pass through the spout's outlet scavenger. This provides a final test of product quality at the point of loading.

Contact us to discuss automated material sampling options

Vibratory Kits

Mounted along the outlet scavenger. To conclude the loadout process, vibrators can continue to be run briefly to encourage residual materials to fall away from the spout's outer sleeve and down into the load, prior to spout retraction.

Material Level-Sensing Devices

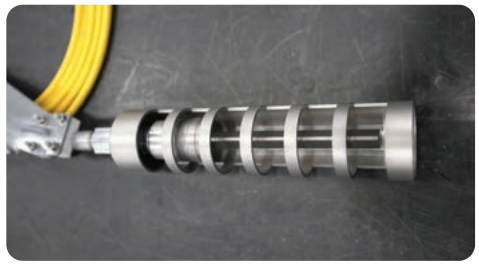
For open loading applications, the purpose of a material level-sensing device is to automate the spout retraction process. In doing so, material level-sensing devices prevent material build-up in the spout, eliminate the need for visual monitoring throughout the loading process, and avoid vessel overfilling.

For enclosed loading applications, the purpose of a material level-sensing device is to detect product level within the vehicle. Once detected, several actions can be initiated, depending on a facility's preferred level of automation. There are several types of material level-sensing devices. Each performs exactly the same function; they are simply alternatives to one another. However, certain loading circumstances call for certain material level-sensing technologies.

Tilt Probe & Auto-Raise System

In enclosed loading applications, a Tilt Probe is mounted beneath the outlet scavenger so that it can be lowered into the loading hatch. As materials fill near the top of the vessel, the Tilt Probe will come in contact with the material pile and gradually begin to tilt. Once the probe is tilted to approximately 16°, several actions can be initiated, depending on a facility's preferred level of automation. Options range from visual indication (via lights) to automated halt of material flow and automated spout retraction – all the way to upstream process control.

In open loading applications, a Tilt Probe is mounted at the outlet scavenger. The outlet scavenger and the Tilt Probe are typically separated by a Vortex® Dust Control Skirt. As the material pile grows beneath the Dust Control Skirt, the Tilt Probe gradually begins to tilt. When used in tandem with an Auto-Raise System, once the probe is tilted to approximately 16°, it triggers an automatic, incremental retraction of the spout as materials continue to discharge. Once the specified load is achieved, the Tilt Probe can be synchronized with the process gate (or belt conveyor) above to automatically halt material flow before the spout is fully retracted.



Vibratory Probe or Pneumatic Probe & Auto-Raise System

Both Vibratory Probes and Pneumatic Probes are primarily used when handling lightweight and/or fine dry bulk solid materials.

Similar to a tuning fork, a Vibratory Probe puts out a consistent vibration frequency throughout the loading process. When contacted by the material pile, the probe's vibration frequency is altered.

Alternatively, with a Pneumatic Probe, a sensor head applies an air stream throughout the loading process. When the sensor head is covered by the material pile, it creates back pressure.

In either case, in enclosed loading applications, this triggers an auto-command to the process gate (or belt conveyor) above to halt material flow. This prevents vessel overfilling and triggers an automated spout retraction process.

In open loading applications, either probe is often used in tandem with an Auto-Raise System. Once the probe's signal is altered, this triggers an automatic, incremental retraction of the spout as materials continue to discharge. Once the specified load is achieved, the probe can be synchronized with the process gate (or belt conveyor) above to automatically halt material flow before the spout is fully retracted.

Rotary Paddle Probe

Rotary Paddle Probes are primarily used in enclosed loading applications – and more specifically, in tandem with a Self-Sealing Discharge (SSD). When applied in this way, the Rotary Paddle Probe is mounted below the SSD's closure cone and is protected by a metal housing. A Rotary Paddle Probe consists of a paddle which continually revolves throughout the loading process. As materials fill near the top of the vessel, the paddle will come in contact with the material pile, causing its revolutions to slow or cease. This triggers an auto-command to the process gate (or belt conveyor) above to halt material flow. This prevents vessel overfilling and triggers an automated spout retraction process.

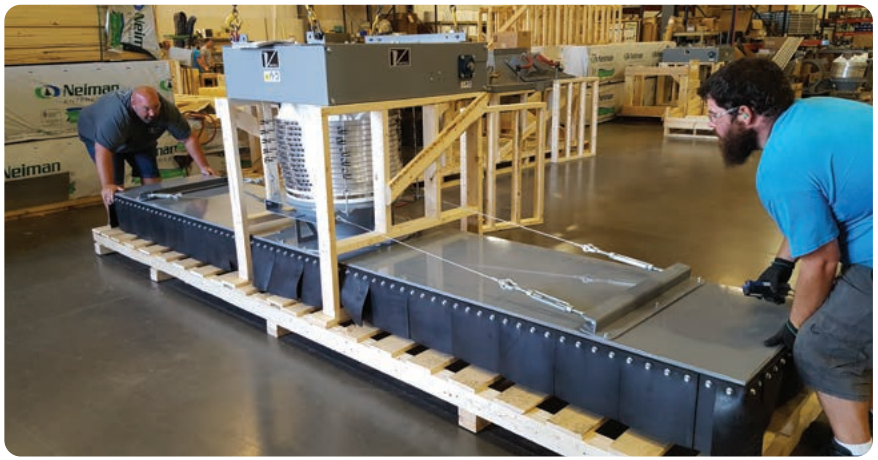
Hatch Adaptors

For enclosed loading applications, a Vortex® Loading Spout can be supplied with optional Hatch Adaptors.

Common scenarios for a Vortex Hatch Adaptor include:

- If a facility is loading trucks and/or railcars with non-standard loading hatch configurations. Vortex Hatch Adaptors are custom-designed to match the unique hatch(es).
- If a Vortex Loading Spout is sized to meet a client's load rate capacity requirements, but that spout size is intended for filling vessels of a different size. Example: To meet a client's load rate capacity requirements, a Vortex VES-25 Loading Spout is supplied. Standard outlet scavenger size for a VES-25 Loading Spout is 16 in | 405 mm. Typical loading hatch size for a truck is 20 in | 500 mm, while typical loading hatch size for a railcar is 30 in | 760 mm. To compensate for the sizing differences, Vortex Hatch Adaptors ensure a Vortex Loading Spout's proper fit into larger hatch sizes.

Vortex Hatch Adaptors are available in either round or rectangular options. Rectangular Hatch Adaptors are intended to address environmental issues when loading railcars that contain elongated loading hatches, also known as "trough hatches." Its purpose is to confine airborne particulate generated during the loading process.



How it Works: Once a loading spout is lowered atop a railcar, the rectangular Hatch Adaptor fully covers the railcar's rectangular opening. When used in tandem with a dust collection system, the rectangular Hatch Adaptor effectively closes off the opening to foster a strong and consistent air withdrawal throughout the loading process. Along the perimeter of a rectangular Hatch Adaptor is a Vortex Dust Control Skirt. The neoprene rubber skirt prevents pathways for dust emissions to atmosphere.

Remote Control Pendants

Put simply, a remote control pendant is a handheld push-button device. Remote control pendants enable automation by allowing loading spout operators to guide the spout into position using programmed controls. Such commands include auto-extend, auto-raise, auto-material start, auto-material stop, full-extension and full-retraction, among others. For safety reasons, remote control pendants are attractive because they allow spout operation to be performed away from hazardous catwalks; walkways; and the tops of trucks, railcars, barges and ships.

Spout Caution System

For enclosed truck and railcar applications, Vortex Loading Spouts can be equipped with a Spout Caution System. This includes a flashing overhead light which works in tandem with an audible alarm system. The purpose for both is to inform the loading spout operator and the truck driver or railroad engineer that the spout is not fully retracted. This reduces the risk of damaging the spout, truck or railcar, as a result of premature pull away.

How it Works: When the loading process is complete, the process gate above is closed or the belt conveyor becomes idle. Once material flow is halted, a relay switch sends an electrical transmission to the Spout Caution System to initiate the flashing overhead light and the audible alarm system. The beacon and horn systems run throughout the spout retraction process, which typically lasts 5 – 10 seconds.

CASE STUDY

Loading System Handling Talc

Application: Previously, the client used chutework to convey talc from a storage bin to a loadout station. At the loadout station, a loading sock with a skirt was used to fill enclosed trucks.

Challenges:
- Constant truck repositioning.
- Talc would suspend and dust to atmosphere.
- Lack of engineering controls caused frequent truck over/underfilling.
- Bridging in the storage bin created flow issues.

Collectively, these issues created long load times, product loss, and profitability concerns.

Solutions:
- Aerated Bin Bottom
- Aero-Slide Conveyor
- Aero-Slide Gate & Drum Valve
- Titan Maintenance Gate
- Clear Action Gate
- In-Line Filtration System
- Single-Axis Spout Positioning System
- Loading Spout

Results: Assisted by aeration, air-gravity conveyance, metering and flow control, and automated engineering controls, this new loading system has significantly reduced loading times, dusting and product loss, and has made an immediate impact on profitability and efficiency.

CASE STUDY

Loading System Handling Fertilizer

Application: Fertilizer is conveyed off of barges and into a storage bin at a truck transloading facility. Fertilizer is loaded into enclosed trucks for local distribution.

Solutions:
- Loading Spout with In-Line Filtration System
- A custom square-to-round transition flange allowed the loading system to mate up to a pre-existing storage bin.
- A material level-sensing kit avoids truck over/underfilling.

CASE STUDY

Loading System Handling Industrial Sand

Application: Industrial sand is conveyed out of rail cars and into storage bins at a truck transloading facility. Industrial sand is loaded into enclosed trucks for local distribution.

Solutions:
- Loading Spout
- An In-Line Filtration System to control silica dusts at the point of loading. This is to address workplace health and safety concerns.
- A Dual-Axis Spout Positioning System solved the client's issue of constantly repositioning trucks before loadout.

CASE STUDY

Loading System Handling Cement

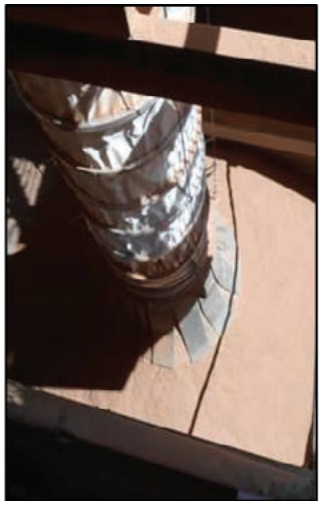
Client: Ash Grove Cement — Chanute, Kansas, USA
- 5th largest cement manufacturer in North America.
- Largest US-owned cement company.
- 8 plants; each produces approximately 1 million tons per year.

Application: In 2014, the Chanute plant sought improved dust management and accelerated load times.

Solutions:
- Loading Spout
- A Dual-Axis Spout Positioning System (4 ft | 1.2 m front-to-back travel; 2 ft | 0.6 m side-to-side travel) solved the client's issue of constantly repositioning trucks before loadout. More accurate positioning eliminated operators manually guiding the spout into the loading hatch, and also reduces wear to the stacking cones. This prolongs cone service life, for reduced maintenance and spare parts costs.

Results: Ash Grove has already saved significant labor hours, making it a much more efficient operation. Their maintenance team particularly enjoys that the Vortex Loading Spout is specifically designed to reduce cable wear and the maintenance and downtime costs associated with it.

Throughout the equipment acquisition and installation processes, Ash Grove enjoyed Vortex's continuous customer service — and even provided on-site field service support when installation challenges arose.



TECHNICAL ARTICLE

Controlling Dust Emissions in Bulk Loading

Over the decades, more strict regulation has forced companies to find solutions for decreasing or eliminating the presence of fugitive dust in loading processes.

Dust Management: Why it is Important

The loading of bulk materials into trucks, railcars, barges, ships or stockpiles is fraught with health, safety and environmental issues. Dust emissions in bulk loading terminals can lead to respiration problems for employees, cause slip hazards in the workplace, propagate a potentially explosive atmosphere, and contaminate local waterways and neighborhoods.

When material is discharged in mass flow, dust becomes airborne due to impact forces, air entrainment and friction between material particles. This is exacerbated by the displacement of air within vessels, which often creates clouds of unmanageable dust in the loading area.

There are many methods currently used across industries to reduce dust emissions. The following are the most common practices used in manufacturing processes today:

1. Loading Socks

A cylindrical tube of sewn, tapered fabric – much like a windsock. Made from canvas or polyurethane fabric.

Pros:
- Flexible.
- Low-cost.

Cons:
- Cannot be automated.
- Does not control displaced air at the point of loading.
- Wears quickly.

2. Telescopic Chutes

A tube-in-tube metal chute that travels downward to load, and upward to clear the transport vessel.

Pros:
- Can “follow the load” and progressively retract.
- Longer service life, compared to loading socks.

Cons:
- Does not control displaced air at the point of loading.
- Its heavy, high-plugged load creates dust on material impact.

3. Dust Suppression Hoppers

A hopper that attempts to lessen the agitation of particles, in order to reduce dust.

Pros:

- A cost-effective solution for certain materials and applications.

Cons:

- Cannot “seat” into a truck or rail car’s loading hatch.
- Does not control displaced air at the point of loading.
- Limited in application scope.
- Material flow is exposed to atmosphere.

4. Cascading Chutes

Designed with angled cones to reduce the velocity of material flow, thus reducing frictional forces and material impact.

Pros:

- Can eliminate the need for a dust collection system in open loading applications.
- Is a “soft loading” solution, reducing material degradation.

Cons:

- Does not control displaced air at the point of loading.
- Heavy and oversized to overcome capacity constraints.
- High acquisition costs.
- Not effective in enclosed loading applications without a dust collection system.

5. Loading Spouts

The aforementioned methods can be effective in limited applications, but all fail to address the primary cause of fugitive dust: the extraction of displaced air. This is key to dust management.

Vortex loading equipment is specifically designed to control this problematic mixture of air and dust, addressing the health, safety, and environmental issues faced by the industry. Vortex loading systems are designed per the demands of each application and address air displacement at the source.

Enclosed Loading

In enclosed applications, such as truck or railcar loading, the Vortex Loading Spout seats into the vessel’s loading hatch and works in tandem with a dust collection system or a filtration system to manage displaced air and dusts by means of air withdrawal.

With the Vortex In-Line Filtration System, the displaced air and dust mixture is:

- Aspirated out of the enclosed vessel;
- Dusts are captured in filter cartridges above. The cleaned displaced air which remains is exhausted to atmosphere;
- The captured dusts are purged back out of the filter cartridges and reintroduced into the material flow.

This creates a closed cycle, which minimizes material loss.

Open Loading

This approach can also be used in open loading applications, such as open truck beds and rail cars, barges, or stockpiles. This is achieved by attaching a dust skirt at the outlet of the spout, which rests over top of the peak of the material pile to seal the air withdrawal as materials flow.

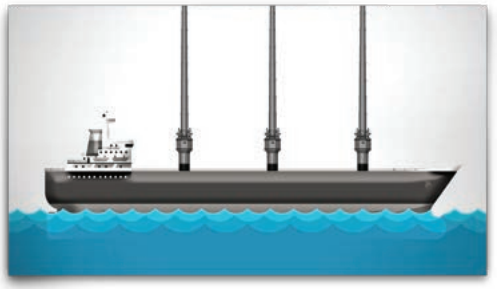
Which Technique is Best?

Controlling dust at loading terminals is a critical concern for many companies. Acquiring equipment that does not manage displaced air and dust can lead to costly health, safety, and environmental issues. Therefore, the Vortex Loading Spout is recommended for optimal dust management at the point of loading.

LOADING TYPES:

SHIP LOADING

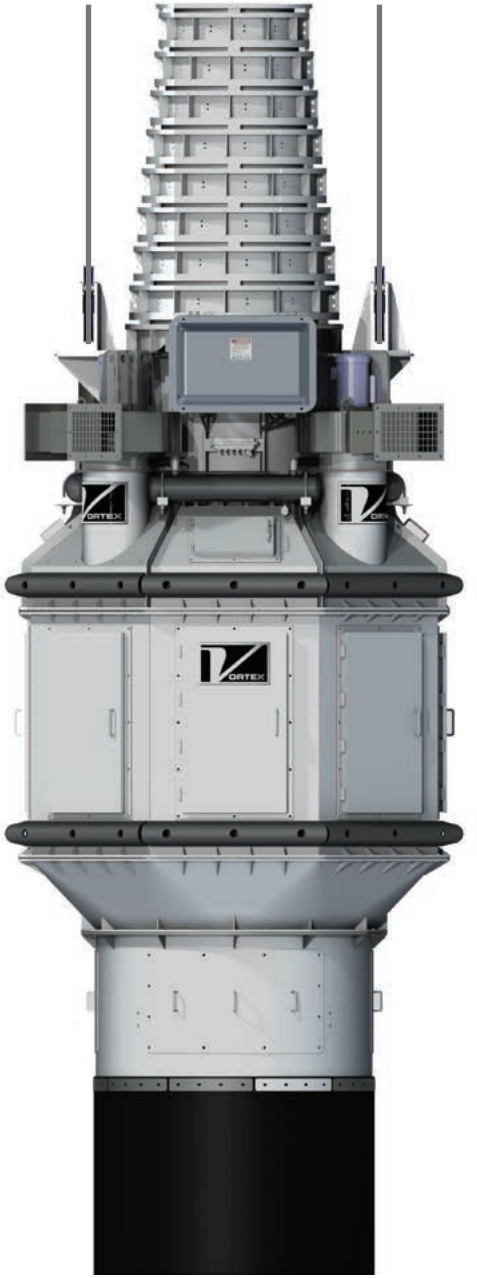
When loading dry bulk solid materials into bulk carriers, spout length, product dispersion and loadout speed are the primary concerns. For optimal performance, the Vortex® Ship Loading Spout can be used in tandem with accessories specifically designed for loading efficiency.



Historically, cargo ships, barges and other bulk carriers have gradually and consistently been built larger. The reasoning is simple: By using only one large ship to transport cargo instead of 3-5 smaller ships to haul the same quantity, it allows the transportation company to scale. Less ships. Less fuel usage. Less manpower. Less cost.

But at the port, it is quite expensive to acquire equipment and other resources necessary to expand and redevelop the port, in order to adjust to such dramatic changes in load rate capacities. Therefore, dry cargo ports are concerned with improving loadout speeds and efficiencies while reducing operating costs, so that operations continue to be profitable for them as well.

While many ports continue to lag in these areas by using pre-existing equipment, the Vortex Ship Loading Spout is specifically designed to meet evolving capacity requirements.



TECHNICAL SPECIFICATIONS

Spout Type	Telescoping, tube-in-tube
Materials Handled	Ideal for grain handling applications
Applications	Intended for ship loading applications. Can also be used in larger-scale stockpiling applications.
Conveyance Type	Gravity drop in the presence of slight negative pressure, if dust collection or filtration is applied
Material Temperatures	250°F | 120°C for standard spout, with modifications that allow up to 400°F | 205°C
Extended Travel	Spout lengths will vary, based on application. Contact us to discuss custom sizing options.
Considerations	To ensure success in its given application, each Vortex Ship Loading Spout is designed and manufactured on a case-by-case basis

"The most critical features of ship loading equipment are reliability and environmental safety. Nowadays, ports worldwide consider pollution prevention a primary objective – paying special mind to reducing dust emissions and preventing cargo overflow or spillage. To address these concerns, it is critical to incorporate sophisticated engineering controls and dust control measures capable of fulfilling the highest environmental standards."

– **Mark Schaberg P.E.**, Chief Engineer, Vortex

KEY FEATURES

Telescoping, tube-in-tube design

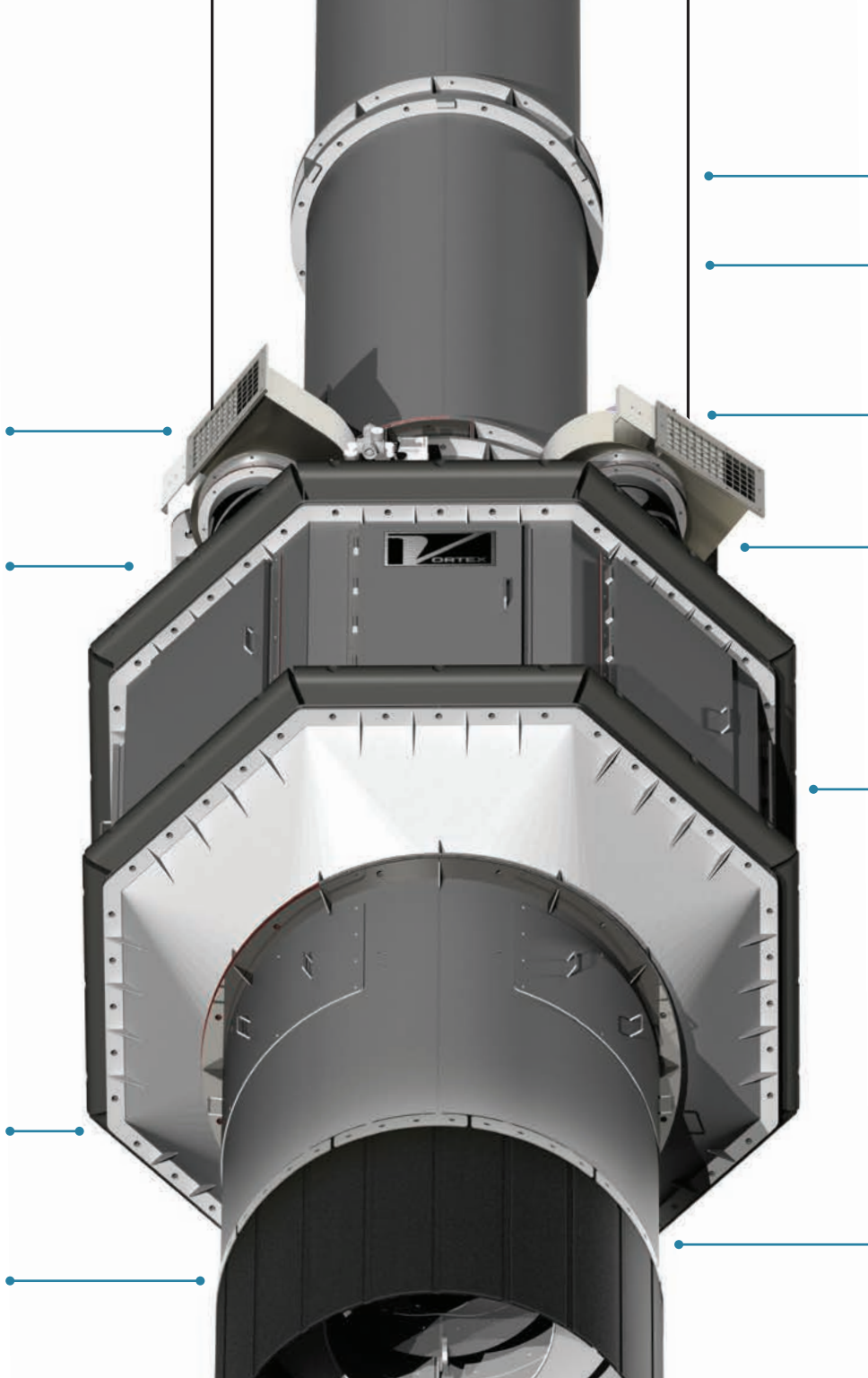
Filter access doors for easy filter cartridge maintenance

Sizing Options

**Not available in standard sizes. Vortex® Ship Loading Spouts require significant engineering consideration to ensure their success in each application. Therefore, Vortex Ship Loading Spouts are designed and manufactured on a case-by-case basis.

Optional trimming spoon horizontally disperses materials to fill hard-to-reach areas

Dust Control Skirt encompasses the peak of the material pile to prevent dusting to atmosphere



Rotation-resistant lifting cables

Tube flange seals

Two cable, dual-drum, two-part reeving hoist drive system

Two-position rotary limit switch

Discharge Filtration System captures fugitive dusts and reintroduces them back down into the load

Material Level-Sensing Device and Auto-Raise System indicate when the material pile has grown to a specified level and automatically raise the spout to prevent burying and avoid vessel overfilling

TUBE-IN-TUBE

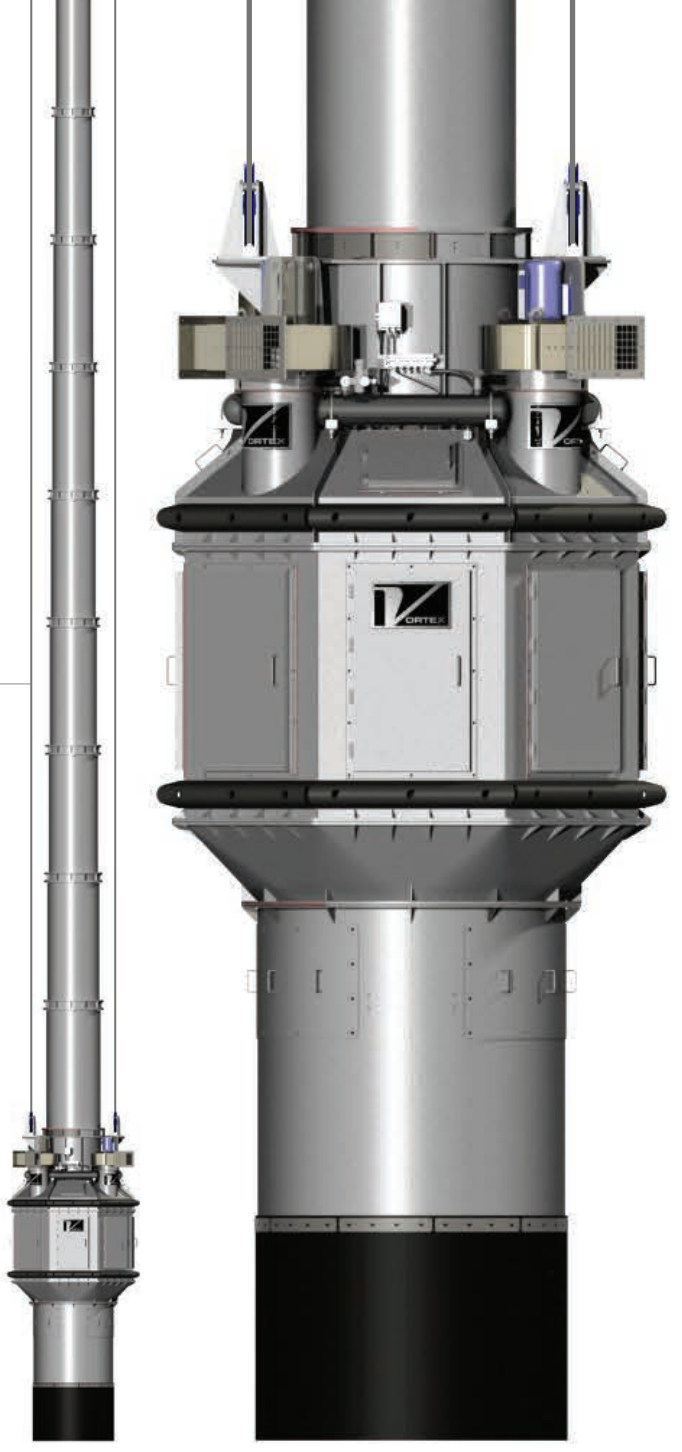
TELESCOPING SYSTEM

- Vortex® Ship Loading Spouts are constructed from telescoping tubes which slide into one another as the Ship Loading Spout retracts. In doing so, the Ship Loading Spout's overall height is condensed to allow vessels safe entry and exit at the port.
- The top flange of each tube is sealed using a layer each of plastic and rubber materials. This fills the void between each telescoping tube.

Tube Material Construction

By constructing Vortex Ship Loading Spouts from durable metal materials, the spout is protected from the elements of its surrounding environment, is protected against wear and abrasion from the material(s) handled, and is provided added stability in applications with especially long extended travel.

- 304 stainless steel
- 316L stainless steel
- A36 mild steel
- Ceramic-lined tubes
- Chromium carbide
- 400 BHN abrasion-resistant steel



TUBE-IN-TUBE

HOIST DRIVE SYSTEM

- Two cable, dual-drum, two-part reeving hoist drive system to better distribute the spout's weight. Therefore, the force required to extend and retract a Vortex Ship Loading Spout is cut in half.
- Vortex designs winch systems at 5:1 service factor for lifting cables. Rotation-resistant lifting cables are also available upon request.

  Note: Total breakage resistance may vary, based on weight and overall size of the Vortex Ship Loading Spout.
- Two-position rotary limit switch to set boundaries on spout full-extension and full-retraction. The rotary limit switch is driven by the output shaft, located on the main drive assembly. This device is factory supplied pre-wired into an electrical panel, which will also be mounted on the main drive assembly.
- Optional rotary absolute encoder provides analog output for intermediate positions. A rotary absolute encoder is direct-coupled to the output shaft, located on the main drive assembly. This device is factory supplied pre-wired into an electrical panel, which will also be mounted on the main drive assembly.

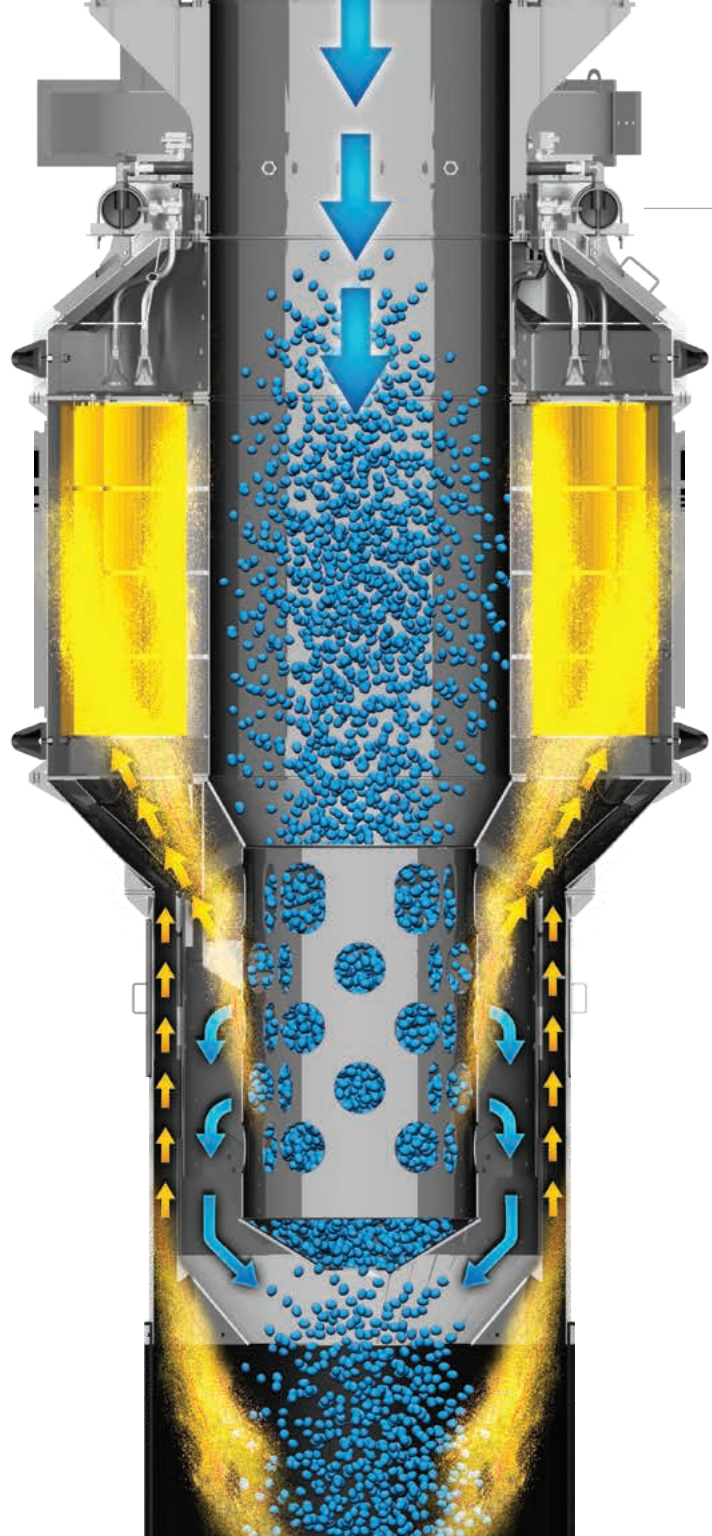
TUBE-IN-TUBE

FILTRATION SYSTEMS

Vortex® Filtration Systems are specifically designed to:

1) Displace dust-laden air from its source;
2) Separate dusts from the air;
3) Exhaust the cleaned air to atmosphere; and
4) Re-entrain the filtered dusts back down into the load.

Vortex Filtration Systems are “active units,” meaning an air withdrawal forcibly pulls displaced air and dusts through the filter cartridges to initiate the filtration process.



Discharge System

Designed to collect fugitive dusts by means of high volume exhaust blowers. Once the loading process begins, the blowers draw up fugitive dusts as they are generated by the material flow stream. The fugitive dusts are captured in a series of pleated polyester filter cartridges. Throughout the loading process, automatic reverse pulse jets inject compressed air to purge the captured dusts back into the load.

Thus, the Discharge Filtration System is designed to minimize product loss and prevent dusting to atmosphere.

A Discharge Filtration System is necessary in spouts with longer travel distances.

**To reduce energy consumption, compressed air is only forced through the reverse pulse jet system during loading operations. It is not a continuously running system.*

Key Features

- Reverse pulse jets self-clean the filter cartridges
- MERV 16-rated high efficiency filter cartridges

Material Contact Options:

- 304 stainless steel
- 316L stainless steel
- A36 mild steel
- Ceramic-lined material contact areas
- Chromium carbide

Filter Cartridge Options

- Pleated, spun-bound polyester media

Efficiency ratings (dry dust particle sizes):
- 99.98% @ 1/3 micron
- 99.99% @ ½ micron
- 100% @ 1 micron

TUBE-IN-TUBE LOADING

ACCESSORIES

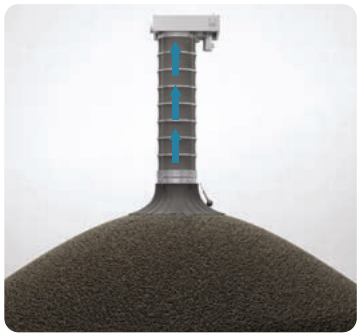
Material Level-Sensing Devices

For open loading applications, the purpose of a material level-sensing device is to automate the spout retraction process. In doing so, material level-sensing devices prevent material build-up in the spout, eliminate the need for visual monitoring throughout the loading process, and avoid vessel overfilling.

Dust Control Skirt

The Vortex® Dust Control Skirt is intended for open loading applications. It is constructed from heavy, durable neoprene rubber. Rather than flaring the skirt from a common piece of neoprene rubber, each flared section is a stand-alone neoprene rubber strip. Each strip of rubber is overlapped to prevent pathways for dust emissions to atmosphere. By flaring larger, the Vortex Dust Control Skirt is able to fully encompass the peak of the material pile, to better contain fugitive dusts.

Power of Comparison: Alternative loading spouts offered by the industry are specifically constructed for use in either an open or enclosed loading application. For clients that require both open and enclosed loading from a single source, those spout designs limit their capabilities – and often require the purchase of two loading spouts. To address this issue, Vortex offers an optional detachable Dust Control Skirt. By including this option, a spout can be supplied with an outlet scavenger to accommodate enclosed loading applications; then, to properly equip for open loading applications, the Dust Control Skirt can be attached along the upper perimeter of the outlet scavenger. Because of this capability, a Vortex Loading Spout can serve dual purposes.



Tilt Probe & Auto-Raise System

In open loading applications, a Tilt Probe is mounted at the outlet scavenger. The outlet scavenger and the Tilt Probe are typically separated by a Vortex Dust Control Skirt. As the material pile grows beneath the Dust Control Skirt, the Tilt Probe gradually begins to tilt. When used in tandem with an Auto-Raise System, once the probe is tilted to approximately 16°, it triggers an automatic, incremental retraction of the spout as materials continue to discharge. Once the specified load is achieved, the Tilt Probe can be synchronized with the process gate (or belt conveyor) above to automatically halt material flow before the spout is fully retracted.

Motor Starter Panel

As a convenience to the end user, all Vortex Loading Spouts can be factory supplied with a Motor Starter Panel. The Vortex Motor Starter Panel is specifically designed to be compatible with the Vortex Loading Spout's three-phase motor requirements, as well as the spout's other electrical components. Without a Vortex Motor Starter Panel, end users must supply a motor starter panel before the spout can be operated, which can be a timely and expensive process.

Aerial Camera System

For added visibility throughout the loading process, the Vortex Loading Spout can be equipped with an Aerial Camera System. At the main pan housing, a video camera is installed externally to provide an aerial view of the spout's position, relative to the loading vessel below. The live video feeds back to a monitor for real-time observation as the operator moves the spout into position.

Trimming Spoon

Mounted below the outlet scavenger. The purpose of a trimming spoon is to rotate around the outlet scavenger, in order to horizontally disperse materials to fill hard-to-reach areas.

CASE STUDY

Ship Loading Spout Handling Whole Grains

Client: Grain Elevator – South USA

Application: Situated on the Gulf Coast, this client loads whole grains and other agricultural commodities into ships and barges.

A belt conveyor is used to transport grains out of storage, toward the loading station. Upon arrival at the loading station, grains are discharged via gravity drop through a Vortex Ship Loading Spout, into a bulk carrier below.

Quantity: 3 Vortex Ship Loading Spouts

Main Drive Features:

- Vertical travel distance: 70 ft | 20 m
- Main pan housing constructed from A36 mild steel structure.
- Main drive assembly includes a 20 HP/230-460 V/three-phase/60 Hz electric brake motor with integral motor braking system (weatherproof).
- Hoist drive system incorporates 8 transfer sheaves to support 2 lifting cables.
- Encoder/controls specifications: 24 VDC voltage, 4-20 mAmp output signal, Rated for IP65
- Magnetic GO switches to detect end of travel
- Two-position rotary limit switches (rated for NEMA 4) to back-up the GO switches.

Ship Loading Spout Features:

- Material feed inlet size (diameter): 2 ½ ft | 0.75 m
- Each spout consists of 10 telescoping tubes.
- 1st & 2nd telescoping tubes constructed from 450 Brinell Hardness Number (BHN) abrasion-resistant steel (thickness: ¼ in | 6 mm), to address the abrasiveness of whole grains.
- 8 remaining tubes constructed from A36 mild steel (7-gauge thickness).
- The exterior of all 10 telescoping tubes is finished with industrial-strength grey epoxy coating.

Discharge Filtration System Features:

- Material feed inlet size (diameter): nearly 4 ft | 1.2 m
- Material contact areas constructed from 450 BHN abrasion-resistant steel (thickness: 3/16 in | 5 mm).
- Rest of unit constructed from A36 mild steel, finished with industrial-strength grey enamel.
- Equipped with 4 high-volume exhaust blowers (powered by a 5 HP/230-460 V/three-phase/60 Hz TEFC electric motor); rated for Class II Div 1 Groups F & G; enclosure rated for NEMA 4.
- Equipped with 16 filter cartridges (size: 1 x 4 ½ ft | 0.3 x 1.3 m); constructed from pleated, spun-bound polyester with PTFE coating.
- 12 AWG/30 conductor heavy-duty cord reel system transfers electrical to the Discharge Filtration System.
- Heavy-duty hose reel system (ID: ¾ in | 20 mm) supplies compressed air to the Discharge Filtration System.

Dust Control Skirt Features:

- Constructed from thick, neoprene rubber strips (length: 4 ft | 1.2 m).

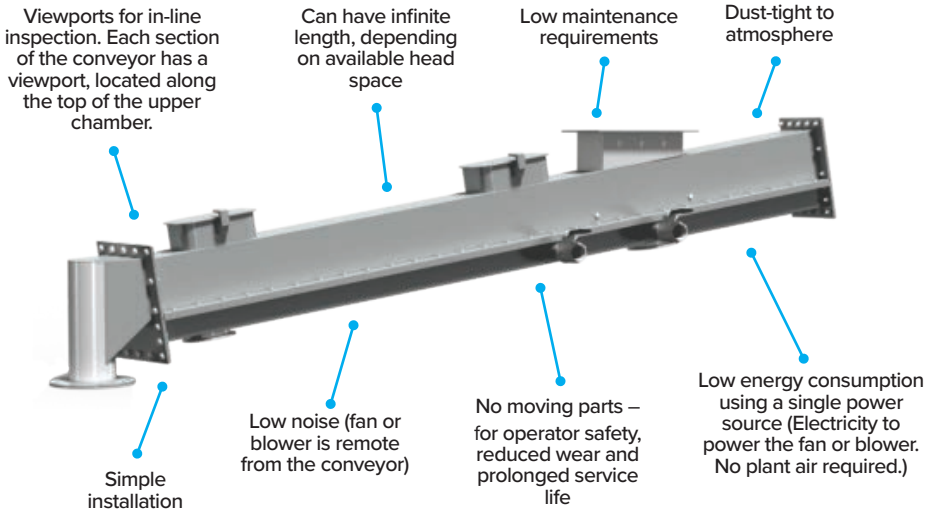
Results:
In total, each unit is estimated to have an operating weight of approximately 33,285 lb | 15,100 kg. Each unit's overall height is approximately 100 ft | 30 m when extended, and 30 ft | 9 m when retracted. These Vortex Ship Loading Spouts have a load rate capacity of approximately 1 ton per second.

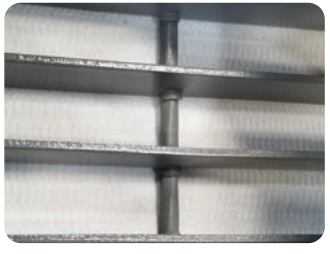
AERO-SLIDE CONVEYOR

The Vortex® Aero-Slide™ Conveyor consists of a rectangle-shaped convey line which is horizontally separated by an air-permeable, porous media to create an upper and lower chamber. To encourage material flow, the Aero-Slide Conveyor is installed at a slight downward slope – typically 6-8° from horizontal. In the upper chamber, handled materials are transferred along the porous media. Through the lower chamber, a fan or blower injects low pressure, dry air – typically 1 psig | 6.9 kPa. As air is pumped into the lower chamber, it permeates upward through the porous media. When counterbalanced by gravity, the air-gravity conveyor uses physics similar to an air hockey table to fluidize/aerate handled materials as they flow downstream through the upper chamber. Once materials are transferred downstream, the excess air is vented through a system bin or filter.

Optional Accessories:

- Dust collection vent at the end of the conveyor run.
- Mesh screen, to be installed atop the porous media. Intended for conveying fine materials – and especially, sand. The purpose of a mesh screen is to prevent heavier, granular materials from settling along the porous media, causing it to sag.





Porous media is supported by a durable steel grate

Cleanout ports to inspect for product in the lower air chamber and maintain, if necessary. Each section of the conveyor has a cleanout port, located along the bottom of the lower air chamber.

Rain ledge prevents precipitation from leaking into the conveyor

Inlet ports with ball valves to adjust the amount of air being injected into the air-gravity conveying system. Each section of the conveyor has inlet ports, located along the side of the lower air chamber.

Several options for porous media material of construction, based on application and material characteristics

TECHNICAL SPECIFICATIONS

Materials Handled	Lightweight, fluidizable dry bulk solid powders
Moisture Content	< 1% (Otherwise, materials can become too heavy to transfer and/or can harden inside the conveyor, creating blockages.)
Particle Size	< 50 mesh Contact us to discuss your material type
Material Temperatures	180°F | 80°C for standard conveyor, with modifications that allow up to 400°F | 205°C
Conveyor Construction Options	304 stainless steel, 316L stainless steel, A36 mild steel
Media Construction Options	Needled polyester, stainless steel media, porous stone, plastic
Media Support Grate Construction Options	A36 mild steel, 304 or 316L stainless steel
Conveyance Type	Low pressure, air-gravity conveyance only
Aeration Type	Dry air, using a centrifugal pressure blower or a positive displacement blower. Regulated compressed air from the plant service air system can contain moisture and/or oil, which can combine with materials and create clogs along the porous media.
Recommended Air Pressure	1 psig | 6.9 kPa, to be introduced at the beginning of every 10 ft | 3 m section. *This recommendation is subject to change, based on handled material characteristics. Contact us to discuss your application.*
Inlet/Outlet Options	Available in square or rectangular sizes
Standard Size/Conveyor Width	6 – 24 in | 150 – 610 mm *Dimensions may vary, depending on material(s) handled and application. Contact us to discuss custom sizing options.*
Standard Size/Conveyor Slope	Typically, Aero-Slide Conveyors are installed at downward slopes of 6 – 8° from horizontal. Depending on bulk density and other material characteristics, different materials may necessitate different sliding angles (2 – 16° from horizontal). Contact us to discuss options.
Standard Size/Conveyor Length	Conveyor length may vary, depending on transfer distance needed in a given application. Aero-Slide Conveyors are manufactured in sections of 10 ft | 3 m length. Shorter sections can also be manufactured to accommodate exact length. Contact us to discuss custom sizing options.
Flange Options	Standard flange pattern, ANSI, DIN, JIS Custom flanges are available

***Depending on slope and overall length of an Aero-Slide Conveyor, head space needed for installation may vary. Contact us to discuss options.*

POWER OF COMPARISON

• Alternative air-gravity conveyors offered by the industry incorporate a woven fabric media. A primary disadvantage to woven materials is they can be easily unraveled, cut, have holes punched in them, or be otherwise damaged. This results in frequent and expensive downtime for media replacement. To address this durability issue, the Vortex Aero-Slide Conveyor incorporates a needled polyester fabric media as a standard.

• Alternative air-gravity conveyors offered by the industry incorporate cross bars or metal screens beneath the porous media to provide it with additional structure and support. Often times, the gap between cross bars is too large, or the metal screens are simply too flimsy to support the weight of the material(s) handled. In either case, the porous media will begin to sag and create “dead spots” where materials become trapped along the conveyor. This creates conveying inefficiencies. For improved media support, the Vortex Aero-Slide Conveyor incorporates a durable steel grate beneath the porous media. The grate features equally spaced, intersecting cross bars which run latitudinal and longitudinal to the porous media.

• At the ends of each section of an air-gravity conveyor, media retainers ensure the porous media stays firmly in place. Alternative air-gravity conveyors offered by the industry use pop rivets to fasten the media retainers. Over time, pop rivets tend to wear and break, creating an air path issue within the conveyor. For added durability, the Vortex Aero-Slide Conveyor instead uses bolts to fasten the media retainers.

Additional Considerations:

• Outdoor installation or non-climate controlled indoor installation: Overnight temperature drops may create condensation within the conveyor. If materials are transferred through the conveyor before condensation has escaped, moisture can combine with dry bulk solid materials and create clogs along the porous media; or, moistened materials can harden and create blockages in the conveyor.

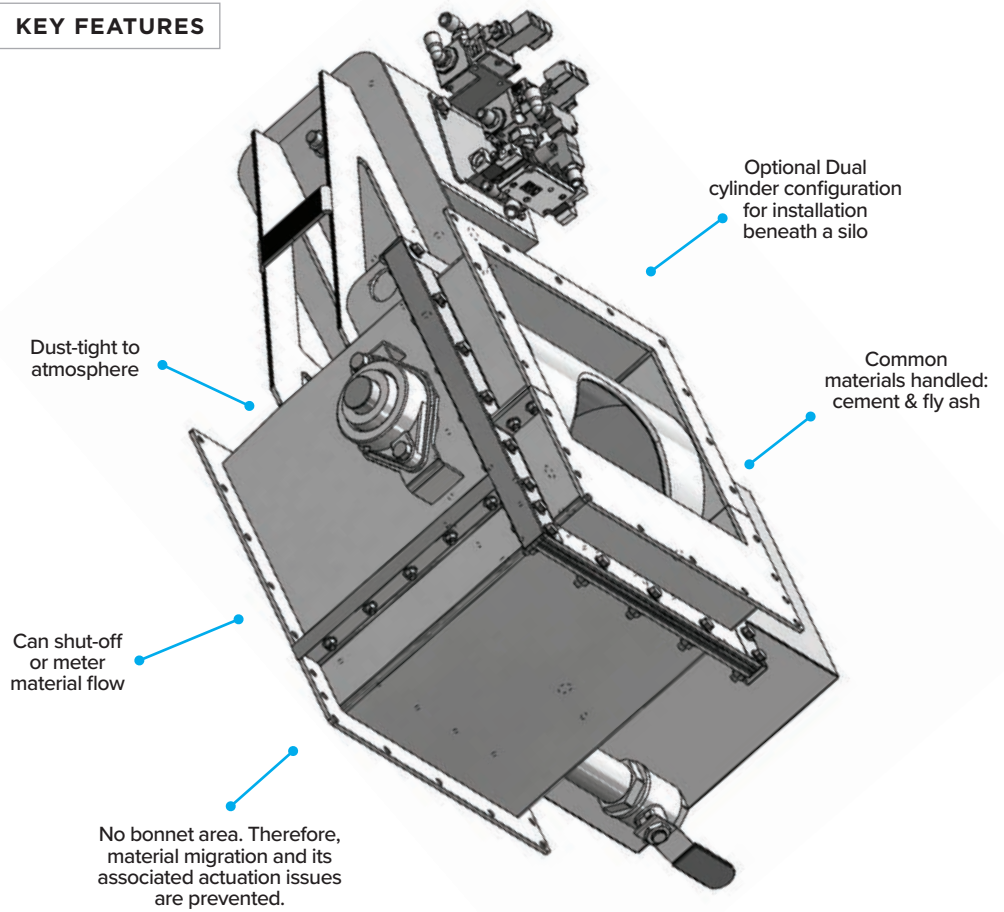
• For proper function, the porous media must be undamaged and must span the full length and width of the Aero-Slide Conveyor. Otherwise, materials can migrate into the lower chamber and disturb the aeration path, which creates conveying inefficiencies.

AERO DRUM VALVE

Ideal application: The Vortex® Aero-Drum™ Valve is specifically designed to be used in tandem with the Vortex® Aero-Slide™ Conveyor. Unlike the Vortex® Aero-Slide™ Gate, which is primarily intended for material shut-off, the Aero-Drum Valve is well-designed for metering material flow. The Aero-Drum Valve features a rotating, cylindrical-shaped blade with a V-notched bore. This provides for more precise metering control.

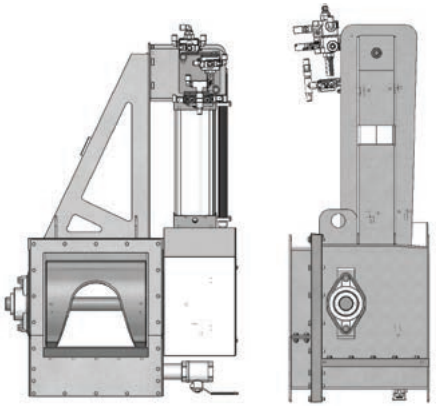
The Aero-Drum Valve is a self-contained unit that prevents material packing, dusting to atmosphere and other valve failures.

KEY FEATURES



TECHNICAL SPECIFICATIONS

Conveyance Type	Low pressure, air-gravity conveyance only
Materials Handled	Lightweight, fluidizable dry bulk solid powders
Standard Sizes	6 – 24 in | 150 – 610 mm Contact us for custom sizes
Opening	Available in square or rectangular sizes
Material Temperatures	180°F | 80°C for standard valve, with modifications that allow up to 400°F | 205°C
Body/Frame Options	304 or 316L stainless steel, carbon steel
Material Contact Options	304 or 316L stainless steel, carbon steel
Seal Construction	Felt
Drive/Actuation	Double-acting air cylinder (single or dual cylinder)



FRONT **SIDE**

For more information & technical resources, please visit:

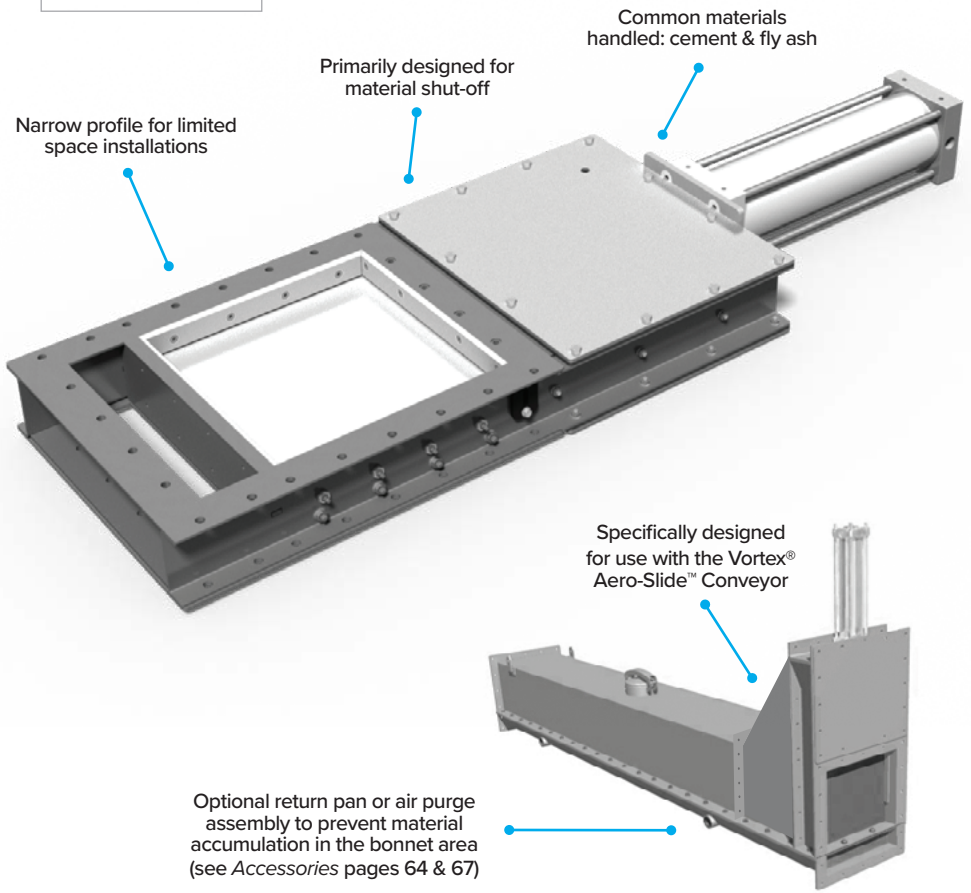
www.vortexglobal.com

AERO SLIDE GATE

The Vortex® Aero-Slide™ Gate is specifically designed to be used in tandem with the Vortex® Aero-Slide™ Conveyor. Designed much like a conventional Vortex roller-supported slide gate, the Aero-Slide Gate features a vertical-mounted blade with a downward closing stroke. While the Aero-Slide Gate can be used for metering, it is primarily intended to shut-off material flow.

Depending on application, the Aero-Slide Gate can either be installed within the convey line or beneath the silo discharge, at the Aero-Slide Conveyor's inlet.

KEY FEATURES



TECHNICAL SPECIFICATIONS

Conveyance Type	Low pressure, air-gravity conveyance only
Materials Handled	Lightweight, fluidizable dry bulk solid powders
Standard Sizes	6 – 24 in | 150 – 610 mm Contact us for custom sizes
Opening	Available in square or rectangular sizes
Material Temperatures	180°F | 80°C for standard gate, with modifications that allow up to 400°F | 205°C
Body/Frame Options	304 or 316L stainless steel, carbon steel
Material Contact Options	304 or 316L stainless steel, carbon steel
Seal Material Options	25% glass-filled PTFE, natural rubber, nylon, PET, silicone rubber, UHMW
Blade Roller Options	Hardened steel, nylon, 304 or 316L stainless steel
End Seal Construction	Pressure-loaded UHMW lined with polyethylene polymer
Modifications	Dual cylinder actuators (see page 61) Sealed body air purge (see page 64) Return Pan (see page 67)
Drive/actuation	Double-acting air cylinder, electric actuator, hand crank, chain wheel
Position Confirmation	Magnetic reed, proximity or mechanical limit switches
Material Flow Controls	AVP, IVP, VPO, VPC (see pages 65 & 66)

For more information & technical resources, please visit:

www.vortexglobal.com

CASE STUDY

Aero-Slide Conveyor Handling Cement 1

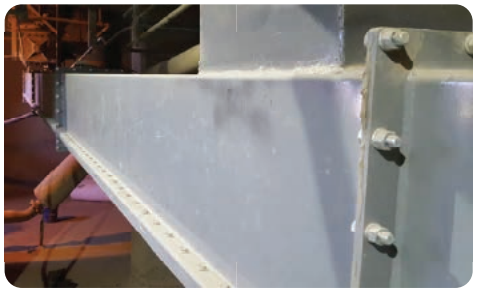
Product: Aerated Conveyor

Handling: Cement

Locations: Cement Packaging Facility
- Southeastern USt

Features: This 16” x 16” x 60’ (18 m) Vortex aerated conveyor replaced a screw conveyor used to transport cement from multiple storage silos to a cement bag filling station.

Application: For this particular product the aerated conveyor offers many advantages: less expensive, more energy efficient, creates less wear, requires minimal maintenance, and is environmentally friendly (being dust tight to atmosphere).



CASE STUDY

Aero-Slide Conveyor Handling Trona

Size: 6” x 6” (152 mm x 152 mm)

Handling: Trona

Location: Trona Processor
- Western United States

Features: Vortex air-gravity conveyors offer superior features for long-lasting performance:

- Non-woven, needled polyester media material
- Media is supported by a heavier grate that is supported by equally spaced crossbars
- Media retainer bars – bolted in (no pop rivets)
- Overlapping rain ledge between chambers
- Air inlet port, inspection port, and clean-out port in each section

Application: For this application the customer ordered two separate Vortex aero-slides: One was 25’ (7.6 m) long, the other was 158 ‘ (48 m) long.

CASE STUDY

Aero-Slide Conveyor Handling Cement 3

Size: 18” x 18” (457 mm)

Handling: Cement

Location: Rail Trans load Facility
- Eastern US

Features: Aerated conveyors are designed to economically move fluidizable powders across a low pressure cushion of air. They offer minimal maintenance and are dust tight to atmosphere.

Application: Vortex manufactures aerated conveyors and shut off gates as components for system groups, contractors, and installers utilizing this means of conveyance for material handling.

CASE STUDY

Aero-Slide Conveyor Handling Cement 2

Product: Aerated Conveyor

Handling: Cement

Locations:
Rail Trans Load Facility
- Eastern US

Features: The porous media material inside the Vortex aero-slide™ conveyor is supported by a heavier metal grate that is reinforced by cross supports within the conveyor chute itself. This method eliminates the problems created when the media is supported by a flimsy, expanded metal base or with cross supports alone.

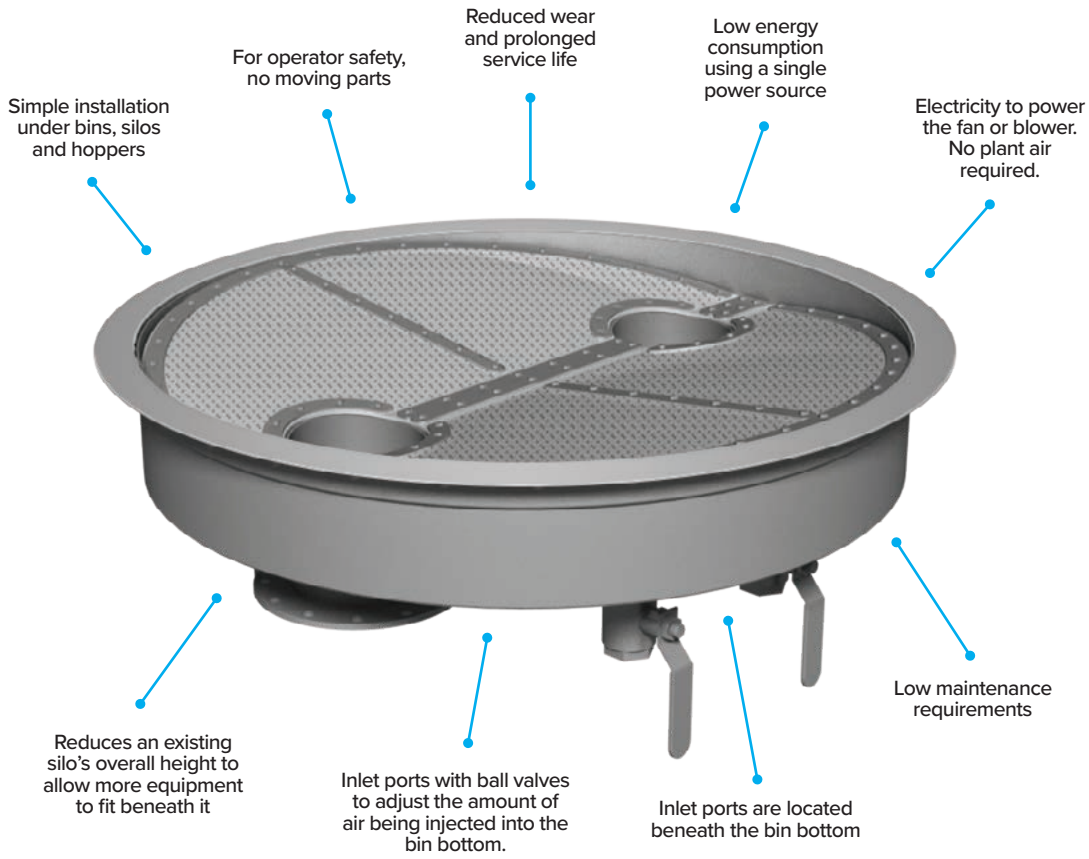
Application: Aero-slide™ conveyors provide an economical means of conveying light powders such as alumina, bentonite, cement, clay, fly ash, gypsum, limestone, and certain sand. This aero-slide™ is conveying cement from a storage bin to a Vortex retractable spout for truck loading.

AERO-BIN BOTTOMS

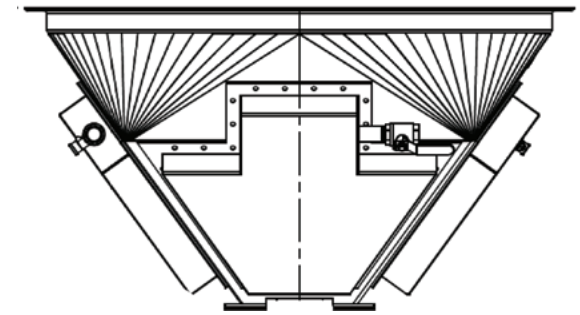
The Vortex® Aero-Bin™ Bottom is attached to the bottom of flat- or conical-shaped silos and hoppers; in particular, storage silos with especially large diameter. It contains two main design features:

- A full-bore silo outlet; and
- A porous aeration bed

KEY FEATURES



TECHNICAL SPECIFICATIONS



As materials begin to discharge through the silo outlet, a fan or blower injects low pressure, dry air (typically 6 psig | 41 kPa) upward into the silo via the aeration bed. As pneumatic pressures permeate the silo, the materials handled become fluidized. This encourages a consistent, continuous discharge of materials, in order to prevent bridging, rat holing and other discharge inefficiencies.

Because materials are air-gravity discharged, the Aero-Bin Bottom is among the most cost-effective solutions for discharging lightweight, fluidizable dry bulk solid powders.

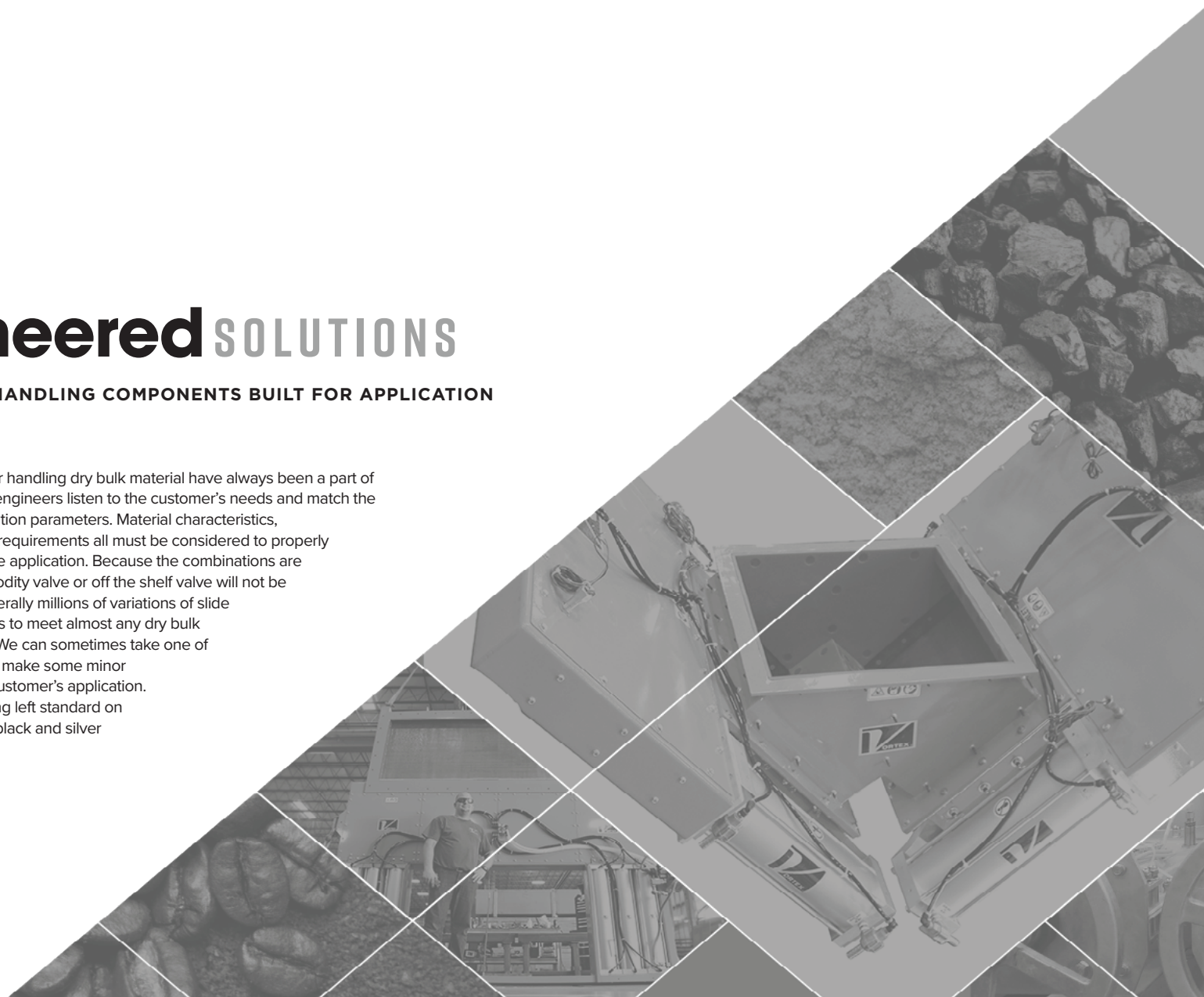
For more information & technical resources, please visit:

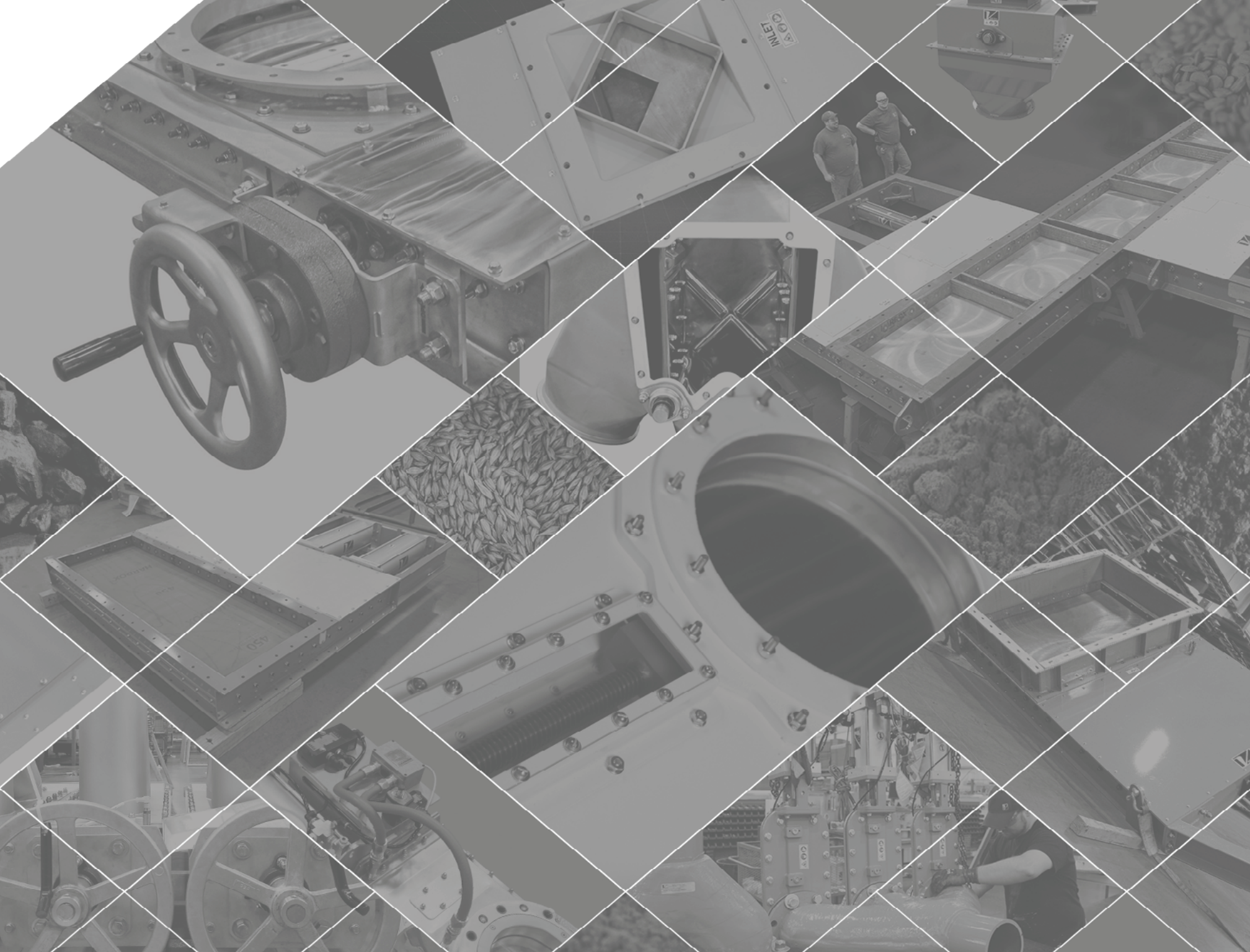
www.vortexglobal.com

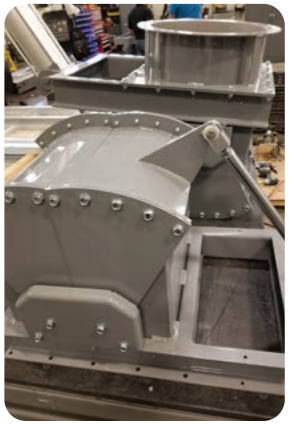
Engineered SOLUTIONS

SOLIDS & BULK HANDLING COMPONENTS BUILT FOR APPLICATION

Engineered Solutions for handling dry bulk material have always been a part of Vortex. Our application engineers listen to the customer's needs and match the right valve to the application parameters. Material characteristics, environment, and valve requirements all must be considered to properly modify the valve to fit the application. Because the combinations are nearly endless, a commodity valve or off the shelf valve will not be enough. Vortex offers literally millions of variations of slide gates and diverter valves to meet almost any dry bulk processing application. We can sometimes take one of our standard valves and make some minor modifications to fit the customer's application. Other times the only thing left standard on the valve is the famous black and silver Vortex sticker.







Custom Dual-Blade Clamshell Valve

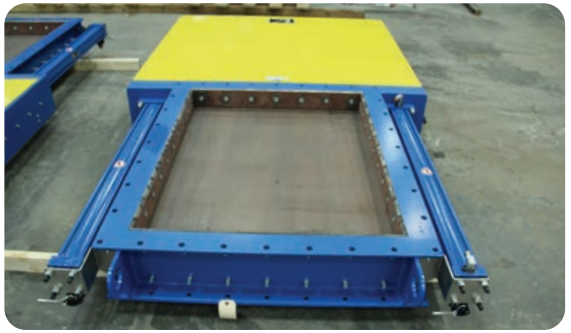
Size: 16 in | 405 mm

Material handled: Coal mill rejects/"Pyrites"

Location: Coal-fired energy plant – Vietnam

Features:
- Valve body constructed from carbon steel.
- Blades & liners constructed from 400 Brinell Hardness Number (BHN) abrasion-resistant steel.
- Pneumatic actuation provides the torque necessary to close through a flowing column of material.
- Equipped with a Variable Position Open (VPO), for partial gate opening to control material flow rates.
- Overlapping blades to contain fine materials.
- Round inlet transition.

Application: Unload pyrites from storage bins into open trucks.



Custom Roller-Supported Slide Gate

Size: 47 x 37 in | 1,195 x 940 mm

Material handled: Gold ore

Location: Gold mine – Canada

Features:
- Dual hydraulic actuators to shorten gate length.
- Custom paint to match client specifications.

Custom Flapper-Style Diverter

Size: 31 x 33 in | 785 x 840 mm

Material handled: Trona ore

Location: Trona mine – Wyoming, USA

Features:
- Custom inlet mates up to a conveyor
- Abrasion-resistant blade.
- Multiple removable access panels, for enhanced interior access. This allows inspection and/or maintenance to be performed while the diverter remains in-line.

Results: Trona tends to build up over time – hence the reason for the multiple access doors.

Custom Pneumatic Gate

Size: 10 in | 255 mm

Material handled: Aqua feed

Location: Eidsvaag – Gursvikdalen, Norway
Challenge: Product breakage must remain minimal to ensure the feed floats or sinks at specified rates. An added complexity is highly variable fatty oil contents, ingredients, and bulk densities amongst the different aqua feed blends.

Features:
- To minimize material breakage, ledges through the inlet were eliminated.
- Custom transitions were fabricated to maintain a low profile, yet transition from a 16 in | 405 mm (square) silo outlet down to a 10 in | 255 mm (round) convey line with a PN10 DIN flange.
- Equipped with an Infinite Variable Positioner (IVP) for infinite blade positioning and signal feedback to a programmable logic controller (PLC), based on Profinet protocol.

Application: Transfer delicate materials in a lean/dilute phase pneumatic conveying system.

Results: The success of this 2008 project led to additional collaboration on a similar project in 2012.

Dual Roller-Supported Slide Gate

Size: 55 x 28 in | 1,400 x 710 mm

Material handled: Adipic acid, used in the production of Nylon

Location: Chemical company – East USA

Features:
- Entire gate constructed from 304 stainless steel, to address compatibility issues when handling acid.
- Two independently controlled gates in a common frame.
- Dual cylinders actuators on both blades (4 actuators total).
- Special Service Inlets protect each gate's blade rollers from abrasion as materials pass through the valve. Special Service Inlets also create a void between the blade, seals and materials, to prevent material packing in the seals with each gate actuation.

Application: The client rebuilt a silo and required a custom-engineered gate to feed materials into a screw conveyor.

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