Pneumatic conveying technology
Clean, safe and efficient transport of bulk materials
Let’s get moving

Your conveying line is there to get material moving safely, not slow you down. Blocked pipes, dust contamination and unplanned maintenance outages have no place in your plant. It’s time to try something better.

Key benefits

A straightforward solution for complex materials:

- Fully enclosed material transport: no dust, no mess
- Flexible and versatile, adapting to your application
- Lowest possible operational costs
- Very low maintenance, high availability
- Long-distance conveying virtually anywhere
- Space-saving solution, works around existing equipment
- Thousands of installations worldwide
- Renowned brands
- State-of-the-art test facilities
- More than 1,000 materials tested

A reliable partner with extensive experience:
What’s the hold up?
Achieving optimum flowability and fluidisation is imperative. But handling dry bulk materials can be challenging. They can be abrasive. Prone to attrition. If your system isn’t fully enclosed, dust can escape. Unsuitable conveying system design can cause blockages, under-performance and build-up. Even worse, you risk unplanned changes in bulk characteristics. All of which cost you time and money to put right.

Traditional mechanical conveying solutions have a lot of moving parts, which require a lot of maintenance, which necessitates downtime. Once again you’re spending time and money. Not to mention risking personnel safety.

Free movement
Pneumatic conveying offers a safe and reliable solution with the added benefit of flexibility and low operational costs. These space-saving systems will take the material where you need it, regardless of the terrain or what other equipment you need to work around.

Pneumatic conveying solutions for multiple applications
FLSmidth is a leading supplier of pneumatic conveying equipment and serves industries such as cement, mining, power generation, lime, and pulp and paper. Our products and systems are proven to provide clean, safe, economical methods to meet virtually every pneumatic conveying and storage application.

As a customer-driven organization, we continually seek broader uses for our products, processes and technology to meet the ever-increasing demands of emerging and diverse applications. From low energy, dense phase conveying systems, to high-efficiency blending systems, the development of new products evolves to meet the specialized needs of global customers.

Our research team actively seeks out problems so that we can solve them before they occur. Varying process conditions are simulated in the laboratory so that the effect on the conveying system can be confirmed prior to actual installation.
Unloading and loading applications

Clean, low-maintenance loading and unloading solutions for road, rail or sea transport.

Take a load off
What are your biggest concerns when it comes to loading/unloading dry bulk from railcars, trucks and ships? Dust? Contamination? Transport capacity? Speed? Reliability? Flexibility?

Pneumatic unloading systems provide fully enclosed transport, eliminating the risk of dust affecting the local environment and machinery. Likewise, material running through pipes can’t be affected by the weather or other contaminants.

We offer high-performing, versatile loading and unloading systems. With no rotating parts, these systems are dependable, giving you maximal reliability and availability. And we can cater to your need, accommodating the right capacity for your application.

Railcar unloading
When it comes to railcar unloading, we understand that different operations have vastly different needs. Some operations rely on continuous rail delivery, while others use it less frequently. Whatever the capacity/demand, your unloading solution needs to be reliable, clean and cost-effective.

Dust-free ship unloading
Pneumatic vacuum unloading promises you clean, automated and reliable ship unloading. But not all vacuum systems are created equal. Our DOCKSIDER™ and KOVAKO® ship unloaders are:

- Fully automated, with easy-to-navigate touch screens;
- Environmentally friendly, thanks to the dust-free design;
- Backed by laboratory research into 160+ materials and a performance guarantee.

Finite Element Analysis (FEA) and kinematic studies are used to identify potential trouble spots.

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**HIGH CAPACITY/DEMAND:**

**Fuller-Kinyon® pump system**
- Continuous railcar unloading with compact design
- Single or multiple cars can be unloaded simultaneously
- Dust-controlled, clean operations
- Automated operations, requiring minimal labour

**MODERATE CAPACITY/DEMAND:**

**Kompact™ II pump system**
- Intermittent railcar unloading
- Up to two railcars per day
- Low maintenance
- User friendly, reliable
- Minimum height requirements

**MODERATE CAPACITY/DEMAND:**

**Pressure tank or V-Series feeder system**
- Single or dual tank; batch or continuous operation
- Dilute or dense phase
- Cost effective

**LOW CAPACITY/DEMAND:**

**Vacuum/pressure system**
- Multiple pickup/multiple destination
- High reliability
- Clean operation
- Continuous duty
DOCKSIDER™ Ship Unloaders
The DOCKSIDER ship unloader is built for flexibility. Every one is custom-designed for your specific terminal application, so we can offer:

- A range of capacities, from 400 t/h up to 1200 t/h, to suit vessels from 5000 DWT to 45 000 DWT, in stationary, dock mobile or gantry mobile configurations.
- Complete systems to move a wide range of dry bulk materials – even abrasive products such as alumina and coarse limestone – with multiple discharge options (pressure tanks, feeders and rotary valves).

The system can even discharge through a Fuller-Kinyon® pump – allowing for simple, low-pressure pneumatic conveying, or to a durable vacuum seal for material transfer to a dock belt conveyor.

KOVAKO® Ship Unloaders
The KOVAKO name is recognized around the world as a symbol of quality and performance for vacuum / pressure transfer of cement, fly ash and ground blast furnace slag from ships and barges to land-side storage. KOVAKO ship unloaders are offered in three standard models that match optimal unloading capacity with typical vessel sizes – eliminating the added costs associated with custom design. You can choose from either diesel or electric powered unloaders and in multiple configurations – making it easy to match a KOVAKO ship unloader model to any terminal application.
FLSmidth provides complete systems for all fine-grained bulk materials.

Where do you want to go?
Conveying systems should move materials where you want them to go, at the speed and density you require. Our systems are designed on that basis. You tell us what you need and we’ll find the right solution for you, not just the closest fit from a handful of ‘not quite right’ solutions.

Our range of pneumatic transport systems includes options for dense, mid and dilute phase conveying; pressure vessel, screw pump or Airslide® air gravity conveyor systems; high pressure or low pressure, but always low maintenance, clean and efficient.

TURBUFLOW®-Transport-System (TTS)
This pneumatic dense phase conveying system is well suited to fine-grained bulk materials such as fly ash, cement, and primary and secondary alumina. The patented TTS is characterised by a secondary inner pipeline, which ensures constant local turbulence by means of a port and diaphragm configuration, fluidizing the bulk material. The result is slow and energy-saving conveying with high loading. Perfect for abrasive materials, like alumina. And blockage-free, thanks to the secondary pipeline.

Multi-TURBUFLOW-Transport-System (Multi-TTS)
Based on the same design principle, the Multi-TTS conveys fly ash from multiple filter hoppers through pressure vessels into a common TURBUFLOW pipe. The row of pressure vessels can be controlled as a single unit and the patented ICC Control® system enables the Multi-TTS to automatically adjust to the actual ash production, ensuring a highly economical operation.

MÖLLER-FLUIDFLOW-Transport-System
The Möller Fluidflow® system is an innovative advancement on traditional pneumatic aeroslides that enables high bulk material loads to be conveyed at low velocities. Working in combination with a pressure vessel or screw pump this system can be operated with pressure of up to 3.5 bar and over.

Direct Pot Feeding
MÖLLER direct pot feeding utilizes either a complete FLUIDFLOW pipe air slide or a combination of TURBUFLOW dense phase conveying and FLUIDFLOW pipe air slide to ensure constant and reliable alumina transport all the way to the electrolytic cell. These systems are characterised by absolute freedom from dust emissions. They save a considerable amount of money, thanks to reduced cleaning and maintenance work, combined with maximum operational reliability.

Pressure Vessel Systems
If you want to transport bulk material safely and with low maintenance, FLSmidth’s Pressure Vessel Systems are the right choice for you. This economic pneumatic conveying system is also suitable for high capacities and strongly abrasive bulk materials. For throughputs up to 1 t/h to 300 t/h and conveying distances up to 3000 m without intermediate stations. Used in combination with the Turbuflow system, we can provide the best various capacity tank conveying system for your application.
Mixed phase Fuller-Kinyon® pump transfer systems for simplicity and durability

Heavy-duty, screw-type Fuller-Kinyon pneumatic pumps are commonly used to convey dry, free-flowing materials from grinding mills, transfer materials from silo to silo, transfer dust from collectors, and load and unload railcars, ships and barges. The materials are conveyed literally anywhere a pipeline can be run and to any number of delivery points. Distances of 1585 meters (5200 feet) are not uncommon.

- Continuous operating systems, reliable for 24/7 duty
- Lower velocities and higher pressure than dilute phase
- Most economical and reliable long-distance, high-capacity technology
- Operational simplicity - only one moving part
- Maintenance-friendly access
- Pneu-Flap™ torque arm controller reduces maintenance costs, lowers power consumption and increases capacity
- FK Auto-Lube lubrication system delivers the precise amount of lubrication required for each FK pump while monitoring the bearing temperatures.

Fuller-Kinyon® 300M pump

Pneumatic conveying systems – versatile solutions from a single source

- Conventional conveying systems
- Dense phase conveying systems
- TURBFLOW® dense phase conveying systems
- Pressure vessel systems
- Fuller-Kinyon® pumps
- MÖLLER® pumps
- Ful-Vane® compressors
- Airlift™ systems
- Airslide® air gravity conveyors
- Silo systems of all sizes and models
- Unloading stations for ships, trucks and rail
- Loading stations for trucks, rail and ship
MÖLLER® Pump
With more than 1000 installations worldwide, the MÖLLER® Pump is at the heart of bulk materials pneumatic transport for capacities from 1 to 250 t/h. The adjustable mixer head can be rotated 360˚ to enable all possible conveying directions, while the continuous, pulsation-free design makes this system especially suitable for burner feeding. A shock-proof version is also available for transporting volatile combustibles such as coal dust.

Dense phase system for maximum efficiency and cost effectiveness
There are five alternatives for dense phase conveying, designed to provide options for every application.

- TURBUFLOW® conveying system
- MaxiDense™ Dual Tank System
- MODU-DENSE™ conveying system.
- Fullveyor conveying system
- EZ-FLOW™ conveying system

The original Fuller® Airslide® gravity conveying system for efficiency
FLSmidth’s Airslide® air gravity conveying system utilizes gravity to do most of the work. Material is fluidized through a porous media with low-pressure air and the Airslide is sloped to match the fluidized angle of repose of the powdered material. At the correct slope, fluidized materials flow like a liquid.

- High capacities, +1500 m³/hr (53 000 cf/hr)
- Multiple inlet and discharge options
- Fabric available for high temperature applications up to 454°C (850°F)

Airslide gravity conveyors have no moving parts, so there is low noise and low maintenance costs - just clean, gentle conveying.
**Ful-Vane™ compressors**

FLSmidth offers a full range of single-stage and two-stage compressors, from critical parts to complete self-contained packages. Packages may be custom built to project specifications or FLSmidth standards. Auxiliary components are available upon request. The Ful-Vane compressor is the perfect marriage with Fuller-Kinyon® pump packages for ultimate reliability.

- Large inlet area provides efficient capture of large air flows
- Only three moving parts for minimal mechanical losses
- Constant blade-to-cylinder contact results in sustained compression efficiency
- Shaft and bearing design minimizes drive losses; suited for operation with VFD
- Ful-Lube™ automatic compressor lubrication system available separately
- Closed loop coiling available

**Future fuels – expertise in alternative fuels**

Biomass is forming an increasingly important part of the fuel mix for power plants and other manufacturing facilities. We are prepared to meet new demand with tailor-made solutions, from engineering to commissioning and start-up.

All in full compliance with applicable European regulations and directives such as:
- Machinery Directive 2006/42/EC
- Pressure Equipment Directive 2014/68/EU
- ATEX Directives
- 2014/34/EU (Machine/Equipment safety)
- 1999/92/EC (Employers safety)
- EMC Directive 2014/30/EU
- Low Voltage Directive 2014/35/EU
- Construction Products Regulation No. 305/2011/EU
- Ecodesign requirements for energy-using products 2009/125/EC

**SK™ V2 2-Way Diverter / Converger Valve**

The SK™ V2 diverter valve is well-suited for many abrasive materials and has a new leaner profile with streamlined parts and lower weight. The seat cartridge is all one piece and it’s easily replaceable via the over-sized hinged access port.

- Compatible with dilute-, two- or dense-phase pneumatic conveying applications
- Available in either standard or ATEX 20 versions
- Right or left-hand configuration can be re-purposed on site
- Actuation is manual, pneumatic or mechanical
- Increased safety – no linkages or guards are required

Our Ful-Vane compressor is designed to allow the cylinder to be rebored and rotor to be reslotted several times, giving you the highest return on investment within the industry.

**Ful-Pak™** packaged air compressors are the ideal solution for the demanding conditions of pneumatic conveying applications. Compact and totally self-contained in a low-noise enclosure, it is the complete air power source for reliable, efficient operations.

Fuller-Kinyon pumps are recognized worldwide as the most successful, most reliable, most versatile pneumatic conveying system, and are available in sizes and configurations to fit virtually every application.
Vertical conveying systems

Vertical pneumatic conveying where you need it, for clean, safe and economical transport of a range of bulk materials.

Why vertical pneumatic conveying?
Vertical transport applications have typically been served by mechanical conveying systems. These operations can be dusty and high maintenance, leaving you with costly clean-up and expensive downtime. Not to mention the safety issues that come with both.

Vertical pneumatic conveying provides a clean, safe and reliable way of transporting fine or granular materials to heights of more than 100 m at rates of up to 1000 t/h. Flexible to your plant layout and your needs, FLSmith’s vertical pneumatic transport options are compact and suited to a wide range of materials and applications.

Applications
- Finish mill to storage silos
- Raw mill feed to blenders
- Feed to preheater
- Ship unloading feed to storage silos
- Feed to roaster
- Feed to storage bin
- Feed to silo
- Feed to mixing bin

Materials
- Cement
- Alumina
- Copper concentrate
- Fly ash
- Aluminium hydrate
- Copper flue dust
- Fluid coke
- Catalyst
- Lime

Airlift™ conveyor for vertical pneumatic conveying
FLSmidth's Airlift™ Conveyor

The Airlift™ Conveyor is a simple, maintenance-free solution for vertical pneumatic transport of powdery and fine-grained bulk materials. With no mechanical or drive elements, the Airlift is not subject to wear like mechanical conveying solutions, giving you a reliable system with high availability at low specific energy consumption.

- Abrasive materials? No problem. We use wear-resistant material for the pickup pipe on these applications and we avoid dead space to increase reliability.
- High temperatures? Not an issue. Fluidization fabric can withstand bulk material temperatures of up to 300°C.
- Contaminants causing you problems? We can fit a grating to remove contaminants from the conveying process.

Pressure, vacuum or combination dilute phase conveying systems

Airveyor™ dilute phase conveying systems offer a completely flexible solution, transporting materials horizontally or vertically using pressure, vacuum or combined systems. From unloading bulk transport vehicles, throughout weighing, batching and blending, to unloading from process and into shipment, Airveyor systems keep your material moving cleanly, safely and economically.

- Pressure systems offer high-capacity material transport over longer conveying distances. Operating at pressures up to 35 psig, pressure systems can satisfy conveying capacities up to 100 tph.
- Vacuum systems offer a low-cost alternative for low-capacity transport over short conveying distances.
- Combination vacuum/pressure systems offer higher conveying capacities over longer distances, with reduced headroom requirements at the collection hoppers.
Powdery and fine-grained bulk materials bring specific storage challenges. When fines settle, solidification can occur, making it difficult to discharge the materials when the time comes. Not only that, but blockages and buildup can also put a lot of strain on your equipment.

Understanding material behavior
FLSmidth provides complete storage and blending systems for all fine-grained bulk materials, from the double-cone silo (DCS silo) to the MultiDom™ large-capacity silo (MDS silo). These solutions are designed to account for the behavior of dry bulk materials at rest and ensure your materials are ready to go when you are.

Long-term storage
Long-term storage can create problems as material solidifies. For example, quality ash produced in the power plant industry is usually sold to the cement industry. Although produced in the winter months, it cannot be marketed until the following spring. The ash is therefore put into storage in large silos where it is prone to solidification over time. With the MultiDom silo, a portion of the material is recirculated – discharged and conveyed back to the top of the silo – at fixed intervals. This prevents materials compacting and bridging, ensuring easy discharge when required.

The range extends from buffer silos through to large-capacity silos with a capacity of 80 000 t and more. Special features include load-distributing filling to protect the silo wall, anti-segregation equipment, the expedient introduction of fine filter return material and a high degree of residual discharge. The venting units have been developed in such a way that different fluidizing areas are aerated in succession, to ensure minimal energy consumption.

The simple principle of fluidization
Low-pressure air is introduced into the material through the porous Airslide® fabric membrane, causing the material to act in a semi-liquid state. With only an 8 to 10 degree floor slope, the material flows like water to the discharge point – and with virtually no abrasion since it is floating on a cushion of air.

With no moving parts inside the storage area, a Ful-Floor™ reclaim system is your best solution for domes, flat storage warehouses and flat-bottom silos.
Dome storage

Dome storage – Ful-Floor™ reclaim systems
Ful-Floor™ reclaim systems for dome silos use industry-proven Airslide® fabric anchored to nearly 100% of the floor area. Embedded aeration troughs and piping eliminate restrictions that can inhibit material flow. The results: complete reclaim of your stored material with minimal floor slope, low average power and low maintenance.

Airmerge™ blender
Air blending is achieved by use of a porous membrane over the entire bin bottom, four or eight air plenums and a simple flow control system. Together they change the density of material in the fluidized bed of material to generate a gentle folding action and a near perfect blend.

- Gentle blending action with diffused fluidizing air through porous membrane fabric for silos up to 2832 cubic meters (100 000 cubic feet) in volume
- 3-in-1: blender, storage, efficient discharge
- No moving parts, low maintenance, low noise
- Effectively overcomes bridging or funnel flow when discharging material
- Rapid and total discharge capability

Column blender
A fully fluidized cone, an upper and lower air plenum and an open-ended central column allow the principle of air blending to be applied to even the most difficult materials. The fluidizing air enters the cone beneath the column, creating a "fountain-flow" that gives a radial circulation capable of blending an array of product types.

- No moving parts, low maintenance
- Gravity discharge 60° cone design
- Simple operation
- Robust design
- Greater flexibility in range of particle size
- Design for different batch sizes available

Gravity blending
The advanced engineering of the RANDOM-FLOW™ gravity blending and storage system delivers increased capacity, productivity and savings.

It is a cost-effective gravity blending and storage system that requires low power consumption but provides high blending efficiency. The silo floor consists of six aeration zones, each with six collection points. Blending is achieved by systematically withdrawing layered material through a gathering slide from a total of 36 collection points. The material is withdrawn by low-pressure air in closed-type Airslide® gravity conveyors from the collection points to the central silo discharge point.
Research and development

FLSmidth brings together the combined expertise of the MÖLLER and FULLER brands, giving you incomparable know-how in the field of pneumatic conveying engineering.

Ongoing research, high-tech developments
We use the latest technology to design and build tailor-made pneumatic conveying and silo systems for the most diverse requirements. Our engineers and technicians are continuously working to improve existing offerings and to develop new, innovative products.

All key components that come into contact with bulk material are configured, developed, and designed in our in-house design department. Conveyor trials are continuously executed on the test plant. We’ve tested over 1000 different materials to date and we’ll keep testing to make sure our equipment suits your needs. We want to find the optimum configuration parameters for each material and for every application, so if you want to commission tests or to run trials at your plant, we’ll be happy to help.

We work with universities and technical colleges to ensure that calculation models and trials are of the utmost quality.

World-class test facility
FLSmidth’s state-of-the-art test facility is dedicated to providing industry-leading support for pneumatic conveying and blending applications. The complex is home to a wide variety of equipment used for the research of process designs, testing to support customer projects, and development of new technologies. The comprehensive in-house capabilities, unmatched variety of equipment, and the breadth of experience differentiate FLSmidth in the industry and directly contribute to the success of our customers’ installations worldwide. Decades of extensive cataloging of physical and chemical evaluations and critical design data supplies an unparalleled knowledge base for future system designs.
Robust, versatile and efficient

Engineered to solve most feed problems, our V-Series feeder handles dry, fine powder or granular product efficiently in both vacuum or pressure conveying systems and dilute phase and dense phase systems.


Clean, safe and efficient

transport of bulk materials

Learn more about KOVAKO® – the original pneumatic ship and barge unloader


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Bringing better solutions to light

in the cement and mining industries

The future is full of possibilities and you are leading the way. But it’s never a straight journey and it’s easy to lose sight of true potential. With an ally by your side, who shares your ambitions and who sees your world from different angles, we will find the right way together.

For more than 135 years, we have challenged conventions and explored opportunities. Across more than 50 countries, we are 13,000 employees who combine our unique process-knowledge on projects, products and services to drive success. We develop the most advanced technology in our industries and offer market-leading product and service ranges.

Rooted in Danish values, we activate our knowledge and experience to navigate your complexity and bring better solutions to light. So no matter where in the world you are, we are here to help you discover new ground and achieve sustainable productivity enhancement.

We are the market-leading supplier of engineering, equipment and service solutions to customers in the global mining and cement industries.

We discover potential.