We know how Pneumatic Conveying

TECHNIK

We know how
About

Since its founding in 1906, Claudius Peters has become one of the world’s most respected engineering houses and an innovative world leader. Its German engineering excellence continues to set benchmarks for the design, manufacture and commissioning of materials handling and processing systems for the gypsum, cement, coal, alumina, steel and bulk-handling industries.

From conception and installation through to commissioning and after-sales support, Claudius Peters provides world-class service to the world’s biggest bulk materials producers.

The Claudius Peters Group GmbH is headquartered in Buxtehude near Hamburg, Germany, with regional offices in the Americas, Asia and Europe.

Claudius Peters is one of the world’s leading suppliers of pneumatic systems for the conveying of dry bulk materials.

With experience in the handling and analysis of over 13,000 different types of bulk solid, Claudius Peters can determine the precise conveying procedure for any requirement.

Claudius Peters’ service includes delivery of a complete plant, from examination of bulk solids through selection of conveying system with auxiliary components to installation and plant commissioning.

Design of required pneumatic equipment (including bulk solid feeders, air supply equipment, conveying pipelines and the air/solid classifiers) can come from a client’s specification or from Claudius Peters’ own material sample analysis.
The Claudius Peters Technikum (Technical Center) offers clients a laboratory with facility to test all bulk solid conveying systems.

Extensive testing, backed by years of experience enables Claudius Peters to design and produce conveying systems which combine high reliability with minimal power consumption.

With conveying lines up to 5km long and a wide range of pipe diameters, the laboratory enables the design and supply of systems which have been calculated for optimal process, cost and operating parameters.

In the Technikum, conveying procedures can be tested for any load, gas velocity, conveying pressure and conveying distance.

Each material is measured for deaeration time, density, humidity and wall friction angle, with data documented in a test report supported by EDP and used to ensure optimal plant design.

In the Technikum, conveying procedures can be tested for any load, gas velocity, conveying pressure and conveying distance.

The Claudius Peters, DIN EN ISO 9001 certified working procedure.
A typical plant consists of a bulk solids feeder, a pressure generator, conveying pipe and a separator.

The Geldart diagram (below) shows how Claudius Peters classifies bulk solids, with grey areas showing materials which can easily be conveyed in a dense phase mode.

Characteristics of bulk materials, determined from sample analysis, are used in configuration of the plant.

The appropriate conveying procedure is determined by results from the bulk solids test and the conveying tests, along with the customer’s basic conveyance data. Once this is determined, the plant can be designed for optimal power efficiency. The required task and the bulk solid’s behaviour will then determine selection of the conveying mode.
Feeder selection

Claudius Peters delivers positive pressure conveying systems.

The diagram (below) illustrates the structure of a positive pressure vessel conveying system, where quantities of bulk solids are introduced into the conveyor pipe against the conveying pressure, resulting in no air leakage losses. Claudius Peters offers a complete range of feeder types.

Types of feeders for plant configuration

The chart (bottom) shows the variety and features of available feeders along with their standardized range of applications. Claudius Peters can also supply solutions for ranges not included in the chart.
The Claudius Peters FLUIDCON system offers the advantages of pneumatic conveying with considerably lower energy requirements owing to its unique aeroslide transportation principle within the transport pipe.

Additionally, FLUIDCON provides a dense phase system with increased bulk material load and can be used to convey all fine bulk solids that can be fluidized with low air velocities, expanding homogeneously during the process. Depending on the transport pipe routing chosen, it can substantially reduce power consumption.

About FLUIDCON
FLUIDCON is a conveyor pipe that can partially or completely fluidize material over the horizontal length of the pipe (the aeroslide principle). The air is used to fluidize but not transport the material.

To transport the material, transport air travels perpendicular to the fluidized air and passes in an axial direction. The pressure loss of the transport air flow substitutes for the inclination of the aeroslide. The aeroslide principle turns the bulk solids into a fluid state with minimal internal friction and ensures that it remains fluidized away from the bottom of the pipe and in the gas flow. These optimum conveying conditions allow the transportation of solids with lowest axial driving gas velocities in the feed point and acceleration section of the pipe. It is therefore possible to convey materials with the FLUIDCON system using minimal differential pressure through uphill inclines of up to 30°.

Advantages of FLUIDCON
- Reduced operating costs. Substantially less energy consumption. Compared to conventional pneumatic conveying
- High availability. The system is easily started or restarted even when solids remain in the conveying line
- Gentle material handling. This is due to lower conveying velocities starting at approximately 2-3m/s and ending at approximately 5-10m/s
- Alternative feed systems. With a reduction in the conveying pressure, Claudius Peters X-pumps (screw pumps) can be installed instead of conventional pressure vessels to ensure savings in height and capital costs
The Claudius Peters FLUIDCON System has proven to be a valuable alternative in bulk materials handling applications.

Additionally, this type of system can be utilized in ash removal plants where it is particularly suitable for the removal of fly ash from a baghouse or ESP. The fly ash discharge points are connected to a common FLUIDCON conveying pipe and the ash is continuously removed and can be conveyed long distances.

The application of the FLUIDCON system for conveying dust beneath filter installations offers a number of advantages compared to other conveying technologies:

- Lower investment cost
- Lower gas and solids velocities
- Lower conveying pressure
- Reduced wear
- Lower power requirement
- Lower installation height
- Simplified material feeding

Schematic of power plant fly ash handling.
The main features of pressure vessel conveying are:
- High availability
- Low maintenance requirements
- Partial load operation
- Suitable for dense phase conveyance
- Appropriate for all types of bulk solids
- Available in sizes up to 50m³
- Conveying distances up to 3,500m
- Conveying pressures up to 30 bar
- Suitable for systems with top or bottom discharge

The main principles of pressure vessel conveyance are:
1. Filling
2. Pressurizing
3. Conveying
4. Venting
Solids can be conveyed by single, twin or double-storey vessels as required.

**Single pressure vessel conveyance:**
- Batch conveyance
- Maximum capacity 150t/h
- Fully automatic
- Simple, low costs

**Twin pressure vessel conveyance:**
- Quasi-continuous conveyance
- Maximum capacity 300t/h
- Fully automatic
- 50% reserve in case of vessel failure

**Double-storey vessel conveyance:**
- Continuous conveyance
- Maximum capacity 150t/h
- Fully automatic

**Special applications**
As well as conveying vessels, Claudius Peters also offers injection vessels, which are designed to inject substances against high counter pressures. If required, injection vessels may incorporate distribution devices within the conveying pipe to divide the material flow, such as when feeding coal into a blast furnace at separate points.

**Design parameters for this type of application:**
- Standard sizes: 0.2m³ to 20m³
- Customized sizes to 35m³ are in operation
- Throughputs to 300t/h are presently operating
- Distances to 3,500m
- Customized solutions
- Modern control techniques with valves suit the specific bulks
As a core component of the Claudius Peters product range, the X Pump is one of the most successful conveyance systems ever developed, providing long and reliable operation for clients worldwide.

When bulk solids are fed into the pump surge bin for deaeration, the rotating screw compresses them to a plug at the end of the screw. This plug acts to seal off the conveying pressure while the bulk solids pressure builds up, forcing the check flap open. Solids are then fed into the conveying air stream and conveyance begins.

The Claudius Peters X-Pump offers:
- Continuous conveyance
- Suitable for dense phase conveyance
- High availability
- Low maintenance
- Partial load operation possible
- Fine particle bulk solids possible
- Conveying volumes to 640m³/h
- Conveying distances up to 1,500m
- Low construction height
- Pressure and shock resistant design
- Pulsation free conveyance
The Claudius Peters X-Pump is an optimum solids feeder of outstanding capability, useful in a wide range of applications, including silos, pre-heaters, pre-calciners, ship loaders and more.

For example, 400 t/h cement can be conveyed distances of up to 1500 m. Additionally, the geometry of the screw can be adjusted to accommodate the requirements of specific bulk solids.

The X-Pump has a broad range of possible applications, from silo feeding, injection of pulverized coal and transport of filter dust, to pre-heater feeding and cargo ship loading and unloading.

**Capacity ranges:**
- Conveying capacities to 400 t/h cement equivalent to 640 m³/h
- Conveying pressures to 3.0 bar gauge
- Conveying distances to 1,500 m
- Loads to 100 kg solids per kg conveying gas

**Special features:**
- Variable arrangement of the pump outlet
- Different screw geometries and end flights
- End flights can be replaced separately
- Easy assembly – wear parts can be replaced with minimal dismantling
- Screw supported at both ends of the shaft
- Individual screw geometry for each bulk solid
- Check flap with integrated damper
- Pulsation free conveyance

### X-Pump capacities.

<table>
<thead>
<tr>
<th>Size</th>
<th>Throughput [m³/h]</th>
</tr>
</thead>
<tbody>
<tr>
<td>X-115</td>
<td>12</td>
</tr>
<tr>
<td>X-150</td>
<td>125</td>
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<tr>
<td>X-200</td>
<td>230</td>
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<td>X-250</td>
<td>425</td>
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<td>X-300</td>
<td>640</td>
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The Claudius Peters Airlift: a pneumatic lift that can convey solids vertically to a maximum capacity of 1000t/h.

Features of the Airlift
The Airlift offers the advantages of low investment costs, low power consumption and high availability, alongside continuous operation and easy partial load operation. It can handle all fluid bulk solids, conveying loads up to 12-25kg solids per m³ of conveying gas, with conveying heights up to 120m and capacities up to 1000t/h.

Airlift – rapid transport of large quantities of material using air
The Airlift feeds bulk solids continuously into the Airlift pot, whilst conveying air is fed to the conveyor pip via a nozzle. Aeration at the bottom of the Airlift pot partly fluidizes the bulk solids prior to transport and the solids column seals off the overpressure of the conveying air. The pressure of the solids column then feeds the fluidized solids into the conveyor pipe where they are transported by the conveying gas.
The Claudius Peters Airlift transports material vertically to cyclone pre-heaters or storage silos. With throughputs to 1000t/h, the Airlift is an efficient, high capacity conveying method. Its specialized design, called ‘dosification’ or DOSCON has a variety of applications:

- Feeding of heat exchangers
- Standby system for mechanical pre-heater feeding such as bucket elevators
- Silo feeding
- Pulsation free, precise dosing (DOSCON)
- All types of vertical transports

Performance range:
- Throughputs of 10 to 1000t/h
- Conveying heights up to 120m
- Bottom aeration
- Bottom cone for coarse bulk solids
- Several feed points using two-way gates in the conveyor pipe
- Bulk solids and conveying gas can be separated by the Claudius Peters expansion vessel

Example throughput for Airlift (cement).
Bulk solids with difficult flow behaviours can be handled with our feeding and conveyance unit. The Claudius Peters Blow Feeder offers a combination of features for all conveying procedures requiring more than simply throughput and conveying distance specification. It offers:

- High availability
- Compact design
- Partial load operation if required
- Closed, dust free system
- Pulsation free
- Throughputs to 100 m³/h
- Continuous conveyance
- Conveying distances to 250m
- Fine grained and coarse grained bulk solids, low abrasivity

**Function of Blow Feeder system**

When the bulk solid is dropped into the rotating feeding chamber, it is blown out of the lower chamber via lateral air connections. The bulk solid then drops into the blow pan where it is picked up by conveying air and transported within the conveyor pipe.

**Blow Feeder applications**

As well as silo feeding and intermediate transport applications, the Blow Feeder can be used for filter dust return and material return, for example bag discharge to the packer pre-bin.

**Not all types of application demand high throughput**

When average performance is required at optimum cost efficiency, Claudius Peters recommends the blow feeder. This feeder has typical volume throughputs of 20-30 m³/h with a maximum of 100 m³/h and is especially suited for the transport of sticky materials.
Of all the five available feeder types, the Claudius Peters Jet Feeder is the most compact and offers important advantages for specific applications.

The jet feeder, which can adapt to different operating conditions, is the best design for low solid mass flows. Operating conditions will determine the size and the type of nozzle selected, while variants with and without an aerated bottom, combined with the corresponding diameter of transport pipeline, provide a highly reliable conveying method.

Jet feeding – converting static pressure to kinetic energy
Within the jet feeder’s nozzle, the static pressure of the conveying gas is converted into kinetic energy. Bulk solids, which can be fed from the pre-bin or through a rotary feeder, are drawn by the conveying gas into the mixing chamber. Then, within the connected diffuser, the kinetic energy of the blended air and solids is reconverted into static pressure.

Jet feeder applications
The Claudius Peters Jet Feeder is an ideal, economic option for silo feeding with minimized bulk solids flow. It can be used for material return to a packing machine, filter dust return, as well as the conveyance of hot ash.

The Claudius Peters Jet Feeder range
Jet feeders can be supplied with a variety of sizes and designs, depending upon the operating conditions. Pipe diameters can be NN 65 to DN 150.
CALCINING
COOLING
DISPATCH
DOsing
DRY BLENDING
DRYING
GRINDING
PACKING
PNEUMATIC CONVEYING
PULVERIZED FUEL SUPPLY
SILO SYSTEMS
STOCKYARD SYSTEMS
ALUMINA HANDLING SYSTEMS
MARINE POWDER HANDLING
TURNKEY PROJECTS

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