

pneumatic conveying technik

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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' headquarters, Buxtehude, Germany.

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.



Technikum

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.

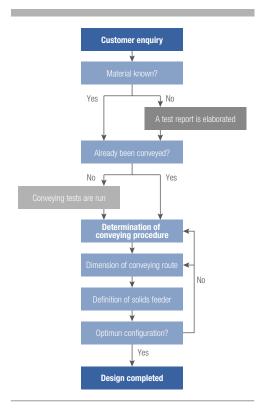
With conveying lines up to 5km long and a wide range of pipe diameters, the laboratory enables the design and supply of systems which have been calculated for optimal process, cost and operating parameters.

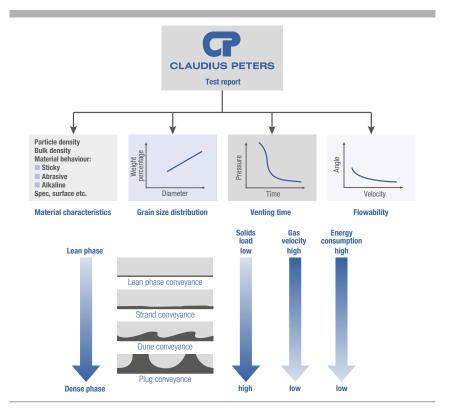
In the Technikum, conveying procedures can be tested for any load, gas velocity, conveying pressure and conveying distance. Each material is measured for deaeration time, density, humidity and wall friction angle, with data documented in a test report supported by EDP and used to ensure optimal plant design.



Claudius Peters Technikum.

State-of-the-art technology to meet every conveying requirement





plant design

Determining the conveying process

Thorough testing delivers optimal power efficiency

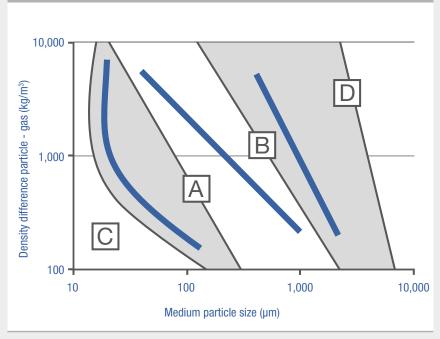
Characteristics of bulk materials, determined from sample analysis, are used in configuration of the plant.

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.

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

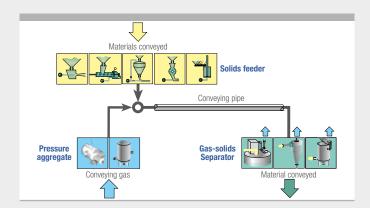
Claudius Peters delivers positive pressure conveying systems.

The diagram (below) illustrates the structure of a positive pressure 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.

A feeder type for every possible system



	Pressure vessel	X-Pump	Airlift	Rotary feeder	Jet feeder
	All non-adhesive materials	Wide particle size distribution with fine shares	Fluidisable materials	Coarse and fine materials low abrasion	All materials
Max. throughput [m³/h]	150 (single) 300 (twin)	640	1000	770	10
Max. conveying distance [m]	3500	1500	120 vertical	300	75
Max. pressure difference in conveyor pipe [bar]	30	2,5	0,6 vertical	0,7	0,2

FLUIDCON

Pneumatic conveying, with considerably lower power consumption



Detail of FLUIDCON pipe.

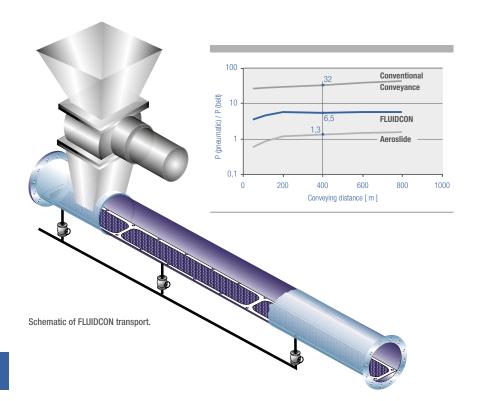
The Claudius Peters FLUIDCON system offers the advantages of pneumatic conveying with considerably lower energy requirements owing to it's unique aeroslide transportation principle within the transport pipe.

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.

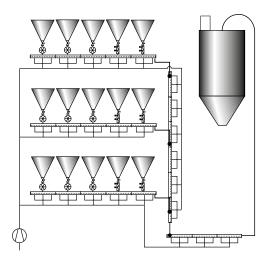


Conveyance of 150t/h fly ash at the Trianel Power Plant Lünen.

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



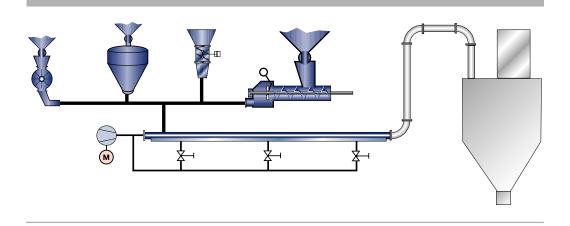
FLUIDCON pipe feeder.



Schematic of power plant fly ash handling.



Rotary Feeder with FLUIDCON.



type 1: pressure vessel conveyor

Conveying solutions for distances up to 3,500 m

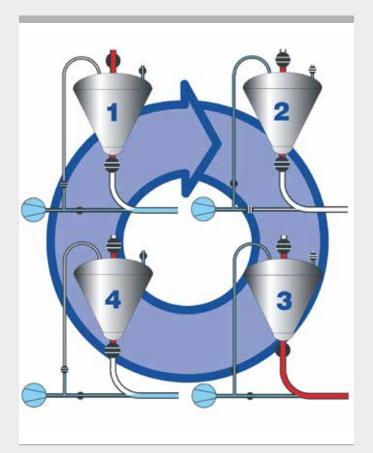
Fully customized, highly efficient

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



Pressure vessel transport system.



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 150m³/h
- **Fully automatic**
- Simple, low costs

Twin pressure vessel conveyance:

- **Quasi-continuous conveyance**
- Maximum capacity 300m³/h
- **Fully automatic**
- 50% reserve in case of vessel failure

Double-storey vessel conveyance:

- Maximum capacity 150m³/h
- **■** Fully automatic

- **Continuous conveyance**

Special applications

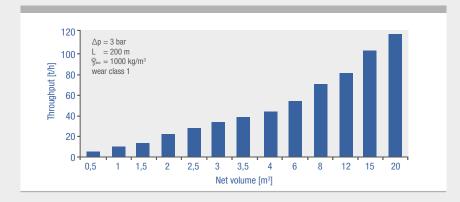
As well as conveying vessels, Claudius Peters also offers injection vessels, which are designed to inject substances against high counter pressures. If required, injection vessels may incorporate distribution devices within the conveying pipe to divide the material flow, such as when feeding coal into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



A range of flexible expansion options

Pressure vessel system.

Throughput for single pressure vessel (for example cement).



Design parameters for this type of application:

- Standard sizes: 0.2m³ to 20m³
- Customized sizes to 35m³ are in operation
- Throughputs to 300m³/h are presently operating
- Distances to 3,500m
- Customized solutions
- **Modern control techniques with valves** suiting the specific bulks

type 2: X-Pump

Proven technology for dense phase conveyance

The Claudius Peters X-Pump is a high-speed screw feeder, installed as a feeding unit in front of a pneumatic conveying pipeline. This system can be designed as a conventional pneumatic pipeline or as a Claudius Peters FLUIDCON pipeline system.

The task of the X-Pump is designed to feed a defined solids mass flow into a conveying gas flow against the overpressure within the conveyor pipe. At the same time it seals the system overpressure against the surroundings or the upstream sections of the plant, minimizing gas leakage through the feeder.

This sealing is realized by forming a plug of bulk solids of defined length at the end of the screw. Conveying pressures up to approx. 2.5 bar overpressure (in special cases even higher)are achieved as well as conveying distances of up to approx. 1000 m and throughput capacities of up to 640m³/h. With this system it is possible to convey pulverized bulk solids as well as coarser materials with grain sizes up to 10 mm. The X-Pump can be used as a feeder for dense-phase as well as for lean-phase conveyance.





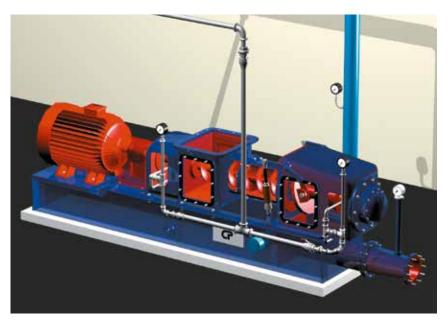


Variable design and power transmission.

Non-contact between screw / housing leads

Advantages of X-Pump

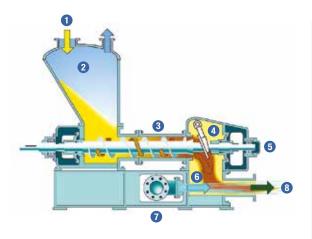
- to less wear and high operation reliability
- End wings can be replaced separately
- Flexible partial load operation due to two-sided bearing system
- No balancing of screw needed
- High sealing effect due to small gap between screw and wear bushing
- Non-contact labyrinth sealing ideal for higher screw speeds
- Low maintenance costs and down time
- Designed for non-explosive or explosive and bulk materials like coal dust
- 100% ATEX conformity for explosive **bulk materials**





Highest flexibility in design of outlet points (example: left hand outlet).





Main Components of X-Pump:

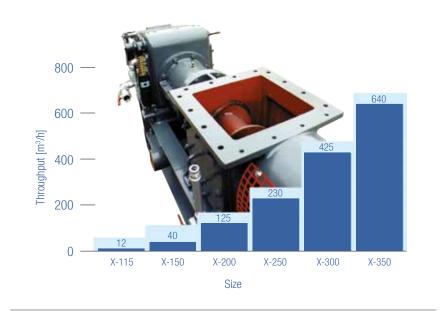
- 1. Material inlet
- 2. Surge bin with dedusting socket
- 3. Conveying and compressing screw
- 4. Material discharge area
- 5. Double sided sealing and bearing system
- 6. Material / Gas mixing chamber
- 7. Conveying gas inlet
- 8. Conveying pipe connection

A reliable feeder for dense-phase and lean-phase conveying

The Claudius Peters solid X-Pump is a very compact unit due to its two-sided bearing. The machinery runs extremely quietly and is characterized by very low power consumption as well as reduced pulsation during operation. The wear parts can be easily replaced and the pump is suitable for a wide range of applications and materials.

Special features:

- Variable arrangement of the pump outlet
- **■** Different screw geometries and end flights
- 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.

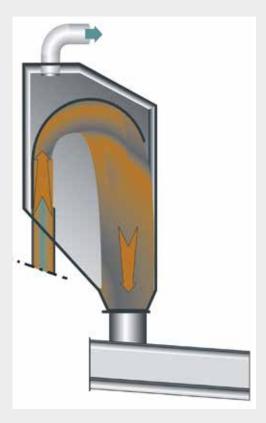
type 3: Airlift

Vertical lift capability with a low investment cost 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.



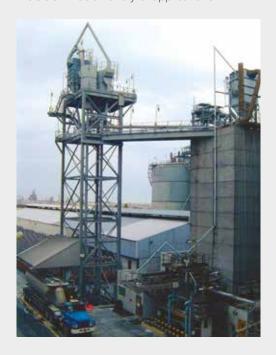


Airlift – rapid transport of large quantities of material using air

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

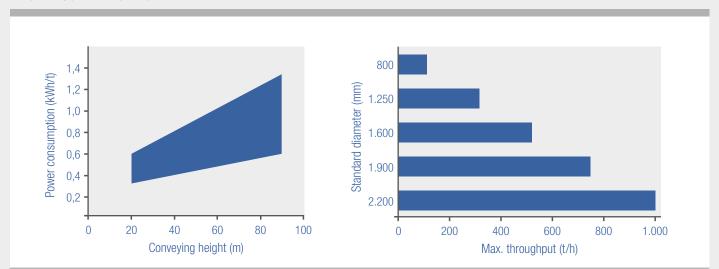


Claudius Peters Airlift.

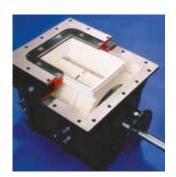
Performance range:

- 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).



type 4: rotary feeder TWA



Rotary feeder system.



Ceramic plate lining of liner.



Mechanical sealing.



Installed rotor cell with ceramic wear elements.

The Rotary Feeder TWA represents a dramatic change in design from common rotary feeder technology. Its 500 Brinell Ni-Hard rotor cell and liner enable much longer lifetimes than traditional rotary feeders coated, for example with tungsten carbide. Wear is further minimized by a total of 12 chambers with 12 sealing webs.

In addition to a long lifetime, the rotary feeder construction offers further innovative features. Wear can be measured with the rotary feeder installed in place. Gap increases due to wear can be corrected and reduced without the need to remove the unit. Furthermore the feeder's mechanical shaft seal increases operational safety. Technically outdated solutions such as stuffing boxes or sealing gas labyrinths are no longer required.

Fields of application

- Optimum use as feed element for pneumatic conveying systems
- Highest wear protection from ceramic inserts allow for conveyance of highly abrasive materials such as clinker, fly ash, alumina, sands, slag sand meal and metal sanding dust

Rotary Feeder TWA with ceramic lining

The main demands on modern high-capacity rotary feeders include an optimum wear concept as well as an intelligent shaft seal. Wear occurring during operation at the rotor, the housing, and the leaky shaft seals are often the main problems in the use of rotary feeders. The Rotary Feeder TWA combination of NiHard components and mechanical shaft seals to increase the lifetime of the system by almost ten-fold when compared with standard feeders. Moreover the maintenance requirements are drastically minimized.

Advantages of the Rotary Feeder TWA

- Rotor cell and liner in the basic version made from wear-resistant NiHard (Mohs' hardness 5)
- Feeder with optional ceramic plates at rotor cell and liner available for highly abrasive materials (Mohs' hardness 9)
- With the valve in-situ, the gap between the rotor and liner can be adjusted to take account of product variation and even wear
- Mechanical shaft seals, practically maintenance-free
- Maintenance-free direct IP55 gear motor
- Exterior bearing, lifelong sealing
- Rotor cell and liner exchangeable for repair
- High-temperature design possible up to 220°C

The optimal ceramic plates offer excellent lifecycles in practical use, even with very abrasive bulk solids. These plates are cut in such a way that they can be arranged in a self-supporting manner, similar to a Roman arch. To avoid movement the plates are fixed to the base material by means of a special ceramic hard epoxy resin. High production accuracy as well as optimum adjustment of the clearance rotor cell and bushing allow for an operation with the smallest possible gaps which minimizes gas leakage.



type 5: jet feeder

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

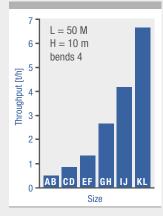
The Claudius Peters Jet Feeder is an ideal, economic option for silo feeding with minimized bulk solids flow. It can be used for material return to a packing machine, filter dust return, as well as the conveyance of hot ash.

The Claudius Peters Jet Feeder range

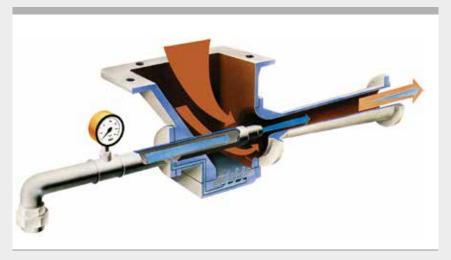
Jet feeders can be supplied with a variety of sizes and designs, depending upon the operating conditions. Pipe diameters can be DN 65 to DN 150.

- Continuous operation
- High operational safety
- Long life times
- Low investment cost
- High solids temperature capability
- Partial load operation without modification of the conveying air flow
- Lean phase conveyance
- All bulk solids
- Closed dust free system
- **Simple and space saving construction**
- No movable parts in the solids flow
- Throughputs up to 10m³/h
- Conveying pressures to 0.2 bar gauge
- Loads to maximum of 6kg/kg

Compact design that handles all bulk solids



Jet feeder capacities.



Cross section of jet feeder.



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TURNKEY PROJECTS

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