



CLAUDIUS PETERS




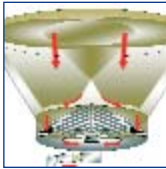


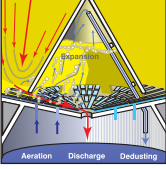

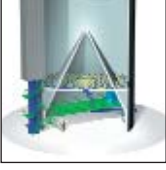
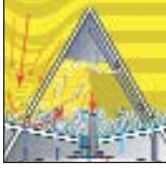

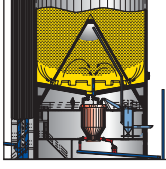
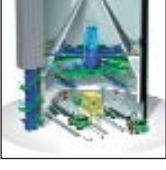



silo technology

Technik

Technology you can trust

www.claudiuspeters.com

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Claudius Peters Technologies GmbH, Germany and Claudius Peters Technologies S.A., France are part of the Technologies Division of Claudius Peters Group GmbH, headquartered in Buxtehude, near Hamburg, offering technologies in the field of materials handling and processing, providing turnkey and semi-turnkey systems to a wide range of industries. Claudius Peters Group GmbH is a wholly owned subsidiary of Langley Holdings plc, a privately controlled UK engineering group, with regional offices in the Americas, Europe, China and the Far East.

With more than 3,000 silo systems sold worldwide, Claudius Peters is a major contributor to the current international standards for silo design. Our expansion chamber principle along with our patented optional inspection chamber for storage silos, and overflow pipes for the mixing silos, provide clear examples of why we are leaders in silo technology.



In just over a century we have grown from our foundations in the cement industry to one of the world's most revered engineering houses. From conception to installation, through commissioning to after sales support and facilities management, Claudius Peters provides world-class service to world-class clients.



Our commitment to innovation and excellence is second to none

Claudius Peters – Competent for all bulk solids...

We think ahead...

The Claudius Peters Technical Centre (Technikum) focuses on basic research and information transfer between international plant operators and Claudius Peters. Located only a few steps away from our administration, design and production facilities, the Technikum houses laboratories and test installations in which the characteristics of more than 1,000 materials have already been determined by means of the Jenike shear test amongst other procedures.

More than 13,000 bulk solid samples have been entered into our database. This data pool facilitates geometry adjustment of a silo to site conditions.



Claudius Peters Test Centre: the Technikum



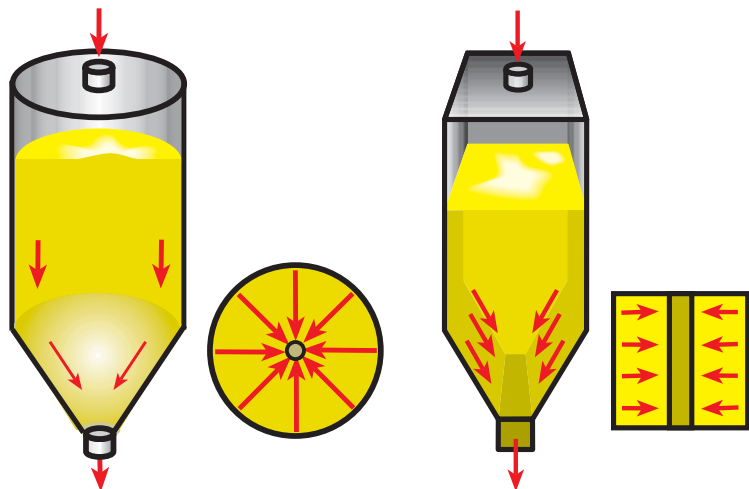
Which is the best discharge for which task ?

Through a central point?

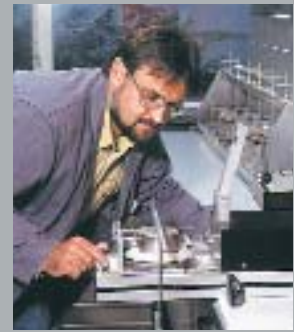
- Advantageous statics for the construction
- Reduced flow profile up to funnel flow and arching
- Excellent solution for small silos
- Steep cone promoting mass flow

Through a straight line?

- Costly statics for the construction
- Good flow profile due to a flat flow behaviour
- Excellent solution for small silos
- Cone promoting mass flow



Silo type	EC	IC
Outlets / number	P / 1	P / 2 - 4
Expansion / Inspection	+ / -	+ / +
Filling level / Ø	1 - 3 : 1	1 - 3 : 1
Standard silo - Ø	10 - 30 m	10 - 30 m
Reclaim rate / Room utilizat.	> 99% / 95%	>99% / 91%
Mix. effect		
P = pneumatic		

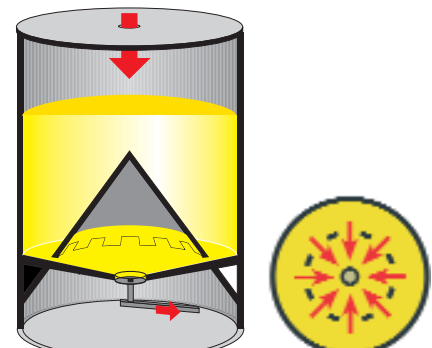
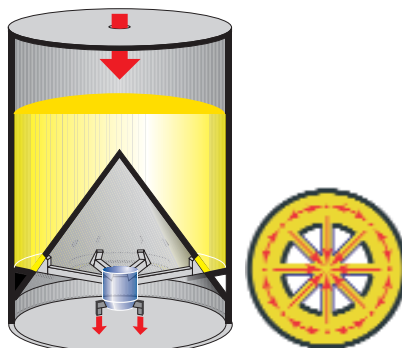
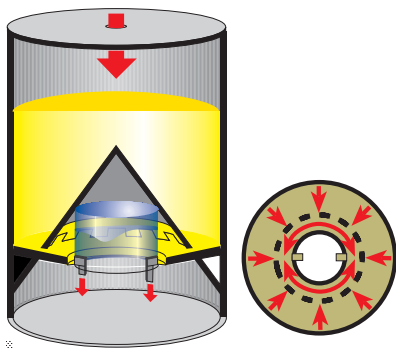


Or out in a circular line?

- Advantageous statics for the construction
- Good flow profile, flat flow behaviour by mounting a displacement cone
- Excellent solution for all silo sizes

Cone or chamber?

The circular line gives the most advantageous discharge principle. According to your requirements, Claudius Peters offers two designs: a cone with several small outlets or a chamber with large surface outlets and a central discharge. Both cases guarantee optimum aeration of the silo bottom.



ME	MS	CC	MC
P / 3 – 9	P / variable	P / 1 – 4	P / 1
- / -	variable / variable	- / -	+ / -
1 - 3 : 1	1 - 3 : 1	1 - 3 : 1	up to ~ 3 : 1
10 - 30 m	as required > 30 m	4 - 14 m	10 - 30 m
>99% / 88%	99% / 88%	>99% / 86%	99% / 95%
			10:1

'...more than 12,000 bulk solid samples have been entered into our database...'

The Expansion Chamber...

Expansion chamber technology is synonymous with the name Claudius Peters Technologies - after all, it was Claudius Peters who invented it!

We were constantly being asked the same two questions - how can we create a room inside the silo, which is relieved from the material pressure of the main silo chamber? And how can we use the resulting conical chamber adequately, while at the same time maintain optimum flow conditions? These two questions were foundations on which we constructed an innovation that defined the industry.

Today this system is the basis for all types of Claudius Peters' silos. During the discharge procedure the displacement cone with its concrete or steel structure moves the bulk solids close to the silo wall, thereby enhancing "first in - first out" operation.

- High flow capacities with minimal residual product
- Use of the chamber as an additional material storage
- Only few outlets, e.g. to the loading and packing plant, are required.
- Investment costs and maintenance costs for control systems, dosing and shut-off devices are reduced significantly.



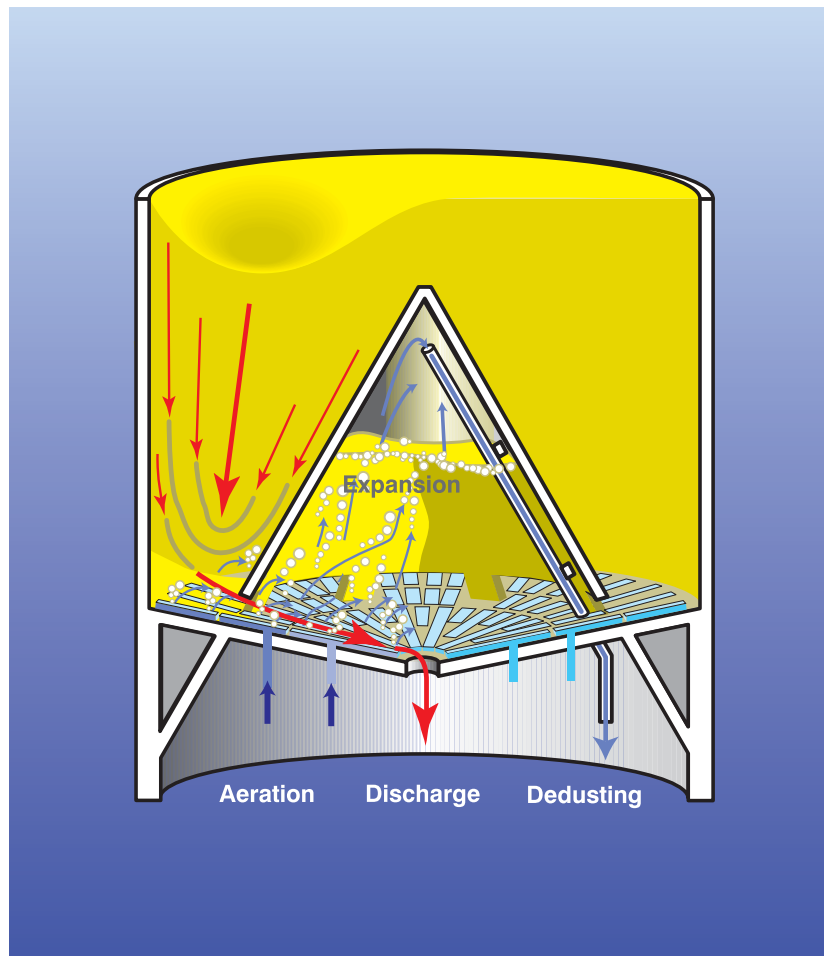


The principle

In order to achieve a free and unobstructed material flow, nearly 40% of the area around the cone bottom is used as an opening. The complete silo bottom is covered with open aeroslides, which are radially arranged and aerated in sections. Economic operation is ensured by a control system.

The controlled air supply causes the pressurized bulk material to flow from the main silo room into the inner cone area. Short flow distances ensure that built-up areas of dead, unmoved material are avoided.

To relieve the material i.e. to re-establish normal pressure conditions, the excess air is allowed to escape into the upper chamber area, where it is dedusted. This is important to ensure a uniform discharge and ensures even, pulsation-free material flow for subsequent loading or packing. Compared to fully aerated material, partially de-aerated material ensures a low velocity and thus, a highly reduced wear rate for the subsequent conveyors.



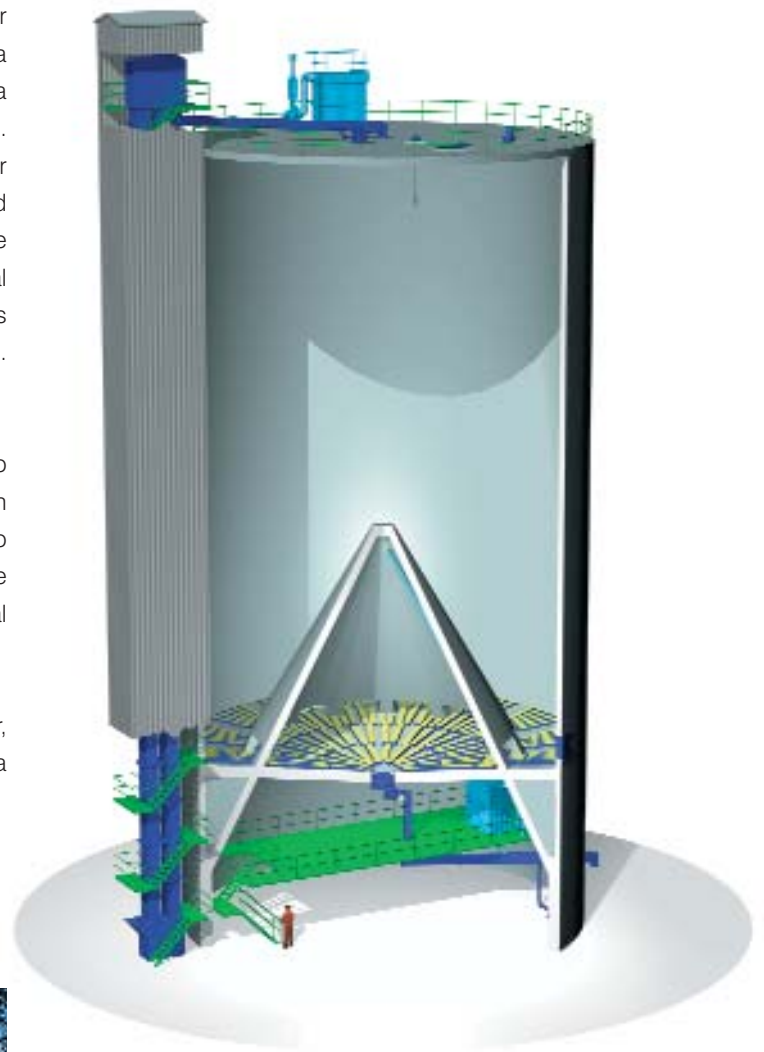
An extraordinary service advantage!

Storage Silo EC with Expansion Chamber...

Based on the advantages of the expansion chamber technology, this silo type uses the complete expansion area as additional storage for bulk solids. This results in a reduction of the building height and thus the building costs. The sloped silo bottom reaches over the whole silo diameter. The complete silo bottom is covered with radially arranged open aeroslides. The aeration of the main silo and the chamber is separated in order to facilitate better material activation. Further separation into smaller sections guarantees that the air is always fed where it is needed. Thus, operating costs are reduced!

The aerated bulk solid directly flows from the main silo through the large cone openings into the expansion chamber where it is partially de-aerated and transported to the central discharge. The constant material level in the expansion chamber results in a constant even material discharge.

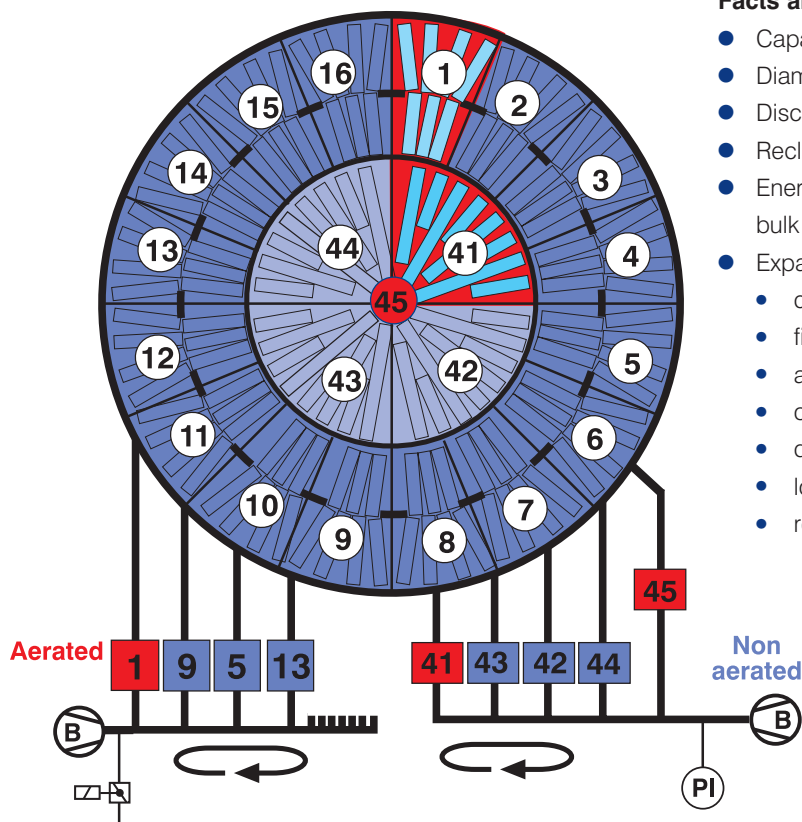
The Storage Silo EC offers the best space utilization by far, and is a sound basis for low purchasing costs ensuring a fast return on your investment.



Storage Silo EC, Kantvik, Finland



For the largest possible storage volume



Facts and features:

- Capacities of 2,500t to 60,000t
- Diameters of 10 to 30m
- Discharge capacities up to 1,000t/h
- Reclaim rate >99%
- Energy consumption approx. 0.03kWh/t discharged bulk solid
- Expansion chamber promoting
 - continuous material discharge
 - first-in first-out principle
 - additional storage room
 - only one outlet necessary
 - dedusting in the chamber
 - low discharge speeds
 - reduced wear in the discharge equipment

Rotating synchronous aeration of outer ring 1-16 and chamber sections 21-24



Central discharge



Expansion chamber - inside



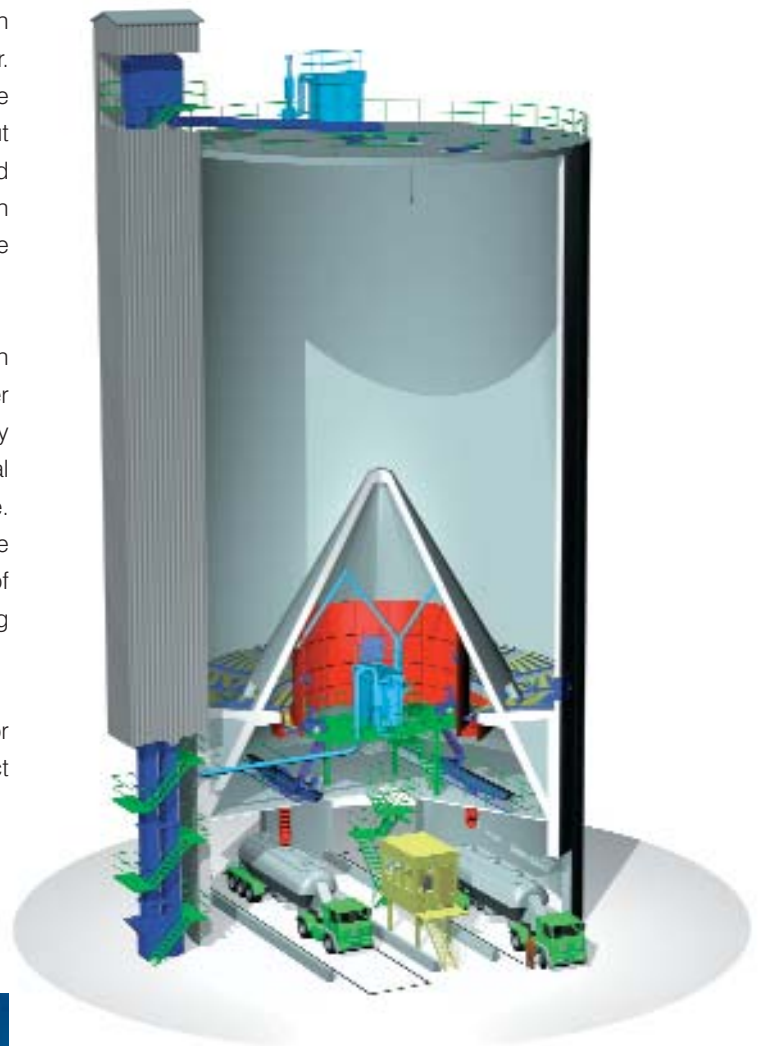
Expansion chamber - outside

Storage Silo IC with Inspection Chamber...

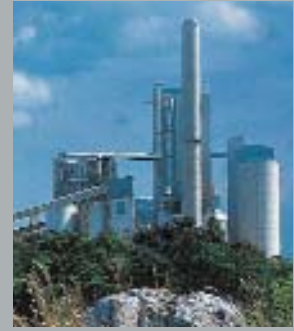
The storage silo IC combines the proven expansion chamber principle with an accessible inspection chamber. By means of the "chamber-in-chamber" principle the inside of the expansion chamber is not only used for storage, but can also be used for maintenance work. It enables rapid access to the outlet area to permit easy maintenance. In addition the inspection chamber is used to house the exhaust air filter system and other plant components.

The main silo corresponds to silo type EC. The inspection chamber design results in an annular expansion chamber and a ring channel that is equipped with circumferentially arranged aeroslides slanted to the discharge. Additional discharge arrangements can be easily installed at any time. The aerated bulk material flows from the main silo via the expansion chamber to the discharge points. Expansion of the material, de-dusting of the exhaust air and monitoring the material levels are carried out at the same time.

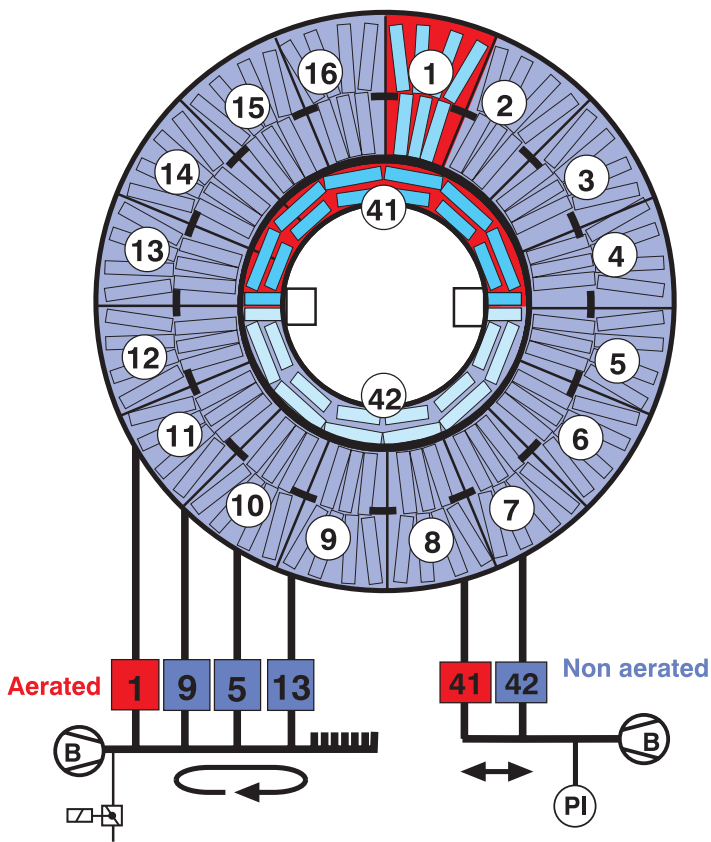
Compared to other silo types, the Storage Silo IC allows for low maintenance, minimum equipment as well as a compact building structure.



Storage Silo IC, Saudi Arabia



A clear view for enhanced safety



Facts and features:

- Capacities of 2,500t to 60,000t
- Diameters of 10 to 30m
- Discharge capacities up to 1,000t/h
- Reclaim rate >99%
- Energy consumption approx. 0.03kWh/t discharged bulk solid
- Expansion chamber promoting
 - continuous material discharge
 - first-in first-out principle
 - additional storage room
 - only 2 - 4 outlets required
 - dedusting in the chamber
 - less wear at the discharge outlet by lower material velocity
- Inspection chamber
 - inspection can be accomplished while the silo is full
 - compact construction by integrating the exhaust air filter system in the inner area of the chamber

Rotating synchronous aeration of outer ring 1-16 and ring channel sections 21-22.



Ring channel



Ring channel inspection



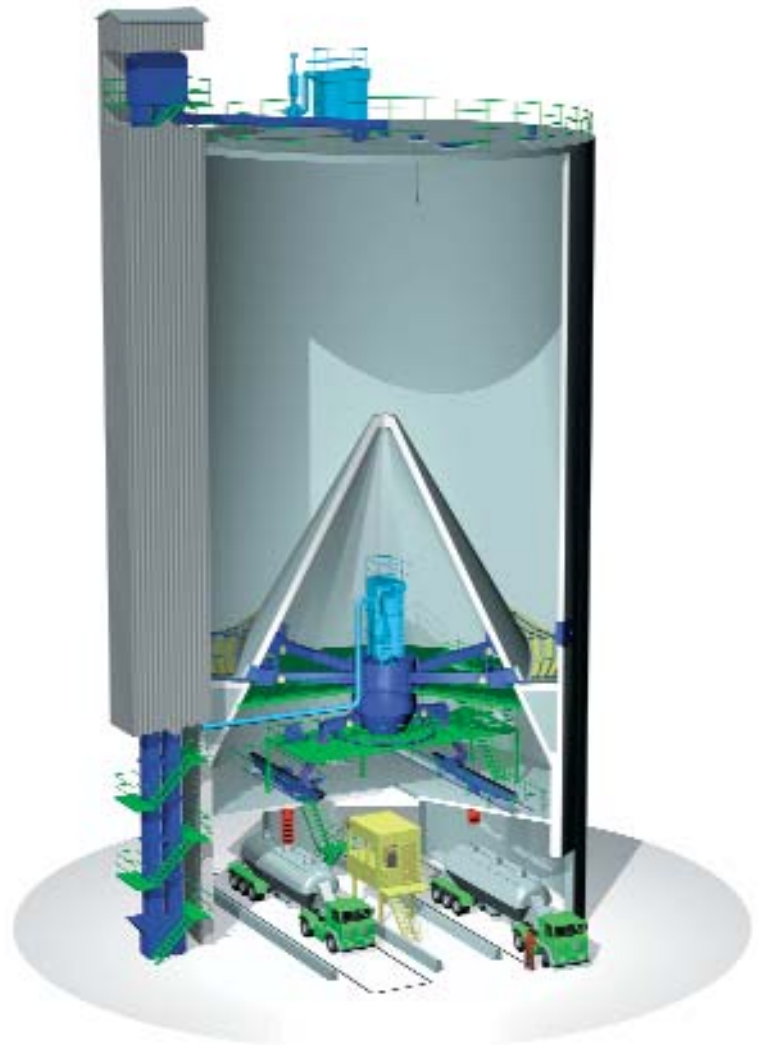
Inspection chamber

Storage Silo ME with Multi Extraction...

Another alternative for bulk solid storage is the ME silo where the concept of multi extraction is applied.

The silo is also equipped with a displacement cone, which almost entirely covers the silo bottom. Unlike our EC silo this technique has a large number of outlets. The silo bottom located between silo wall and cone is completely covered by circumferentially arranged open aeroslides. The outlets are divided into small, slanted sections optimizing the air usage.

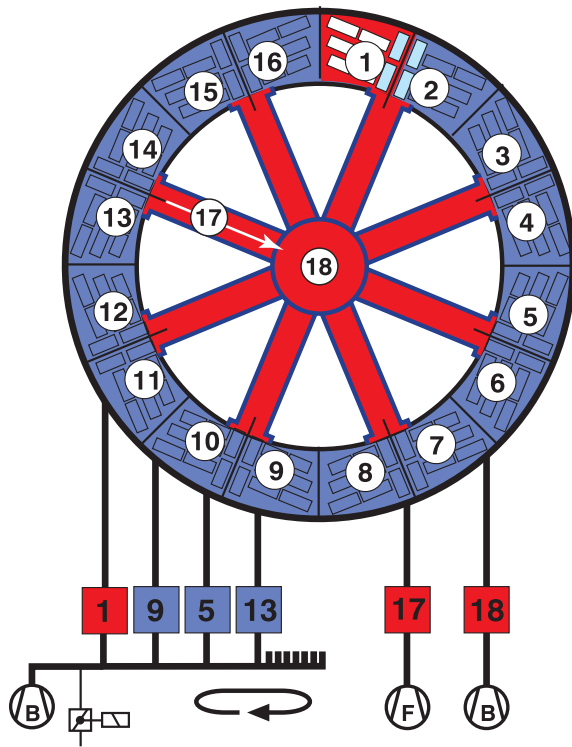
From the outlets the material flows via closed aeroslides into a centrally installed collecting bin/pot. Inside this bin any excess air pressure is relieved and the dust from the aeration air is returned into the system before the material is distributed e.g. to bagging and loading stations.



Storage Silo ME, Australia



Ample room for more extras



Facts and features:

- Capacities of 2,500t to 60,000t
- Diameters of 10 to 30m
- Discharge capacities up to 1,000t/h
- Residual discharge >99%
- Energy consumption approx. 0.04kWh/t discharged bulk solid
- Displacement cone promoting
 - use as room for aggregates and filters
 - first-in first-out principle
 - facilitating many outlets (3-9)
- Collecting bin/pot for
 - dedusting
 - buffering the material

Rotating aeration of bottom section 1-16.

Permanent aeration of aeroslide 17 and collecting bin 18.



Silo discharge



Collecting bin, feeding



Collecting bin, discharge

Multi Storage Silos...

Multi Storage Silos, mainly used in cement works and cement terminals, offer various storage possibilities whilst using all available space in the silo.

In addition to cement, raw meal and gypsum it is also possible to separately store additives such as slag, fly ash or mixed cements and to have these materials ready for use at all times. When connected to mixing, packing and loading systems this gives a highly versatile solution to storage problems.

By working closely with our clients Claudius Peters can provide a tailor-made system that delivers the right technology in a timely and cost effective way. As a result of our many decades of experience, we can advise you on the solution that best meets your requirements.



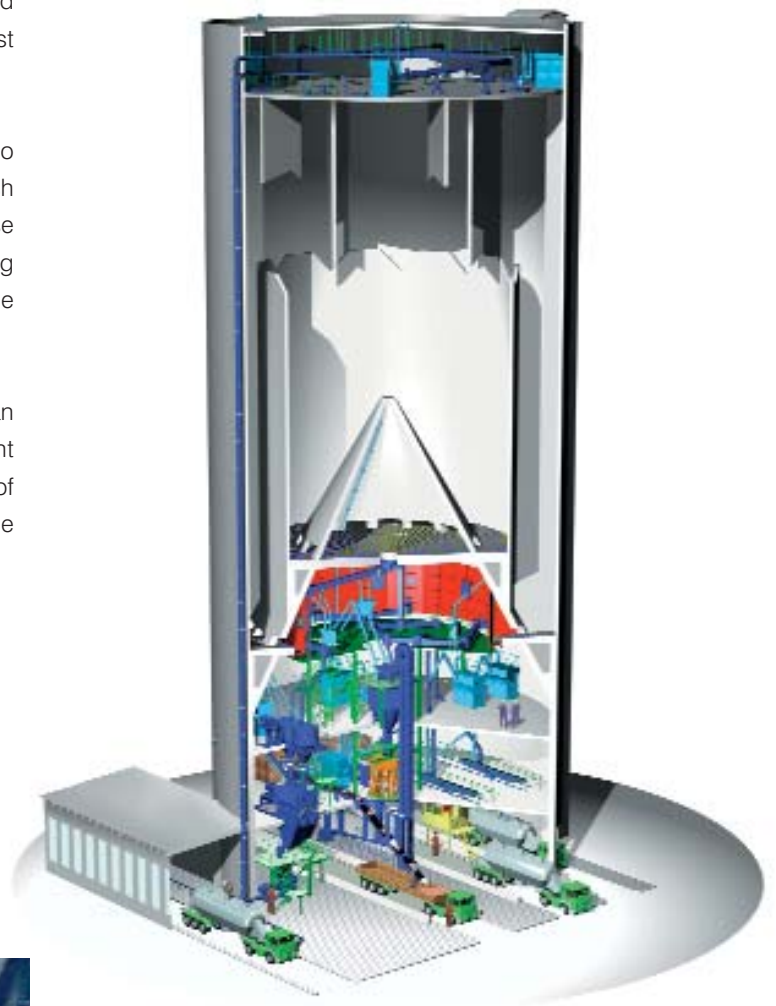
Loading technology



Bagging technology



Mixing cement systems





Round or Angular - your choice

Loading, packing and mixing of the most efficient type

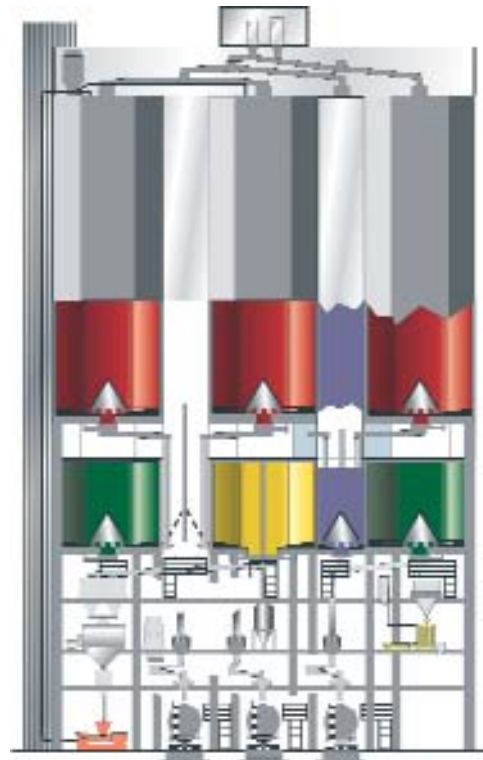
Whatever you plan to use your multi-storage silo for, the Claudius Peters product range will be able to meet every need.

Your silo terminal can be made up of storage silos combined with mixing and blending technology, packing plant and loading systems all operated and controlled by one of our state-of-the-art control systems designed in-house by our experienced control engineers. Claudius Peters is a global market leader for turnkey plants.



Polygon silo

- Ideal for several small bulk solid quantities
- Simple, economic construction
- Easily expandable



Dispatch automation

Round silo

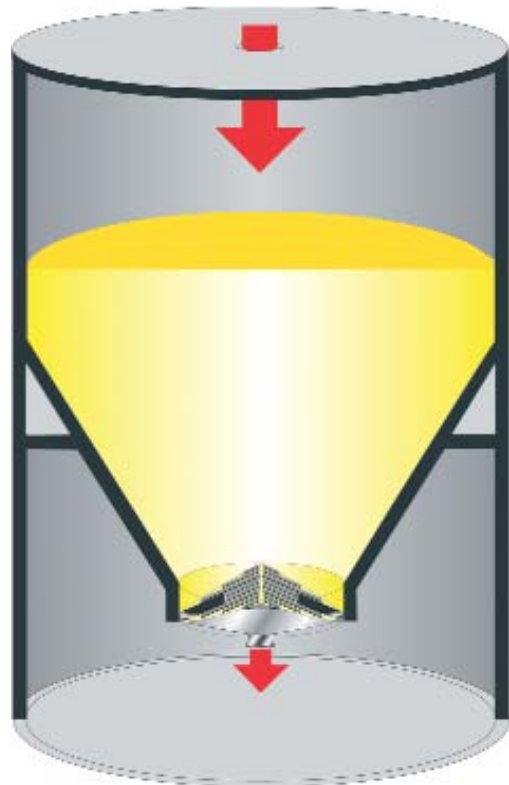
- Ideal for large quantities of bulk solids
- Inner silo with outer ring silo
- Compact design



Storage Silo CC...

The Conventional Cone CC Silo is especially suited to small silo units. It is basically a conventional cone silo where the lower section of the cone is cut and replaced by an aerated CC standard bottom. Owing to its compact design, this type of silo bottom needs less fluidization equipment and therefore consumption of less energy compared to a conventional silo construction. It guarantees excellent discharge characteristics even for those materials which do not fluidize so well. Other bulk materials like Gypsum, Quicklime, Lime Hydrate and others can also be stored and discharged in the CC Silo.

The CC Silo bottom can be used for conversions of cone silos allowing a significantly improved discharge characteristic which can also be easily applied to new installations. Using the CC Silo bottom on a standard size of 3.5 metres in diameter, a silo size of 8 metres in diameter can be achieved, however where higher capacities are required a silo bottom of 5.5 or 7.5 metres is available.



Storage Silo MF after completion, Austria

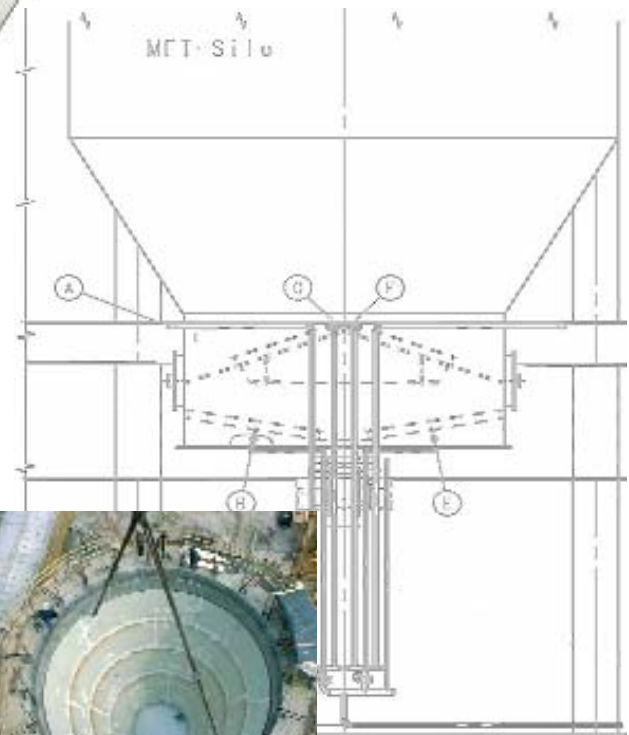
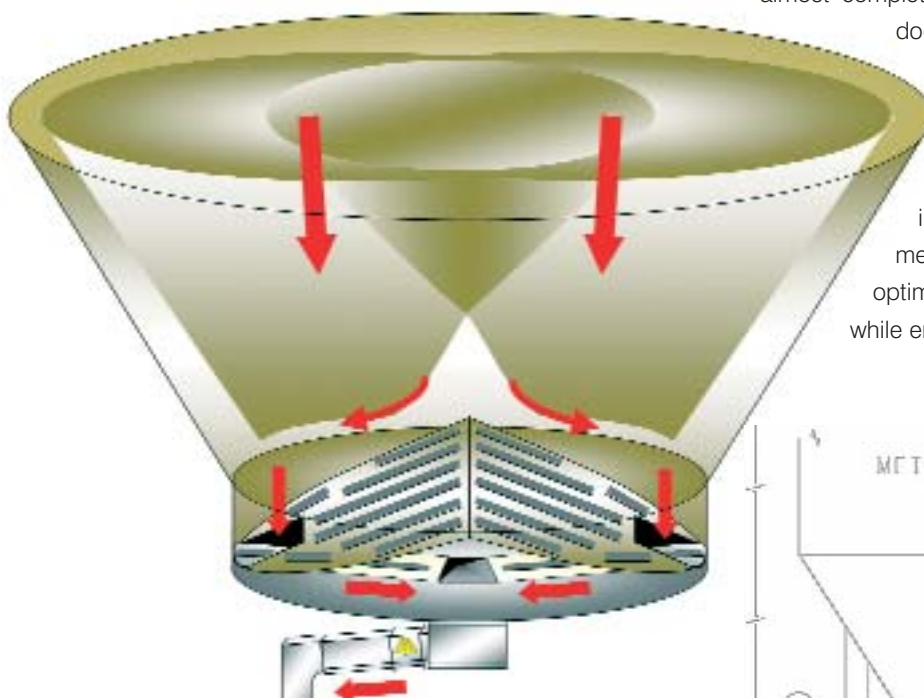
Main advantages of the Converted Cone CC Silo

- High flow of material
- Excellent reclaim rate
- Reduced amount of equipment and energy required
- Suitable for small silo units
- Easy and quick erection on site (due to the pre-installation of the CC Silo bottom)
- Reduced building height for new installations at same storage volume



Excellent discharge characteristics

The sectors are alternately aerated at pre-set times ensuring almost complete discharge of the silo. This process does not affect the filling procedure. The aeroslides arranged on the silo bottom support the discharge by fluidizing the stored material. Then the fluidized material flows along the inclined aeroslide to the outlets by means of gravity. The size of the sector is optimized so that the flow is maintained while ensuring bridging does not occur.



CC silo delivery on site



Erection of the CC silo



View from above

Solutions for all requirements... Increasing existing plant capacity

Fine tuning to higher capacities

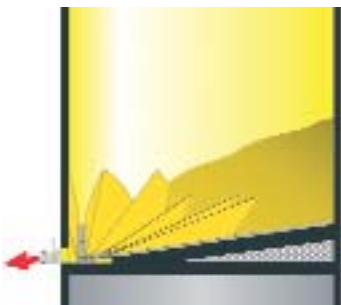
Retrofitting your plant with expansion chambers, displacement cones made of steel segments or the modernization or complementation of the aeration systems will help you achieve large increases in storage capacity and streamline your operation into an efficient, modern unit. Discharges up to 99% are possible with silo modernization.

The extension of an existing plant is always a good time to think about silo modernization. You want to increase the capacity? One of your silos is no longer operating efficiently? Dead zones have formed? Is there a tendency to core flow? Or maybe you are experiencing coarse particle separation? Do you want to use one of your silos for other materials?

Claudius Peters offers proven modernization concepts that can be developed to provide a tailored solution.

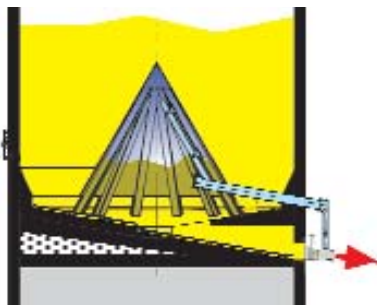
Before:

Storage silo of old design with discharge problems



Now:

Optimization of the storage volume and discharge by installation of a steel expansion chamber



Singapore, modification of a grain terminal to a cement terminal



Mixing Technology

The more homogeneous the better

Particularly in cement and other applications economic kiln operation mainly depends on the condition of the raw material. From quarry to rotary kiln feeding the quantity and quality of the raw materials are treated in various processes and are then supplied to the clinker production process. The principle of the mixing silo plays the central role in this process as it is the last quality-improving step within the processing chain of the material directly before kiln feeding.

Is 20:1 better than 10:1?

Mixing effects and discharge variations are a silo's performance indicators. They are determined by the ratio of inlet and discharge variations of the raw meal components. The mixing effect indicated in figures can only be high if the inlet fluctuations are high. A lower ratio such as 10 : 1 can therefore indicate an optimum mixing effect. An optimum raw meal mixture is achieved by joint use of the Claudius Peters PHB Someral preblending bed technology with stacker and reclaimers and Claudius Peters mixing silos in raw material processing.



The three mixing steps of the mixing silos

● Step 1: multi-flow feeding

The raw material is fed evenly over the whole silo area via a special distributor at the silo ceiling (multi-flow feeding). Thus thin layers of different raw material concentrations are produced.

Principle: the thinner the layer, the better the mixing effect.

● Step 2: gravity mixing in the main silo room

In the main silo room the raw material flows in a funnel flow produced by gravity due to special bottom aeration. The different layers are mixed by the material exchange so that long-term variations are compensated. An additional mixing effect is achieved by mixing different material funnels. This effect is produced by the rotating material discharge into the mixing chamber.

● Step 3: pneumatic mixing in the mixing chamber

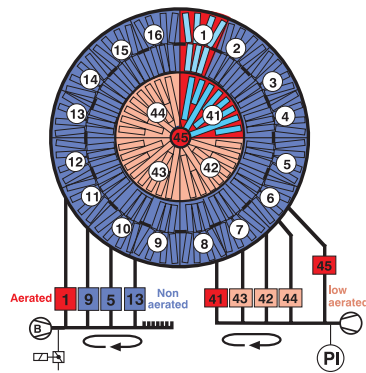
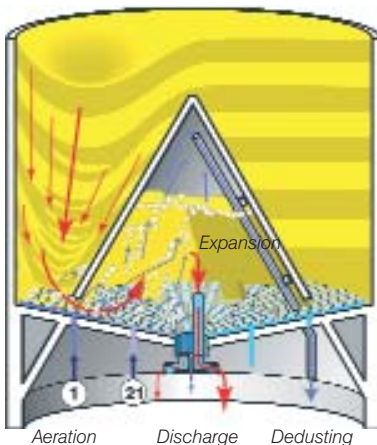
In addition, Claudius Peters mixing silos are equipped with mixing chamber sections that can be aerated separately. In this way the segments can be supplied with air quantities that not only fluidize the raw meal but also intensively mix it and therefore guarantee a low discharge variation.

Intimate Mixing for optimum raw meal quality

The unique construction of the MC silo has short travel paths and compact intense mixing areas within the chamber. The silo also incorporates our patented overflow pipe, which increases the mixing time while air usage is kept to a minimum, ensuring perfect and economical homogenization.

Facts and features:

- storage capacity of 2,500t to 60,000t
- diameters of 10 to 30m
- discharge capacities up to 1,000t/h
- mixing effect up to 15:1
- residual discharge >99%
- lowest energy consumption
- lowest discharge fluctuations possible
- mixing / expansion chamber for
 - continuous mixing operation
 - additional mixing step
 - additional storage room
 - avoidance of separation
- intensive de-dusting in the chamber leads to:
 - reduction of discharge velocity
 - wear reduction on the discharge devices
- patented overflow pipe for:
 - increasing the retention time of the material in the mixing chamber
 - increasing the mixing effect
 - reduced discharge fluctuations
 - low construction height
 - low investment costs
- second discharge in the lowest point of the silo bottom minimizing any residual product



Rotating synchronous aeration of outer ring 1-16 and chamber segments 21-24.



Rüdersdorf, Germany



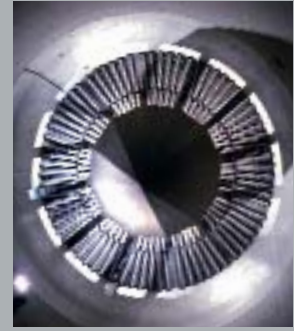
Multi-flow feeding



Overflow pipe, patented



Flow control gates



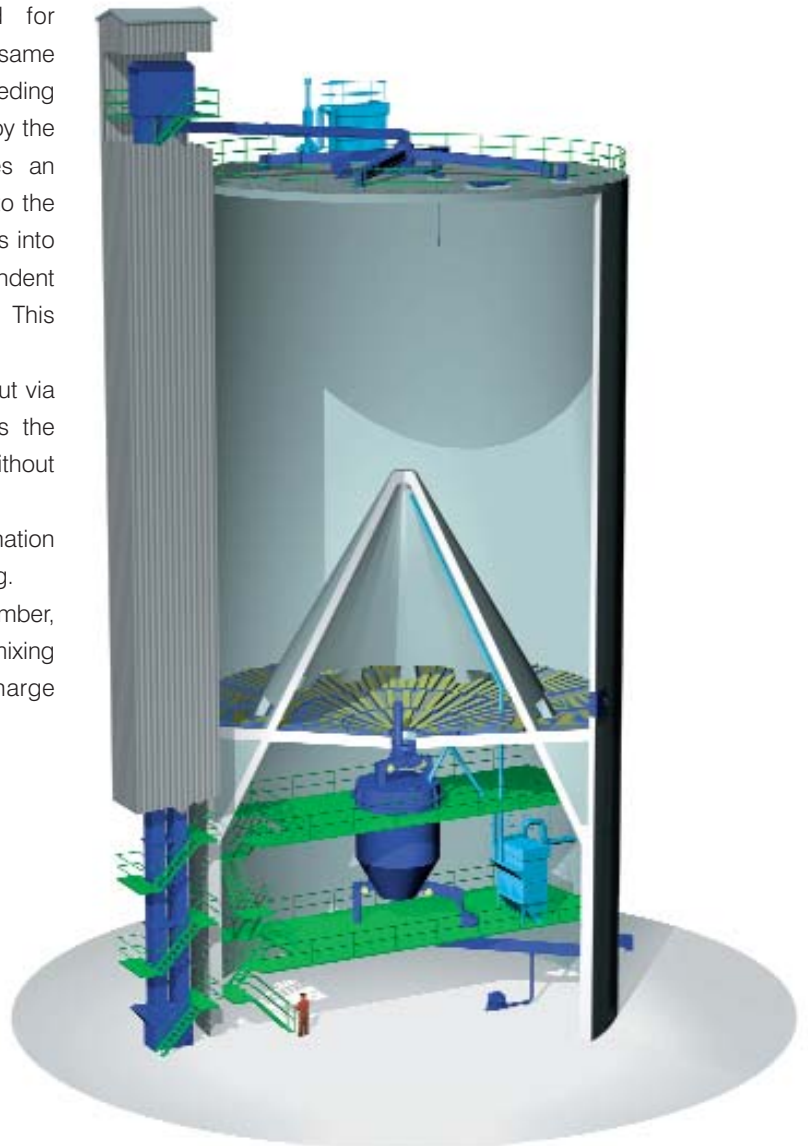
MC type for continuous mixing with Mixing Chamber

The whole expansion chamber can be used for homogenization and storage of the raw material at the same time. The raw meal is fed to the silo via a multi-flow feeding system. The number of feeding points is determined by the diameter of the silo. This type of feeding ensures an optimum and even distribution of the bulk material into the silo. During operation the aerated material funnel-flows into the mixing chamber, which is made up of independent sections each having varying air-flow characteristics. This produces the best mixing possible.

The discharge out of the chamber is mainly carried out via the centrally arranged overflow pipe. This increases the retention time. Material cannot pass straight through without having been mixed intensively.

Automatic flow control gates at the outlet in combination with a flow control facility ensure controlled kiln feeding.

The MC silo is highly energy efficient. The mixing chamber, with its integrated over-flow pipe, ensures optimal mixing performance, while simultaneously keeping discharge fluctuations as low as possible.

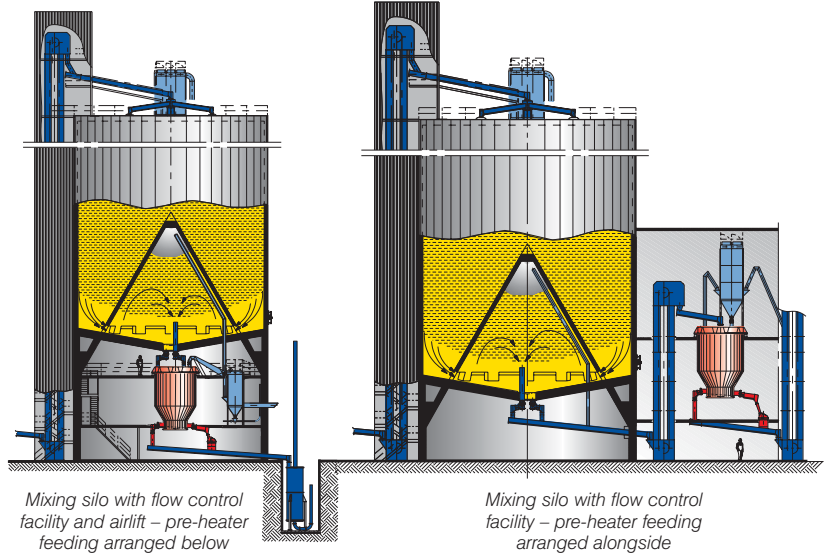


*Claudius Peters standard mixing silo
with integrated overflow pipe*

Proven technology

Claudius Peters flow control facility for cement raw meal

Mixing silos are combined with a subsequently connected flow control facility to meter the raw meal to the pre-heater of the kiln. The system consists of a control bin, flow control gates and a continuous weighing device. During the continuous, pulsation free preheater feeding by airlift or bucket elevator, the raw meal metering device is calibrated on-line and the requirements of the kiln are met without kiln feeding interruption.



From single to parallel operation - it's your choice

Single operation

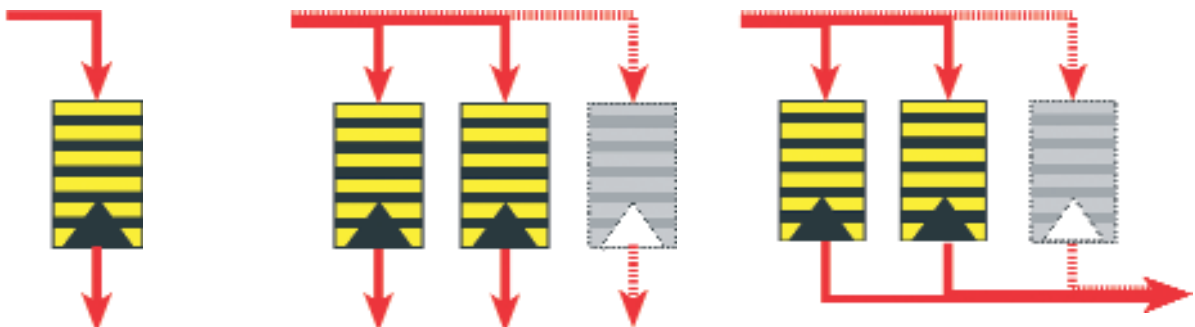
- Simultaneous feeding and discharge is possible
- Cost-advantageous because only one system is used
- Mixing effects of up to 7:1

Half-parallel operation

- Simultaneous feeding of several silos while discharging out of one silo is possible
- Double availability guarantees full functionality, e.g. during inspection work
- Mixing effects of up to 10:1

Parallel operation

- Simultaneous feeding and discharge of several silos is possible
- Double availability for a safe production process
- Mixing effects of up to 15:1



Optimization of your existing silo plant

Reasons for a silo modernization:

- To increase discharge rate
- A silo of an older, outdated design no longer works satisfactorily because
 - dead zones have formed, or
 - the silo tends to core flow, or
 - segregation occurs
- The mixing effects of an existing silo are to be increased by up to 50% whilst at the same time the energy consumption is to be decreased

In all cases Claudius Peters is the perfect partner.



Steel mixing expansion chamber, retrofitted in old silo



Modernization of a two-storey silo with MC silo technology, Turkey

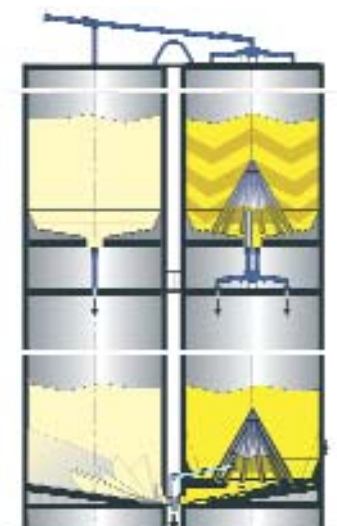
Efficient mixing operation by:

- installation of multi flow feeding
- installation of a mixing expansion chamber of prefabricated steel or concrete segments
- efficient covering of the silo bottom with aeroslides
- process automation

Before:

Two-storey silo (combined mixing and storage silo) of old design without expansion chamber

- batch mixing operation with high energy consumption
- discharge problems in the storage silo area
- low discharge output



After:

Two-storey silo after modernization with expansion chamber

- continuous mixing operation
- high discharge output
- high usable silo volume, thus >99% of the available storage capacity is used
- reduction of energy consumption
- pulsation-free operation

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