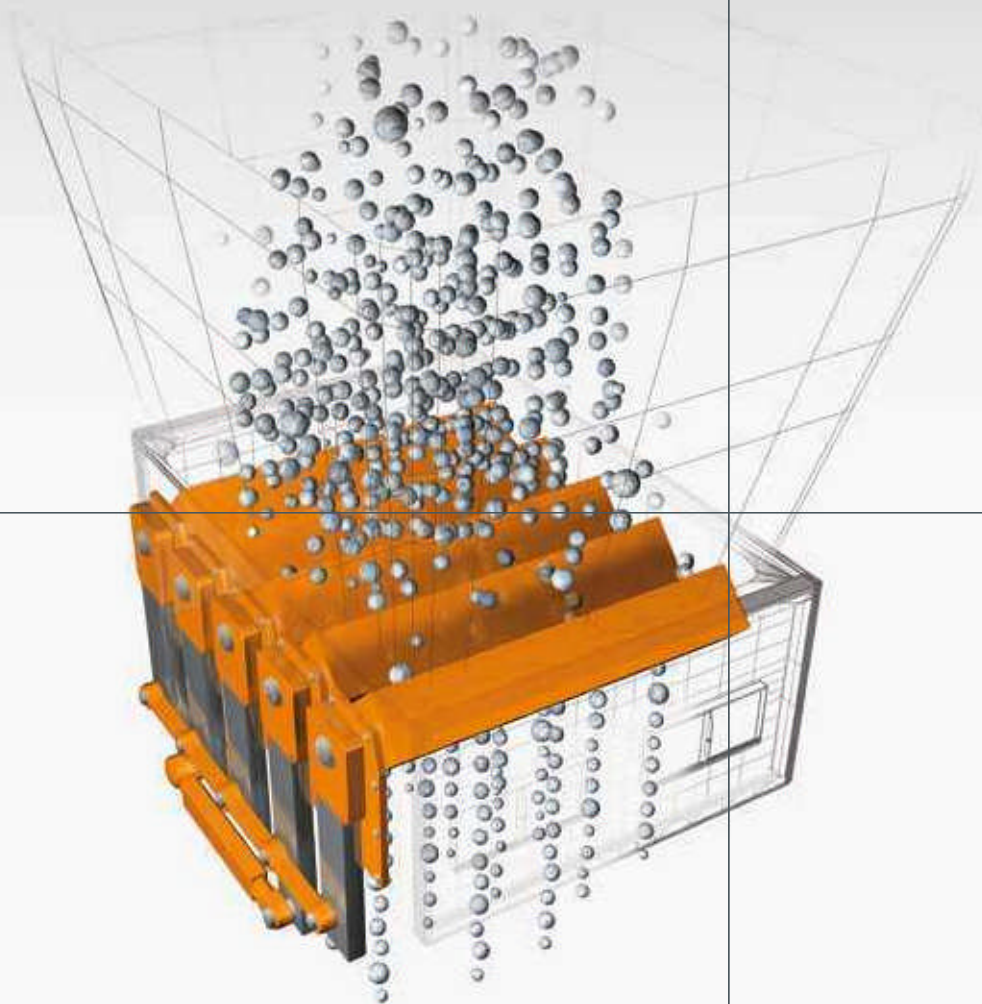




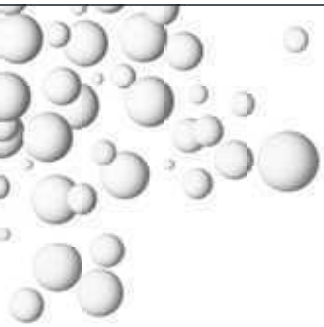
OSZILLOMAT[®]

The Effective and Efficient Discharge System.

Loosen, discharge,
and dose complex bulk
solids from silo/container.
All in one system.



OSZILLOMAT: THE OVER-ALL SOLUTION FOR ECONOMIC BULK SOLIDS DISCHARGE.



Did you know that discharge is the core of bulk material logistics? As a specialist in bulk solids with more than 35 years of experience, we can only agree and say, "yes, that's right!" Especially difficult bulk solids can cause flow and other discharge problems which affect the course of downstream processes negatively or even can lead to a total stop of the material stream. But, don't worry! Our discharge system **OSZILLOMAT** assures you that "your facility will never stand still!"

Every downtime costs money. To prevent this from happening we incorporate our research expertise, our high competence in mechatronics and our knowledge in common bulk solids processes into every project. Of course, the engineering of the **OSZILLOMAT** is mainly influenced by these essential components.

Quality Assurance, Precise Discharge

This simple and ingenious discharge system consists of a individually adaptable silo geometry and a oscillating beam discharger. The controllable beam floor triggers mass flow, which is essential for the quality assurance of most complex bulk solids.

The **OSZILLOMAT** is a safe all in one solution by which bulk solids, however hard to handle they may be, can carefully be loosened, dosed, and gently discharged. In addition, you always keep control, because the material flow can be monitored and controlled automatically from a central operation station.

Through buffering the bulk solids always discharge with high precision in the right amount and structure. This assures highly efficient processes.

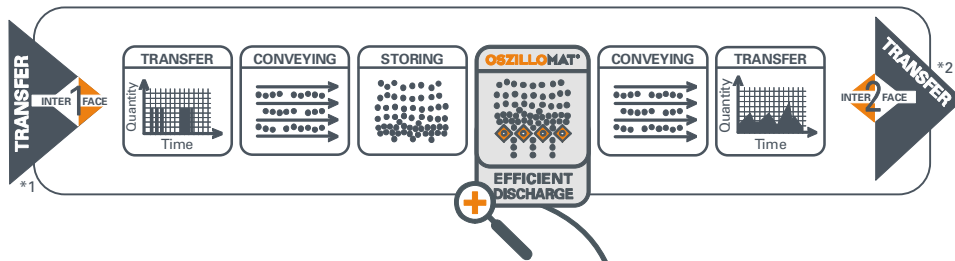
Services Offered

You will receive the entire service spectrum: starting with consultations over engineering, to process automation, assembly and after-sales support (training). From us, you always obtain economic package solutions in which all parameters of downstream positions are integrated in a cost effective way. You save expenses on a long term basis. The long lifespan combined with little maintenance and stable operations guarantee efficient intra logistics. Hence, the resulting low costs of life cycles are a good reason which makes the **OSZILLOMAT** system not only an economic solution for complex applications, but also for simple ones.

You see we know how to deal with bulk solids. Moreover, on following pages we would like to show you the thoughts behind the **OSZILLOMAT** system.

DISCHARGE = THE CORE OF BULK SOLIDS LOGISTICS.

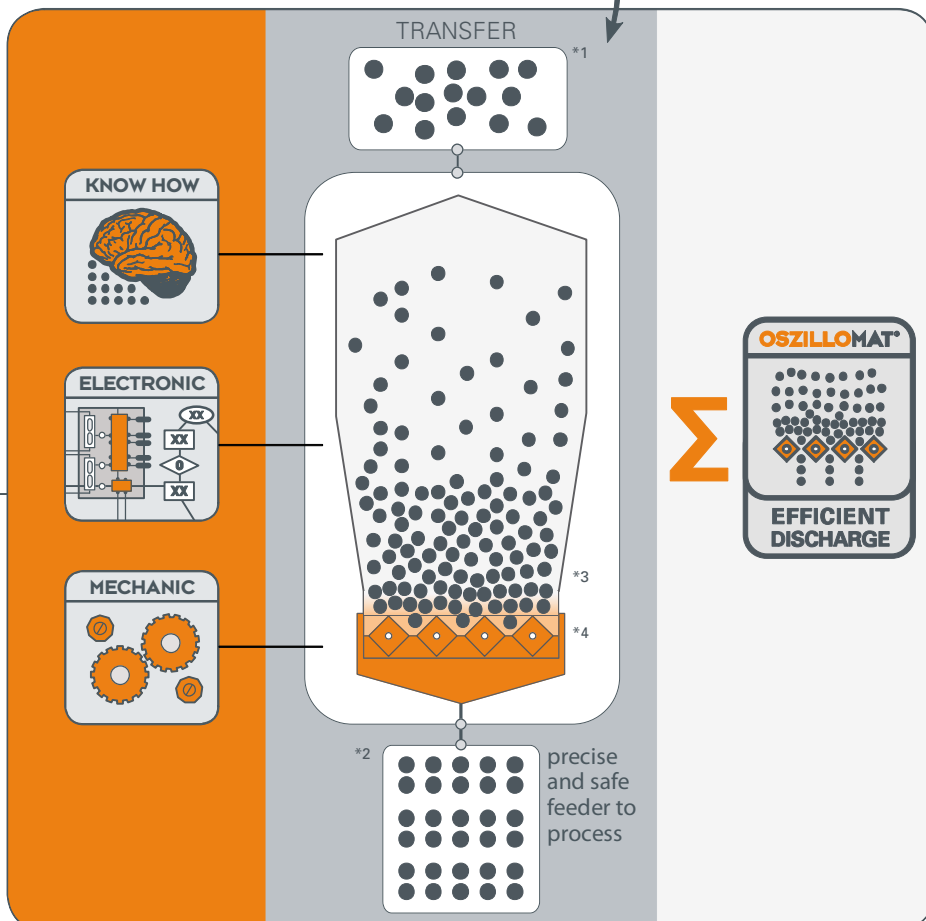
An overview of bulk solids logistics ...



● "Since many years we have been using silos in which filling material like PCC, Caolin, TiO₂ and other extender types for slurry production can be stocked. Almost all of these silos are equipped with an OSZILLOMAT. After this way of discharge has been working so well we have decided to also equip our new paper machinery with the OSZILLOMAT. The eldest machines have been running great for more than 20 years. The new ones are in use since 2003, all of them working perfect even though almost no maintenance is necessary."

Wolfgang Lepschi,
Production Manager, delfortgroup

... and the core in detail.



*1, *2 The requirements/parameter of the interfaces or rather downstream processes are considered in *3 design/dimensioning of the silo geometry and *4 the oscillating beam floor.

OSZILLOMAT: SAFE CONTROL OF ALL COMPLEX BULK SOLIDS.

This is how the system acts to complex flow-technological properties.

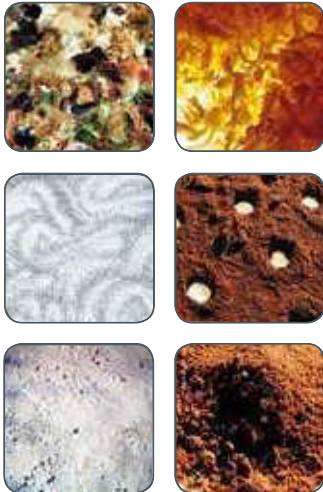
The first and most important step towards automatic handling of bulk solids is the exact analysis of your material. We examine your bulk solids for conveying or flow-technical requirements in our in-house laboratory. We can already access more than 1600 such research results. This makes the possibilities nearly endless and we swiftly find an acceptable solution. This even applies to totally new developed bulk solids. The OSZILLOMAT system is especially suited for the following complex applications:



Cohesive bulk solids (titanium dioxide, moist kaolin, melamine, synthetic gypsum...) The system discharges the material safely. Slow, oscillating motions prevent bridge building in the hopper. The beams cannot be clogged.



Elastic cohesive bulk material (plastics pellets, rubber granules...) The huge, powerful movement of the oscillating beams overcomes the inherent elasticity and adhesion of big particles.



Ultra-fine bulk solids (fine lime, chalk, fly ash....] This material cannot be liquefied, partial bridge building is excluded. Therefore, maintaining a high dosage constancy.



Cohesive viscous bulk solids (clay containing 25 % water, filter cakes...) Despite a maximum of stickiness, all materials are safely discharged and despite the complexity of the substances' properties high discharge at appropriate dosing is guaranteed.



Anisotropic bulk material (plastic fractions, XPS flakes, alternative fuels...) Even under high floor pressure, the bulk solids are released and safely discharged.



Hygroscopic bulk solids (urea, phosphate, salt...) The oscillating bar discharger triggers the essential mass flow. Possible clumps are dissolved, layer growth is minimal.



Segregating bulk solids (silicon dry mortar, gypsum...) Aside from mass flow, the beam system triggers the piston flow. This phenomenon causes the material to remix. At all times, quality is kept at the highest level.

Application Spectrum of Bulk Solids

Whenever the silo needs to be closed, the heavy oscillating beams assure that it really is closed. The OSZILLOMAT system manages a bulk weight of 50 to 3000 kg/m³ from very coarse particles (50 mm) to bulk solids in microscopically small powder form (0.01 µm). As an option, the system can be designed even for especially high temperatures of up to 800° C e.g. during dry ash removal.

Mixing individual batches in various qualities poses absolutely no problem. With Geroldinger's appropriate additional equipment, bulk solids of 5 to 100 m³ can be homogenised. Therefore, the OSZILLOMAT can be designed as large capacity mixing facility.

5 REASONS WHY WE ARE THE RIGHT ONES FOR YOUR COMPANY.

OSZILLOMAT®

The OSZILLOMAT is a multi-functional discharge system that combines the functions "loosening, discharging, dosing, and locking."

1. MASS FLOW

The oscillating beam floor and the silo geometry activate the silo volume to 100%. The resulting mass flow assures that bulk solids do not cling to the edge of the silo and cause the "first in, first out" principle during which the bulk solids filled first are discharged first. The OSZILLOMAT's discharge performance is between 10 and 80 m³ per square meter of outflow cross-section. The piston flow (a special occurrence of mass flow) minimizes fluctuations in grain distribution at the outlet.

● "Your OSZILLOMAT machinery does do a perfect job. Due to a precise and consistent feeding they ensure to use the maximum capacity of the mills. At the same time the durability of the mills has been extended by more than 50%. We look forward to using these benefits also at our facility in asia soon."

Customer from
Minerals Processing Industry

2. GUARANTEED SILO DISCHARGE

Parameter adjusted to the bulk solids, "silo geometry" and "beam floor" assure that all materials flow downwards and is discharged between the beams. There are neither bridges, nor chambers formed in the silo, nor any obstructions in the area of the beam floor allowing safe and punctual discharge from the silo/container. It does not matter how complex the bulk solids are. The OSZILLOMAT system always assures dependable discharge.

3. DOSING CONSTANCY

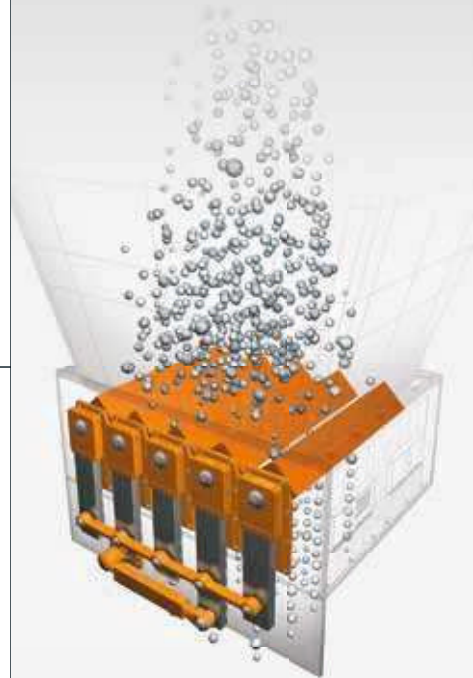
Even when discharging ultra-fine material, the system offers highest dosing constancy, because dosing and discharging happen simultaneously. An efficient control system assures dosing accuracies of +/-1% and better without any fluctuations in density. In the range of 1 to 100% of the maximum performance, your bulk solids are precisely and continuously measurable without flooding. The following process is always handled at an optimum.

4. OPERATING COSTS

Downstream equipment in the bulk solids process chain is preserved to its benefit and the equipment's lifespan increases. The operating power necessary for discharge is significantly lower than in many other systems. The especially economic construction saves lots of energy and minimizes operating costs.

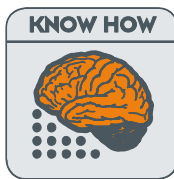
5. AVAILABILITY

All functional components of the system are located on the outside, at easy accessible locations making maintenance very simple. The excellent emergency features reduce any downtime probability significantly. If any such case ever happens, then it can always be rectified outside the silo. Operating safety is not at risk. A mining evacuation is never necessary as the silo can be completely emptied at any time.



3 FACTORS THAT FORM THE UNIQUE BASIS FOR YOUR SUCCESS.

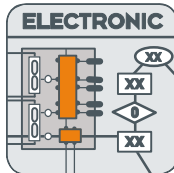
FACTOR 1 TECHNOLOGICAL FOUNDATIONS OF BULK SOLIDS



Our consultation starts with the need analysis. Our experience with many already realized projects let us swiftly determine the system's proper size, form, and rate of motion.

We gain our comprehensive expertise in the area of technological bulk solids foundations primarily from our in-house bulk solids laboratory and our pilot plant. Furthermore, our employees gain knowledge from a large data base, which includes a comprehensive network of field reports, research results, and other relevant reports connected to bulk solids. The high degree of network based thinking and working gives our team with the professional competence necessary for most complex applications, which is essential to determine the dimension of the silo geometry and to develop the control systems.

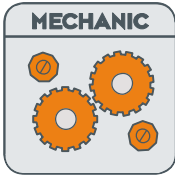
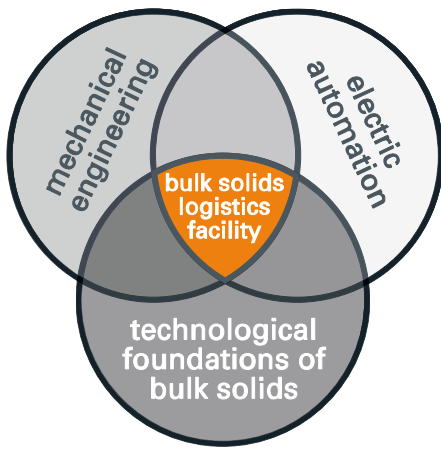
FACTOR 2 AUTOMATION & CONTROL



After the flow-technical properties of your bulk solids and the requirements of your interfaces were considered, i.e. the resulting demands on your facility or mechanical engineering are fulfilled, all relevant parameter are adjusted and automated to your control electronic. To assure that every process runs safely and smoothly, the **OSZILLOMAT** mechatronic is backed up by a smart diagnostic tool, the Geroldinger SPS control system.

It records precisely all relevant processes in and around the **OSZILLOMAT** and displays it clearly at a PC workstation. This comprehensive approach allows quick reactions to all operating conditions that arise during material flow and even during monitoring. **The safety and availability during complex applications is always guaranteed.** Finally, the modular structure of the Geroldinger software allows individual adaptations to already existing operating systems. Electronic sensors are attached to the **OSZILLOMAT**.

Flexibility to meet future demands! Various modes of motion allow adjusting the discharge rate of the beam system for numerous applications or bulk solids. The SPS software we developed assures proper function of all processes. You always know what is going on and in addition, you receive a safe prevention tool. If you wish, Geroldinger can remotely monitor the **OSZILLOMAT**. The system is controllable by internet and if needed, it corrections can be made swiftly from afar.



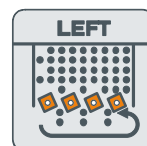
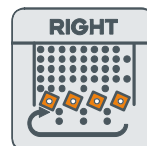
FACTOR 3 MECHANICAL ENGINEERING

In a solidly welded machine frame, the massive oscillating beams are supported by high performance swing bearings. On the side of the bulk solids, the bearings are sealed by a grease chamber and gasket allowing no bulk solids into the bearings and no lubricant into the bulk solids. The beams are moved back and forth by connecting rods and levers without vibrating or rotating. No air is used. The slipping clutch between beam and pendulum assures high machine safety.

● "Earlier we had to handle Urea in Big Bags. As a pharmaceutical plant it is important for us to produce within enclosed units, mainly to avoid foreign particles in our products. OSZILLOMAT made this possible for Urea due to reliable discharge. Furthermore the unit does a great job in dosing. Meanwhile we extended our plant in Norway with further OSZILLOMAT machinery and also equiped our facility in Denmark."

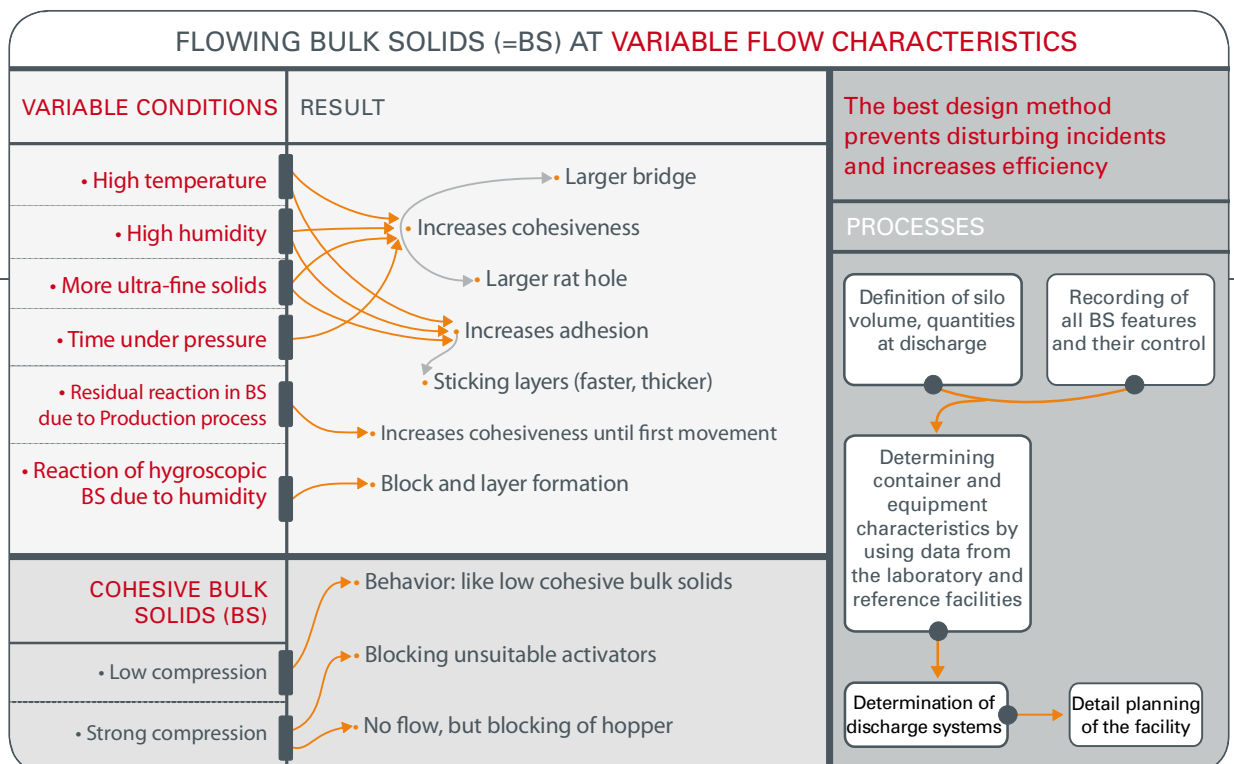
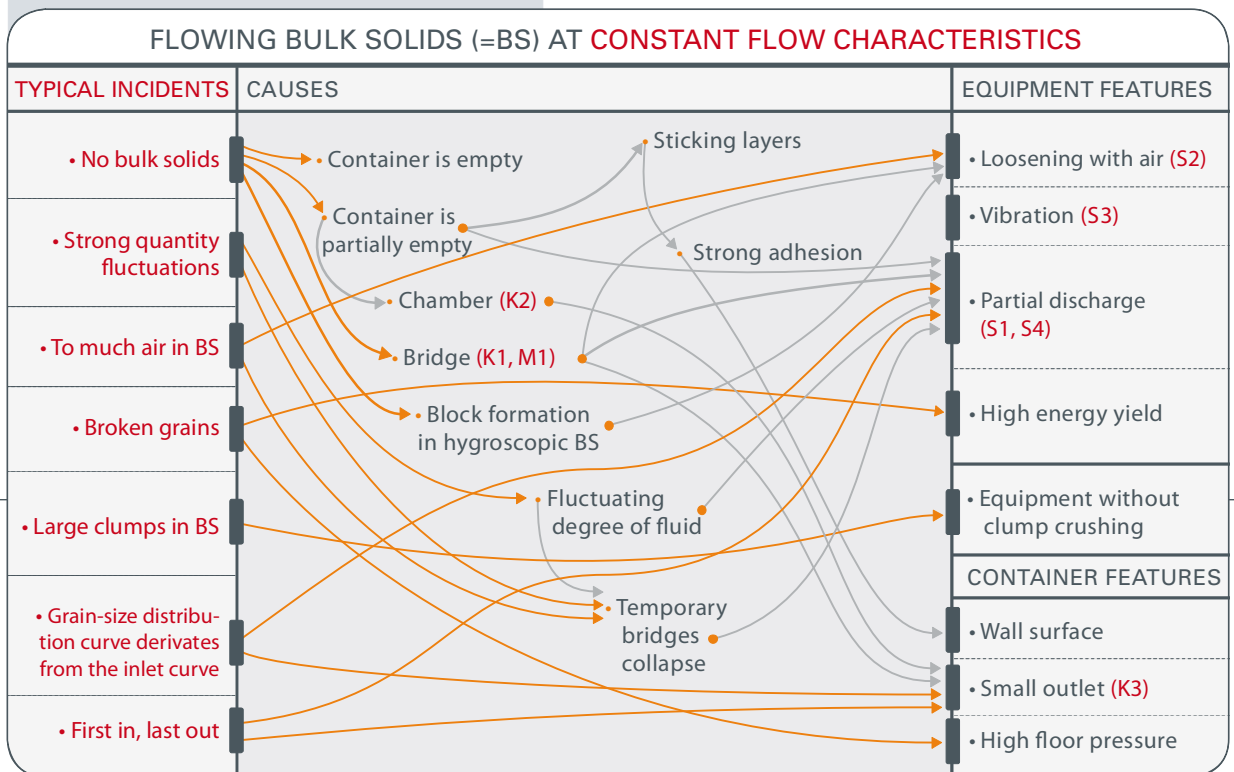
Henrik Fismen, Plant Development Manager, Pronova BioPharma Norge AS

The beam floor can be delivered in universal machine sizes between 0.6 x 0.6 and 10 x 5 m and optionally can be fitted to a custom made round or rectangular silo geometry. Careful production and robust steel construction guarantee an extremely long lifetime with little effort. Thanks to the easy access and the low wear and tear, apart from lubrication no maintenance is necessary. The beams are individually exchangeable and can be adjusted as often as needed. The high-tech OSZILLOMAT assures even left-right movements for mass flow – the beams oscillate. With particularly difficult bulk solids, this function assures that bulk solids never clump, stick, build bridges inside the silo nor even entirely clog a silo. The lack of cohesion lets the bulk solids flow easily through one little opening out of the device by gravity. Any medium-hard clumps get dissolved in a gentle way. The individual grain does not get crushed. The system withstands a floor pressure of up to 140 kN/m². Discharge is easy even at high bulk weight.



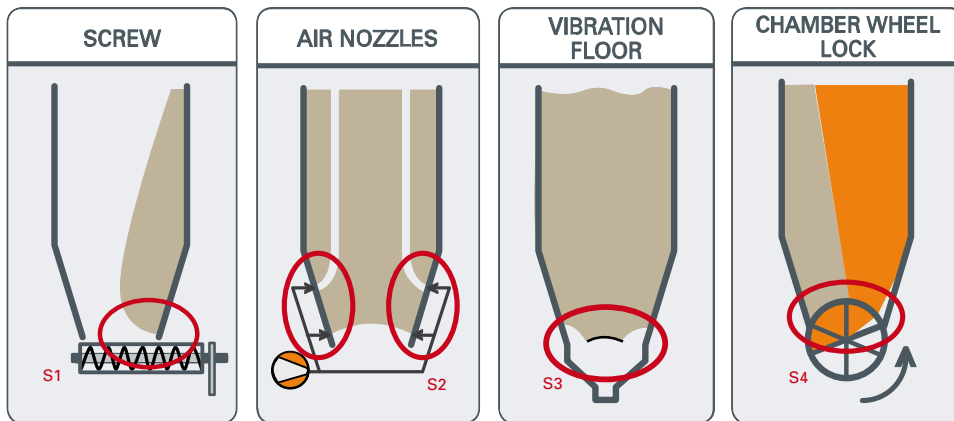
TYPICAL PROBLEM AREAS DURING BULK SOLIDS' DISCHARGE, WHICH WE PREVENT.

The situation at the silo-outlet:



FREQUENT INCIDENTS DURING DISCHARGE, WHICH WE AVOID WITH OUR EXPERTISE.

At Geroldinger all bulk material parameters are fine-tuned to your silo system preventing the following typical incidents:



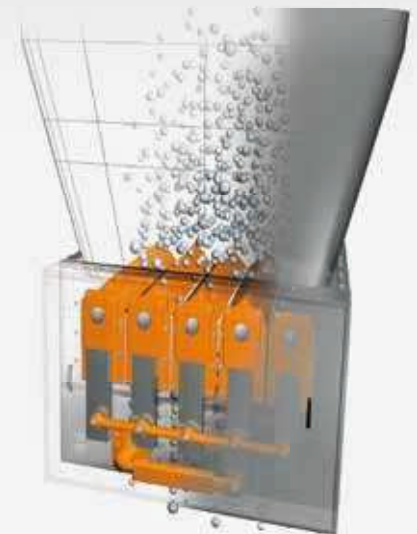
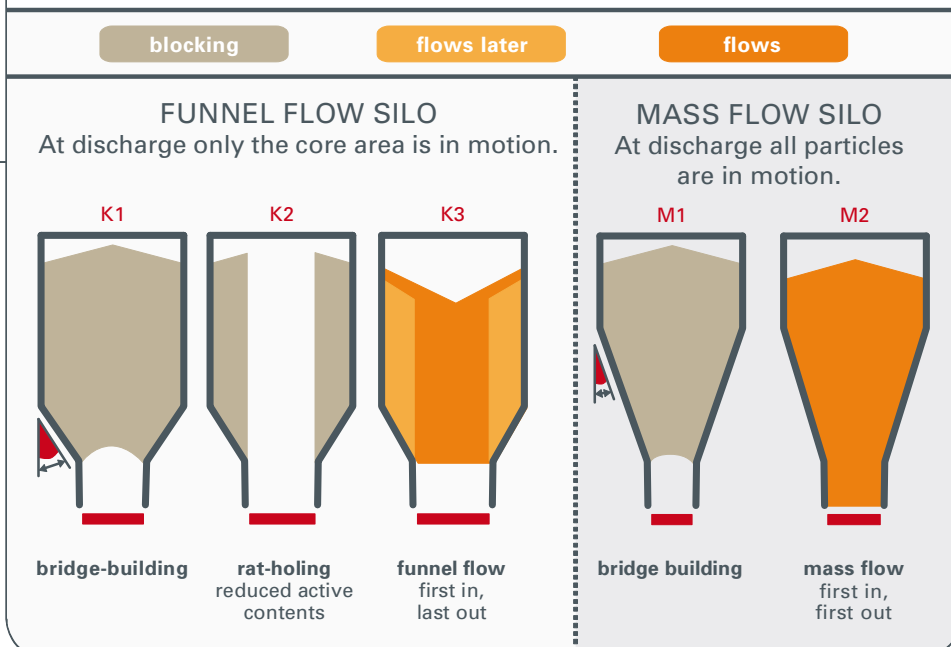
● "Even during winterly operating conditions with low temperatures and longer discharge intervals together with formation of ice sheets at the outlet we are able to discharge synthetic gypsum reliably with OSZILLOMAT. We generally see the benefits in the adaptability of the discharge system regarding operational caused alterations in product properties, as well as the optimisation of the filling distribution when loading trucks."

Wolfgang Kindlhofer, Project Engineer
VERBUND-Austrian Thermal Power

- S1 Uneven discharge of screw conveyors forms dead zones in the silo.
- S2 Blown air cannot loosen cohesive material and solid bridges form.
- S3 Elastic bulk solids form stable bridges by the small outlet area of the vibration floor.
- S4 One-sided material discharge by a filled chamber (chamber begins to fill itself immediately after material enters the silo and does not accept any additional material when full)

GEOMETRY INFLUENCES FLOW CONDITIONS.

All theoretical models contain the same bulk solids.



SAFE DISCHARGE MEANS STABLE OPERATION! OUR REFERENCES:



1.

1. Not free-flowing RDF from large bunker

Shredded Refuse Derived Fuels with 80 % < 60 mm, very high proportion of paper and moisture. Storage of 200 m³ RDF and continuous, dosed discharge at onsite conveyor belt. It replaces previous manual handling with wheel loaders.

Delivery details:

MULTIGON Silo 200 m³ without hopper, 4.50 x 4.50 m OSZILLOMAT with the same cross-section, differential dosing scale, control system.

2. Hygroscopic Sodium Nitrate (not illustrated)

Sodium nitrate, fresh from production with a residual heat hardens very quickly and intensely. Up to now, it has been deemed not silable. Previous handling: open storage, manipulation with bobcats.

Current handling by OSZILLOMAT: closed automated system with extremely high availability

Delivery details: 2 MULTIGON mass flow silos with a capacity of 110 m³ each, Two 1.68 x 2.48 m oscillating bar dischargers, screw conveyors, pneumatic conveyor system, control system.



3.

3. Moist REA gypsum from Silo with a Capacity of 600 m³

REA gypsum with a humidity of 12 %, bulk weight of 1.1 t/m³, granulation of 0.02 to 0.3 mm, cohesiveness factor $\sigma_c = 7 \text{ kN/m}^2$, critical diameter/bridge spanning width approx. 2.3 m.

The geometry of the existing silo with a diameter of 8 m was adapted to the complex task by adding a two-part hopper. The OSZILLOMAT system assures dosed discharge of up to 80 t of REA gypsum per hour.

OSZILLOMAT can also deal with extreme muddy REA gypsum, which is caused by not emptying the silo for some time.

Scope of delivery details: hopper, 2.89 x 2.89 m oscillating bar discharger, hinged cover (seepage water) under the silo outlet, control system.



4.

4. Cohesive, adhesive, and/or ultra-fine raw materials precisely dosed:

aluminium sulphate, CaCO₃, silicate, kaolin, talcum, starch... primarily highly cohesive, bridge-building, sticking, and difficult to discharge from large silos and to dose. Round silos puffer the various raw materials. They are mainly discharged by OSZILLOMATs, vibrating discharge floors, and screws.

They are conveyed mechanically or pneumatically depending on distance/task.

Delivery details: round silos, oscillating bar dischargers from 1,38 x 1,38 to 2,05 x 2,05 m, network of installations with dosing screw conveyors. It transfers all powders to dispersing safely and precisely. Control system: upgradeable/future-proof, can deal even with future powders.



MORE DETAILS AND ADDITIONAL REFERENCES AT WWW.GEROLDINGER.COM



OSZILLOMAT®

5. Free Discharge of Cohesive Quartz Sand/Grain Size of 0.1 to 0.3 mm (not illustrated)

During silo filling varying size/rolling ability of particles lead to segregation into vertical layers. There is no way to avoid segregation. Filling pipes/hopper installations reduce the effect of segregation, but do not prevent it! We approach this problem by "remixing" the vertical layers. Inside the silo, mass & piston flow is assured. A standard deviation of the patterns drawn during filling and discharge of less than 3% is guaranteed. The grading curve at the outlet is nearly identical to that at the inlet. Therefore, the requirement for the result of the next process is met.

Delivery details: Round silo with piston flow geometry (4.4 m in diameter, capacity of 80 m³), 2.45 x 2.45 m oscillating bar discharger, and control system.

● "Thanks to the OSZILLOMAT we were able to eliminate funnel flow so that we nowadays have a balanced grain-size distribution at the silo outflow. Therewith we can deliver the homogeneous quality, which is essential for the production process of our customer."

Johann Brunner
Area Manager coloured sand,
Dorfner Kristallquarzwerke



6. Paste-like Filter Cakes from Bunker with a Capacity of 300 m³

Coarsely agglomerated filter cakes of chalk, clay, and other mineral compounds. Humidity: 18 to 22 %. Bulk weight: 850 to 1400 kg/m³ > extreme variable flow characteristics. The filter cake varies between extremely cohesive and adhesive to paste-like with strong hardening over time. The task: buffering 600 m³ in two bunkers. Dependable discharge and move into position without delay even after several hours of resting phase. Feeding to a conveyor belt with a dosing constancy of +/- 2 % in

5 minutes. **Delivery details:** Engineering of the bunkers, 2 OSZILLOMAT discharge systems with a 20 m² of discharge area each, 2 eightfold screw conveyors (no transport, but only with crushing effect), control system.

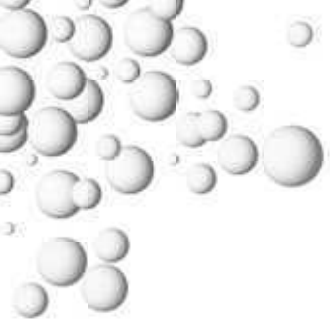
7. Silo storage with reliable exactly dosed discharge of uncoated, hygroscopic urea

Extremely fragile, high dust content (quickly forms hard, thick layers and large clumps). It makes storage in a silo more difficult. Individual batches are conveyed pneumatically and dosed exactly. The problem is solved by automated logistics, from the truck to the task of dosed batches in the reactor with top precision. The silo design and mechanical effect of the beam increases operating safety and decreases maintenance efforts.



7. Delivery details: 2 MULTIGON mass flow silos 80 m³ each, 2 oscillating bar dischargers of 1.65 x 1.65 m, screw conveyors, pneumatic conveyor system to transfer to and load 2 weighing containers 10 m³ each incl. oscillating bar dischargers of 1.04 x 1.04 m, control system.





Consultation
Research & Engineering
Production & Assembly
Turnkey Systems
from planning to start-up

Storage
Mass flow silos:
Round & octagonal MULTIGON

Conveyor Systems
Pneumatic conveyor systems,
screw conveyors, chain conveyors

Discharging, mixing
Dosing & weighing
Systems for mass flows:
OSZILLOMAT, screw conveyors

Process Automation
Controlling, recording,
visualizing

WE HAVE THE RIGHT SOLUTION FOR YOUR BULK SOLIDS!

