SOLID NEWS

ISSUE 20

The newsletter of **AJAX EQUIPMENT** - the **BULK SOLID** performer

WHEN ONE MULTI-SCREW IS NOT ENOUGH

Advanced materials company, Mersen, has benefited from expanding carbon fibre production at its Eurocentral, UK facility near Glasgow with storage, feeding and handling equipment from Ajax.

"After the recent success of working with Ajax to upgrade an existing line we were happy to work with them again. Commissioning with the new multi-screw system went exceptionally well with production totally satisfied that the Ajax feed of product to our mill is consistent and far superior to our original Silo set up," commented Scott Keil, manufacturing manager, Mersen.

Ajax multi-screw feeders provide active extraction from the silos above. The integrated design of the hoppers and feeders means that together the equipment prevents any hold-up of carbon fibre, including arching, and ensures a positive and regulated feed of carbon fibre.

A collecting screw serves the outlet of the screw feeders, moving the carbon fibre towards an outlet which features a grille to ensure the most stable clump free feed to the mill below.

"Carbon fibre requires careful handling as the combination of low bulk density and a fibrous particle shape can make it resistant to flow. During development of the handling equipment previously supplied Ajax conducted flow property tests to establish the material's needs. Using the data this provided we were able to design a system which would ensure flow and deliver the feed rate required," said Eddie McGee, managing director, Ajax Equipment.

SAFE SIZE REDUCTION FOR PHARMA POWDER

Vickers Laboratories has enhanced production with a combined mobile lump breaker and sack-tip featuring a pharmaceutical grade, stainless steel finish from Ajax. The system allows sacks of caked pharmaceutical powders to be safely opened and efficiently reduced to a consistent particle size, while the mobile frame enables the station to be removed from the production line and fully washed down.

"Since installation and integration of the Ajax lump breaker into our salt processing line production has increased by at least four times. In addition, process noise has been reduced to acceptable levels and operator satisfaction greatly improved," said John Kirkham, Quality and H&S manager at Vickers Laboratories.

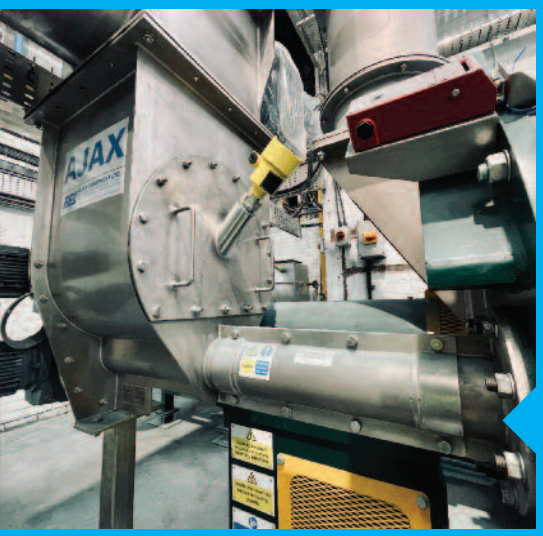
HAZARDOUS ASH PROCESSING

One of the UK's leading providers of resource management has increased its Air Pollution Control Residues (APCr) treatment capacity with ash handling systems from three silos provided by Ajax.

Each system consists of a quadruple screw feeder, as well as the associated collecting conveyors and elevators, to move material towards a large capacity Ajax twin screw ash conditioner.

"Hazardous materials such as ashes require careful handling. Designing the system as a whole has ensured that the material is safely stored, transferred and treated into a non-hazardous state suitable for long-term storage," says Lewis Shaw, technical sales engineer, Ajax Equipment.

SCREW FEEDERS • LUMP BREAKERS • SCREW CONVEYORS • CONTINUOUS MIXERS • HOPPERS & IBCS • DRUM EMPTYING



MATERIAL RESISTANT TO FLOW? AN AGITATED SCREW FEEDER CAN HELP IT GO

Sometimes the arching capability of a powder is so strong that it is not practical for gravity flow and the material effectively needs a push! This is where an agitated screw feeder can prevent cohesive materials consolidating to a non-flowing condition and keep the bulk solid moving.

How an Agitated Screw Feeder Works

An agitated screw feeder ensures a material is in the right condition for further processing by providing 'active' storage, which prevents the solid from settling.

The hopper ensures that solid does not remain static by encouraging flow through its shape, usually a deep U-shape or barrel profile to suit the sweep of the agitator, material and finish. An agitator maintains 'live' product flow condition by gently stirring the solid - it is important to avoid over compaction from trapping or wedging the solid against the hopper wall, as well as positively directing the material towards the screw feeder below, which provides an efficient and controlled feed rate.

Inside a retractable screw feeder with Z-form agitator.

The screw needs to be sized and utilise geometrical considerations which are conducive to good extraction from the hopper section. As it serves a long slot, all the feed screw considerations of progressive extraction geometry capability also apply.

Designing an Agitated Screw Feeder

Agitated screw feeder design depends on the user's process needs, required discharge rate and holding capacity. However, the design process should start with learning how the material can be best served.

Bulk Density

During handling or storage, a material's bulk density will often change as volume is reduced when a solid is compacted or tapped due to deaeration. Gentle stirring, as provided by an agitator, can assist deaeration, though this is dependent on the material. Continuing to stir the product can keep the material in a consistent flowing condition.

Measuring bulk density informs how a solid reacts to handling and stress conditions, indicating a sensitivity or tendency towards poor flow. The Hausner ratio, tapped bulk density to loose bulk density, is a means of characterising flow potential in bulk solids.

Wall Friction

Wall friction testing measures a material's resistance to sliding and provides the data needed to establish the wall angles for a hopper to work well with a material.

Additionally, the wall friction test provides useful information on which hopper material would provide optimum slip. Screw flight geometry and agitator form also need to take this into account.

Shear Strength

Shear strength shows how cohesive or resistant to deforming and flowing a solid is. Usually this is used to show the opening size required for a gravity flow hopper shape. However, cohesive materials can use an agitated screw feeder, where the outlet is relatively small, as it isn't relying on gravity alone but uses the action of the agitator to direct the material to the outlet.

Depending on the material and load applied, consolidation can take from minutes to a few days. Shear tests carried out for instantaneous and time consolidation conditions help identify strength gain with time and optimise frequency of agitation.

Some solids, such as filter cake, have a liquor associated with them which can provide strength and increase cohesion and adhesion. The 'drying out' of this liquor can also help strengthen the material as it settles and starts to cake or fuse together. An agitated hopper can be very helpful here by intermittently stirring the product to maintain live flow condition.

Is Bigger Capacity a Larger Challenge?

Supersized agitated screw feeders allow bigger or multiple batches to be stored. However, it's not just a case of scaling up, many issues need to be considered.

Design wise, mechanical integrity, assessment of the torque required and how that is delivered, e.g. using planetary geared motor units, and matching with the screw for feed control are very important, especially on 'supersized' machines.

One of the largest agitated screw feeders Ajax Equipment has produced also had specialist handling requirements due to the material's corrosive nature. To meet the needs of Lianhetech Europe's centrifuge material, the agitated feeder was constructed in Alloy 22, an extremely corrosion resistant high nickel alloy, and designed to be ATEX compliant.

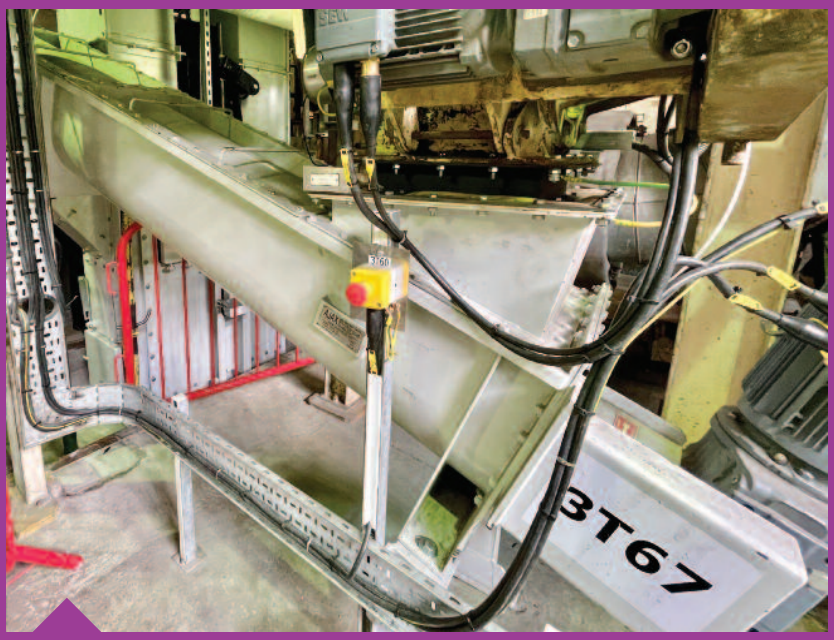
Imran Khaliq, Lianhetech Europe commented, ***"Ajax takes the time to understand the requirements of each specific process rather than supply a generic design and this is one of the key reasons that ensures the units can do the job from the start."***

In Summary

Agitated screw feeders provide an excellent method of maintaining material condition when there may be a prolonged delay between stages or simply when the feed rate demands a smaller screw than can be adequately served by gravity alone. With properly integrated screw design they provide a positive and controlled feed of material.

As with most engineering projects, there is almost always a solution, it just needs to be found. That is where the benefit of both fundamental understanding and extensive experience tend to help the most.

SCREW CONVEYOR SPURS CATALYST HANDLING



Speciality chemicals and sustainable technologies company, Johnson Matthey, has enhanced the handling of a catalyst material at temperature with an inclined screw conveyor and chute sections from Ajax.

Commenting on the project, Johnson Matthey engineering project manager, John Lowe, said, ***"It was a delight to work with Ajax Equipment on the transfer system upgrade at the Johnson Matthey Clitheroe plant. Ajax's vast knowledge and expertise in transfer systems was essential to ensuring the correct equipment was specified for transferring the powders.***

"Initially, we requested Ajax to develop an inclined screw conveyor that would transfer low density powders, at up to 100°C, at a minimum rate whilst deaerating the powder. During the design process alternative thermal expansion joints were required, which Ajax worked closely with us to develop. Ajax then incorporated their designs into our 3D models which provided a useful visual representation of the installation. The meticulously designed equipment ensured perfect installation within the very limited plant space available.

"The new inclined screw conveyor has been installed on plant for over 8 months and has performed amazingly. Ajax delivered on every expectation we had."

DIARY DATE

BULKEX 2024

15-16 October 2024

Chesford Grange Hotel & Conference Centre

Organised by the Materials Handling Engineers Association, the BulkEx 2024 awards, exhibition and technical conference will bring together all areas of the materials handling industry including mining, ports, transport, power, biomass, waste-to-energy and cement, providing a unique showcase of products and services.

Register at: **www.mhea.co.uk/bulkex-24-conference/**

ASK LYN...

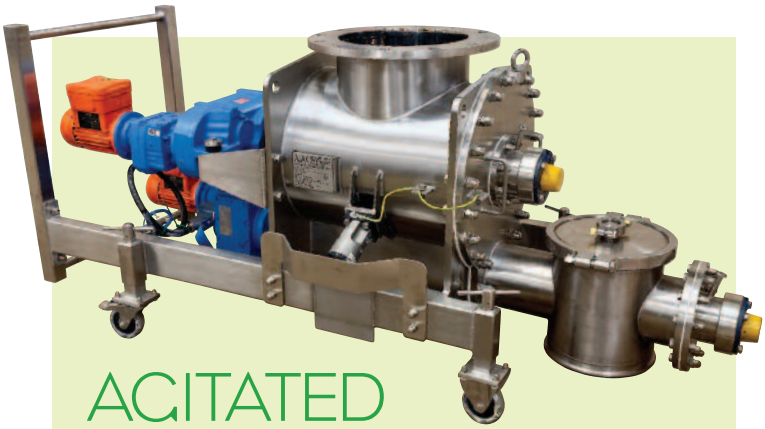
Q What approach should I take if I want an optimum bulk storage system?

A It is over 60 years since Jenike introduced Mass Flow as a means to design bulk storage hoppers on a scientific basis. This is often cited as an ultimate form of flow from hoppers, but mass flow alone does not provide optimum flow and process benefits.

Certainly, mass flow provides reliable flow through a predicted outlet size, but this can also be acquired by an 'expanded flow' regime. Mass flow also prevents indefinite storage time, 'ratholing' or arching but does not secure the optimum benefits of mitigating segregation, even residence time, securing a consistent discharge density and reducing the risk of flushing. Fitting a feeder not only controls the rate of discharge, but can enhance the equipment performance in these features, provided that it generates uniform extraction along a plane flow hopper outlet that is at least three times as long as it is wide.

A well-designed screw feeder can accomplish this task because of its positive action and the ability to offer incremental intake capacity along and across the hopper outlet. Application understanding and experience is essential to accommodate the geometry of the system. The flow properties of the material and the equipment construction must be suitably aligned with the mechanics of screw technology and the characteristics of the bulk solid to secure best results.

For example, a chisel-shaped hopper and triple screw feeder were used in a plastics processing plant to get their poor flowing powder moving again.



AGITATED SCREW FEEDER **KEEPS IRISH PHARMA SMILING**

With an intense polished finish and bespoke crafted agitator and screw, this stunning feeder turned heads at its FAT for a leading pharmaceutical manufacturer in Ireland.

FROM APPRENTICES **TO CRAFTSMEN**

"After four years of learning and developing their skills, Josh and Robbie have demonstrated their skills to an external inspector from City & Guilds, through an 'end point assessment'. This new approach requires a face-to-face interview and a practical demonstration of abilities in the workshop," Mark Waters explains.

"Both engineers have shown their capabilities to increase manufacturing throughput, as they step up to being skilled craftsmen and valuable members of our team."

HEAVY METAL POWDER HANDLING IN THE UK & USA

Ajax has once again worked with Atomising Systems Limited, supplying three feed hoppers and mass flow screw feeders for metal powder handling. Two systems will be used in the USA, while the other ATEX-rated system will expand production capacity in Sheffield, UK.

"We've used Ajax on several occasions for screw feeders and mass flow hoppers and so when this new requirement came up, we were happy to work with Ajax again and have not been disappointed," commented Craig Winfield, Project Manager, Atomising Systems Limited.

To secure mass flow and provide a consistent feed, Ajax designed the screw feeder and two-stage plane flow hopper to work together. The interface between a hopper and feeder is key for mass flow as material extraction must occur over whole cross section of the outlet.

LIFETIME ACHIEVEMENT AWARD FOR LYN

Ajax welcomed the Solids Handling and Processing Association's Michael Bradley, Louise Smallwood and Ian Birkinshaw to present Ajax co-founder Lyn Bates, with a Lifetime Achievement Award.

"Lyn has been a stalwart of our industry for over fifty years and has been a great influence in transforming the perception of it being seen as a black art into an innovative science-based, design-led industry. It was a great pleasure to present Lyn with the award in front of all his colleagues and family," said Mike Bradley, Chair of SHAPA.

Eddie McGee, said, ***"This award recognises Lyn's extensive contribution through Ajax and beyond to the international solids handling and processing community, putting the science of flow at the centre of his practical and innovative approach to equipment design. Ajax continues to develop this approach to provide the very best bespoke, customer-focussed solutions. We were pleased that Lyn's family were able to join us in celebrating Lyn's achievements."***

We hope you find our newsletter informative and interesting. To provide feedback or find out more about Ajax's equipment and services contact Ajax today.

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