

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

SEXTUPLE SCREW FEEDER FOR CARBON FIBRE

Ajax Equipment has worked with Mersen again, supplying a carbon fibre handling system for a new production line at the company's facility near Glasgow, UK. The system comprises multi-screw feeder, hopper, collecting screw conveyor with declumping features and an inclined screw conveyor.

The multi-screw feeder uses six screws to extract poor flow carbon fibre from the large outlet of the hopper above. The integrated design of feeder and hopper means that arching and hold up of fibre is completely avoided and a positive, regulated feed is consistently achieved. To ensure the most even of feeds to onward milling processes the collecting screws incorporate blades to comb the fibre through a grille, breaking up any tendency for the fibre to clump and hold together.

"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 has gone exceptionally well with production totally satisfied that the Ajax feed of product to our mill is consistent and indeed superior to our original Silo set up," commented Scott Keil, manufacturing manager, Mersen.



MOBILE SACK-TIP STATION



Fuel marker dye producer, John Hogg, has procured an Ajax mobile foldable sack-tip station to aid with the efficient discharge of powder solids from sacks into three different reactor vessels.

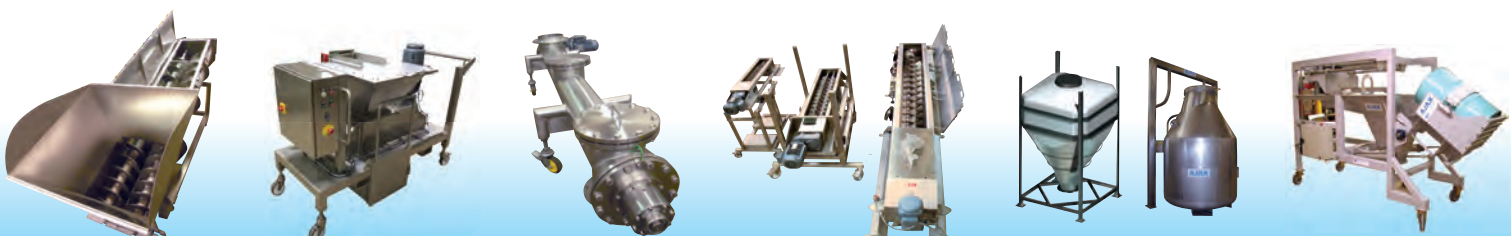
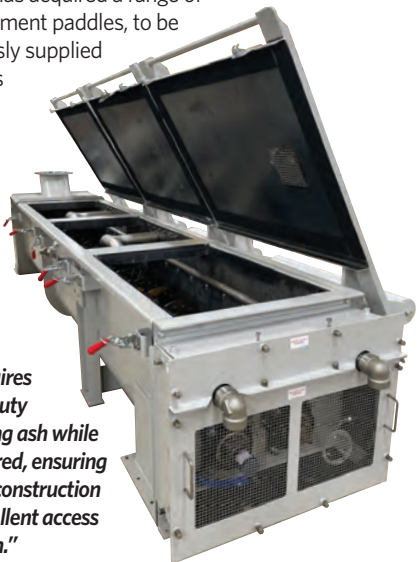
"Ajax's sack-tip station has made a huge improvement to the way we charge our blending vessels, both in terms of safety and ease of operation. Heavy packs of powder are now easily handled giving the user a solid platform to work on without having to bend or reach. The chute and surface lip design contains the powder well, which reduces waste; while the station's foldable parts and mobility mean we can move the equipment easily between vessels. In short, we are very happy with the equipment and service received from Ajax," said Stuart Dalrymple, engineering manager, John Hogg.



CONTINUING PARTNERSHIP WITH LYNEMOUTH POWER

UK energy generator, Lynemouth Power, has acquired a range of Ajax Equipment parts, including replacement paddles, to be used with four ash conditioner units previously supplied by Ajax in 2016. The twin screw conditioners form part of a fly ash handling system for Lynemouth Power Station's biomass plant, each handling up to 30m³ of ash per hour.

"Ajax Equipment's ash conditioners have performed extremely well since being installed, helping us to efficiently process the ash produced from generating bioenergy," commented, Luke Stephenson, senior engineer - rotating plant at Lynemouth Power. *"Processing ash, a very abrasive material, requires a robust solution. The design of Ajax's heavy-duty mixing screws makes them well suited to mixing ash while their paddles are simple to replace when required, ensuring maintenance time is minimised. The machine construction with counterbalanced hinged covers gives excellent access for cleaning and maintaining reliable operation."*



GO WITH THE FLOW WITH A MULTI-SCREW FEEDER

From fine cohesive powders to shredded wastes, bulk solids can exhibit varied and awkward flow behaviours which can make the material challenging to handle. Multi-screw feeders can help secure a reliable and effective feed of these demanding materials from hoppers, silos and bunkers through positive transfer and control of discharge and feed rate.

It is well recognised that to get a dependable feed of bulk solids from a storage system it is essential to use the correct hopper geometry and outlet size. Less appreciated is the importance of the feeder design and interface between the feeder and hopper.

The Virtues of Multi-screw Feeders

Working with a suitably designed hopper, multi-screw feeders can provide a positive means of extraction and transfer of material. This helps to make sure all areas of the hopper flow, an essential requirement for achieving mass flow. Screw feeders control the rate of feed, valuable for processes which require a consistent feed of material.

The benefits of multi-screw feeders are numerous and include compact construction, reduced headroom requirements, complete containment of the product as well as increasing the storage capacity and flow benefits of serving vee-shaped hoppers.

The design of a screw feeder, including the number of screws, depends on the needs of the material and process. Here are three Ajax case studies illustrating how multi-screws can be used in retrofit and new installations, and how the design is determined.

Two Screws - Chemical Powder Handling

In response to feed variations in excess of 30% from a feed system, including a large pyramid silo, at an Egyptian fertiliser plant handling milled phosphate, Bradley Pulverizer called Ajax Equipment in to investigate. Tests found a combination of high shear strength and much shallower wall angles than required for mass flow allowed ratholes to form while new material flowed straight through.



Due to the high shear strength, the bottom section of the hopper was redesigned to have a vee shape with steep walls and large outlet as well as a new Ajax twin screw feeder. The feeder has to extract from the full width and length of the new outlet and to do so uses twin screws, variable pitch and stepped shafts to provide progressive extraction geometry and satisfy the hopper's mass flow requirement.

Following the improvements, reliable and stable discharge was achieved, the residence time of material is much more even and the twin screws deliver feed stability within 0.5%.

Four Screws - Waste to Energy

In 2020 Enviropower approached Ajax Equipment to discuss how best to replace a poorly performing walking floor discharger below a bunker at their waste to energy facility. The refuse derived fuel stored has a low, variable bulk density and a tendency to form 'bird's nests'; a combination of characteristics challenging for any feeding technology.

Following trials with a large twin screw feeder, Ajax designed and manufactured a screw feeder with four screws, each measuring eleven metres long, to provide positive transfer from the full length and width of the bunker's huge outlet. Care was given to flight design and clearances to mitigate the variability of the fuel's size and shape. After the successful performance of the first quadruple screw feeder, Enviropower ordered an identical feeder for the facility's other processing line.



Six Screws - Carbon Fibre Handling

Following Ajax's supply of a hopper and single screw feeder on a successful upgrade of an existing milled carbon fibre handling line, Mersen asked Ajax Equipment to design another system for a new line handling carbon fibre.



The process required the carbon fibre to be stored in a large silo and due to the materials resistance to flow, the silo's walls could not have any convergence as sloping walls would cause the material's long and thin fibrous particles to arch and form a blockage over the outlet. For the vertical walled silo, a fully live multi-screw feeder was required to extract the carbon fibre from the silo and prevent any hold-up of material. To achieve this, Ajax designed a silo and six screwed feeder, driven as a pair of triple screws, as well as collecting screw conveyor with declumping features and an inclined screw.

"Commissioning with the new multi-screw system has gone exceptionally well with production totally satisfied that the Ajax feed of product to our mill is consistent and indeed superior to our original Silo set up," commented Scott Keil, manufacturing manager at Mersen.

AJAX DEVELOPS HYBRID CONTINUOUS/BATCH MIXER

Ajax has developed and supplied a global confectionary producer with two heated mixers on mobile frames for chocolate production. While designed for continuous production, the mixer can switch to 'batch mode' and hold the chocolate mix should a manufacturing issue occur further down the line.



The stainless steel mixers feature Lynflow™ paddle flights to provide efficient though gentle mixing of chocolate and a variety of inclusions. While the casing's hot water jacket maintains material temperature, ensuring consistent ingredient condition and thorough mixing. To maintain the condition of any chocolate and inclusions held in 'batch mode' the mixing screw has been designed to run in both directions, keeping the mix moving and in optimum condition for when production is able to resume.

"Ajax's latest innovation, a hybrid of our high performance continuous and batch mixer technologies, allows significant manufacturing flexibility without any compromise on product quality. This expands our mixer options which include custom casing profiles, quick release augers, mobile frames, and the ability to hold water, allowing the machine to be filled and run for cleaning,"
says Eddie McGee, managing director, Ajax Equipment.

ASK LYN...

Q A supplier sold me a 'live bottom screw feeder' but I don't get a consistent feed & material still hangs up in the silo, can you help?

A Multiple screws present several challenges to creating the extraction pattern the hopper geometry and flow regime need. 'Mass Flow', where all material moves during discharge, suits cohesive materials that deteriorate in quality/flow condition, or 'Funnel Flow', flow limited to a narrow cross section, is adequate for stable, easy-flow products, unless segregation is a concern. Whichever regime, material properties need to be measured to fix the outlet size, shape and wall inclination.

Large outlets can be served by multiple screws, but extraction should take place over the whole outlet area. Increasing the pitch is rarely enough as it reduces transfer efficiency and longer pitches have to serve long sections of the outlet.

Where multiple screws are used to save headroom, the hopper outlet may be far larger than arching size and the overpressure on the screws, particularly in the centre, can be significant. As a result, extra torque may be needed.

If residence time needs to be uniform, not just mass flow, then extra care is needed to balance the extraction geometry, with the central screws usually extracting a smaller proportion of the total output.

Multi-screw feeders provide wide outlets for difficult flow materials and enhance storage capacity, but they require care and experienced design to match the screw characteristics with the hopper flow pattern needed. It's best to talk to Ajax!



DIARY DATE



13:00 - 17:00 UK Time

Following the success of last year's event, Ajax Equipment's Eddie McGee will once again be contributing to the course with a practical approach in design to accommodate material characteristics.

For more info contact:
events@bulkterminals.org

**Institution of
MECHANICAL
ENGINEERS**

Introduction to the Bulk Materials Handling & Process Industry

10 November 2022, Webinar

Ajax's Eddie McGee & Westlake Vinnolit's Richard Hellebrand share their experience in materials handling & processing to introduce an often overlooked area of engineering.

For more info see:
www.imeche.org/events

SODA ASH HANDLING SYSTEM FOR INOVYN



Leading industrial chemical producer, INOVYN, has worked with Ajax Equipment once again to install a soda ash handling system to improve production capability and capacity at INOVYN's Lostock Gralam, UK facility. The stainless steel handling system consists inclined collecting screw conveyors and supports, chutes and diverter valve.

"We have a long-standing relationship with Ajax Equipment and have always been served well by them. The benefits achieved for our business have been significant over time," said Brian Done, brine & water sustenance projects & commissioning manager, INOVYN.

"We are always happy to have customers return to Ajax. When INOVYN approached us to evaluate how their dissolving tanks could be best be supplied we carried out a site visit to assess and establish design layout work," says Eddie McGee, managing director, Ajax Equipment. *"Ajax then worked with*

INOVYN to develop, produce and install an effective and efficient handling system for this challenging application. The contract included installation of the new equipment, which was carried out whilst ensuring plant feedstocks were maintained."

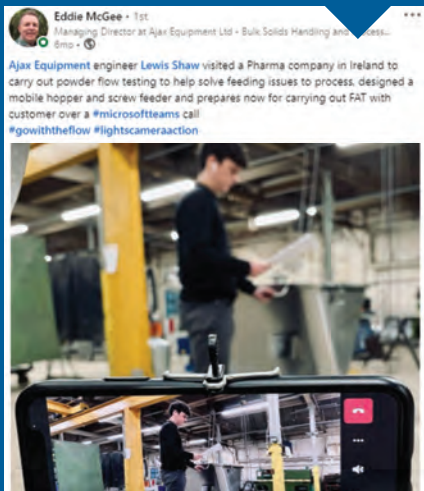
TRIPLE SCREW FEEDER FOR COVEYA



Material transfer specialists, Coveya, have procured an Ajax triple screw feeder and mass flow hopper for powder handling. *"Ajax were a pleasure to deal with; both the hire and sale went without hitch and they understood and delivered exactly what we required. I would highly recommend their company,"* said Jason Burrill, sales director, Coveya.

The design of the screw feeder and hopper address the powder's properties, which make it resistant to flow without encouragement, ensuring the powder flows well and is evenly distributed onto a belt conveyor alongside another component. *"When handling bulk solids that are resistant to flow a feeder with multiple screws can help material keep moving. The triple screw feeder supplied provides a large and active extraction area from the hopper, which features two stages of plane flow symmetry to optimise flow performance and holding capacity,"* commented Lewis Shaw, technical sales engineer, Ajax Equipment.

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TOP AJAX APPRENTICE RECOGNISED BY SHAPA

Congratulations to Ajax Equipment's own Morgan as the runner up in the Solids Handling & Processing Association's Apprentice of the Year Award. *"We're delighted that Morgan's development has been recognised by SHAPA. Morgan is a great representative of Ajax as well as a skilled and dedicated engineer. Thanks to all the team at Ajax for their efforts in helping our apprentices develop the engineering skills needed to craft the specialised equipment our customers require,"* commented Mark Waters, director, Ajax Equipment.



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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