

# SOLID NEWS

ISSUE 8

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

## AJAX EQUIPMENT 40 YEARS OF EXCELLENCE IN SOLIDS HANDLING

Ajax Equipment celebrates 40 years in solids handling. Founded by Lyn Bates and Bill Waters, the company has developed into a leading specialist in screw-based equipment, accessories and systems, with emphasis on the reliable flow of solids in storage, feeding, handling and processing applications. *Continued inside...*

### BARDYKE CHEMICALS STREAMLINES PRODUCTION WITH **AJAX SCREW FEEDER**

Ajax Equipment has supplied a screw feeder for the manufacture of cuprous thiocyanate, as part of a new production line at Bardyke Chemicals.

Based in Blantyre, near Glasgow, Bardyke Chemicals manufactures a range of copper-based chemicals for applications from marine paints to pharmaceutical production. When the company recently upgraded the plant layout, it consulted Ajax Equipment on the hopper used to store filter cake from a filter press. Ajax supplied a 400mm diameter Lynflow ribbon screw feeder to deliver filter cake from the hopper to an agitated screw



feeder previously supplied by Ajax some years ago.

*"The new Ajax screw feeder has allowed us to streamline production and so increase our overall productivity,"* said Duncan Norman, managing director, Bardyke Chemicals Ltd.

### IMECHE

NEW FRONTIERS  
SYMPOSIUM AND BULK  
SOLIDS EUROPE 2010

Ajax Equipment technical director and vice-chair of the IMechE Bulk Materials Handling Committee, Eddie McGee, welcomed delegates to the Bulk Solids Europe 2010 conference in Glasgow.

Eddie said the event was a great success with 150 delegates from 22 countries attending. The conference programme had 50 technical presentations on topics ranging from biomass to belt conveyors and flow promotion techniques.

Eddie McGee and Ken Picking, Tata Steel Europe Research, Development and Technology UK, presented a paper 'Using insert technology to improve flow from a 4000T coal bunker'.



*Dates for your diary!*

**Bulk Solids India Conference**  
6 - 8 April 2011, Mumbai, India

**SHAPA Knowledge Conference**  
October 2011, Loughborough

**Also inside...** Ajax Conveyor Increases Plant Capacity and Productivity  
Ajax - 40 years in bulk solids handling

We hope you find our newsletter informative and interesting, your feedback is appreciated. Please call **+44 (0)1204 386 723** or send an email to [newsletter@ajax.co.uk](mailto:newsletter@ajax.co.uk)

# AJAX EQUIPMENT

## 40 YEARS OF EXCELLENCE

### IN SOLIDS HANDLING

Ajax Equipment celebrates 40 years in solids handling. Founded by Lyn Bates and Bill Waters to provide secure employment, remain independent and debt free, Ajax Equipment has developed into a leading specialist in screw-based equipment and systems, with emphasis on the reliable flow of solids in feeding, handling, storage and processing applications.

From the beginning Ajax has benefited from skilled management. Lyn and Bill formed a well balanced team, combining Lyn's technical knowledge and Bill's practical and works management experience. Together they offered first-class, custom built equipment for handling bulk solids. Through hard work and dedication to customer service, Ajax Equipment flourished gaining business from repeat and new customers alike. Eventually expanding to own and occupy works and offices of 33,000 sq.ft. The company's first order was for a stainless steel shaft, the first large project - a screw mixer for Rowntree-Mackintosh (Nestlé UK Ltd).

Despite a difficult economy and a recession, there were important developments being made in bulk solids technology. Lyn recalls, "From the outset we took the view that we needed to establish a reputation for technical excellence as a way of distinguishing us from a 'back street operation.'" Lyn also notes "At that time universities were taking a theoretical approach to solids handling, this meant we were in a privileged position with our practical knowledge and experience. In addition we've always combined our industrial work with an active interest in the evolving technology of particulate solids through membership of various technical committees and working parties."

Ajax Equipment is a strong advocate of the importance of powder testing as a way of gaining insights into the handling of bulk solids.



The Ajax team pictured outside Milton Works.

It has developed various powder-testing devices, with a number of innovative devices for improving the flow, feeding, de-aeration, and countering of segregation. Dr Eddie McGee, technical director, who joined Ajax Equipment 18 years ago observes, "The big step forward in solids handling has been greater recognition of the importance of characterisation and powder testing. Perhaps the most important part is interpretation of the results and application into the right technological design."

Forty years on, Ajax Equipment now employs 25 people and supplies the UK and the world with a wide range of equipment to industries as diverse as pharmaceuticals and waste to energy, confectionery and chemicals. Bill reflects on the considerable changes to in-house production practice, "Laser cutting has made the biggest difference to the way our equipment is manufacture, we make it quicker and easier to produce screw flights and intricate hopper shapes, the role of IT has increased our flexibility to deal with more complicated equipment designs. We also have our own mechanical-polishers for food and

pharmaceutical equipment. Overall we have far greater control over the quality and degree of customisation today."

In the face of stiff global competition from cheaper, standard screw conveyor manufacturers, Director Mark Waters is confident that Ajax Equipment will remain a thriving business. "Our high quality manufacturing skills and dedication to technical excellence is our point of difference, which sets Ajax Equipment apart." He adds, "Our dedicated team of engineers offer a first class service and we support customers by providing the necessary skills to solve that difficult flow problem. The key to our success has been the skilled team we employ and our future success will depend on continued investment in our engineers for tomorrow."

Mark notes, "Challenges will always arise. However, working closely with our customers, we will continue to operate in a lean and efficient way, developing our technical expertise, and with the same determination and vigour that has distinguished our first 40 years in business."

**Ajax Equipment** is a long-serving, member of the I.Mech.E, (Institution of Mechanical Engineers), Bulk Materials Handling Committee, the I.Chem.E, (Institution of Chemical Engineers), Particulate Solids Subject Group and the technical committee of SHAPA, (Solids Handling and Processing Association), and UK representative to the EFCE, (European Federation of Chemical Engineers), Working Party on the Mechanics of Particulate Solids, various B.S.I, (British Standard Institute), Committees and the U.S. ASTM, (American Standards Organisation), Rock and Soil committee.

# A BRIEF HISTORY - 1971-2011

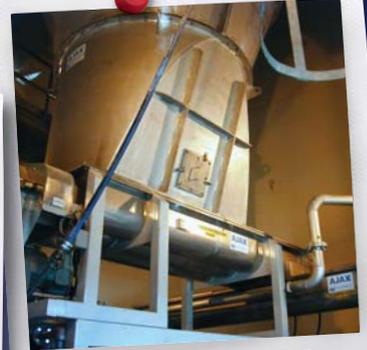


Early powder testing facility 1992

"I have worked with Ajax for over 20 years and keep coming back because of their innovative solutions, solid support at the bid stage of projects, quality, and after-sales support & service. Congratulations Ajax."  
**Mike Coffey, Pharma Team Leader/Product Manager, Hosokawa Micron Ltd.**



Elevator testing prior to delivery 1996



Polymer arching successfully resolved 1998

"I had very good experience working with Ajax. I received professional advice, sound design and help with installation."  
**Shahzad Mehmood, Cargill's Seaforth.**

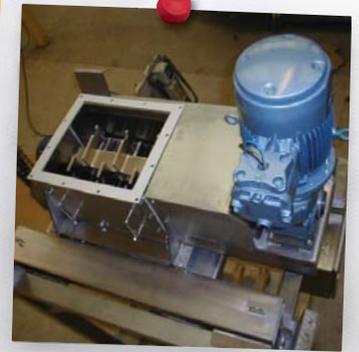


Lyn's Australian Award - a proud moment 2004



Testing of the Lynflow Invertabin 2002

"A very successful business which has traded through three recessions and has a strong management team who are professional and organised. To achieve this and to be celebrating 40 years in business is a true tribute to their hard work and efficiency."  
**Stephen Ford, Senior Relationship Manager, RBS.**

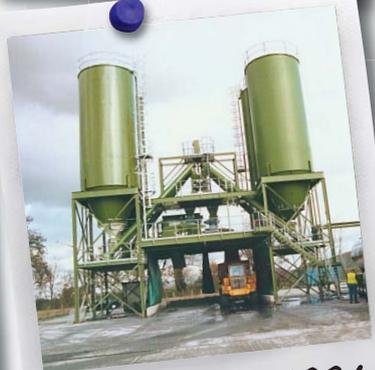


Putting the bite on lumpy ingredients 2005

"Over the years, we have seen Ajax as one of the leaders in recognising and implementing latest research and best practice in design for powder processing. Working with Ajax on a project has always led to success for the customer, even for the more challenging problems. The commitment Ajax has shown to insisting on designing its equipment around the properties of the powder to be handled (rather than a cheaper solution!), has been an example to the industry, which is now increasingly followed by others."  
**Mike Bradley, The Wolfson Centre for Bulk Solids Handling Technology at the University of Greenwich.**



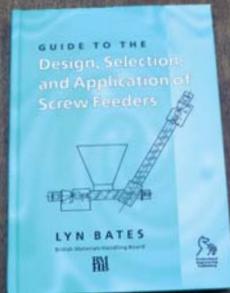
An Ajax 30m long conveyor 1993



Ash conditioning 1996



SSIP agitated screw feeder 2003



A good read! 2000

"I like working with Ajax due to their good knowledge, experience and fabrication skills. If I have the opportunity in the future I would like to work with Ajax again."  
**Danny Oppeneer, Maintenance Engineer, Antwerp Butvar plant, Monsanto.**



Performance by design 2010

"Our Ajax ash conditioners have performed well for many years. Ajax's experience of our industry and the processing of difficult powders, together with their competitive pricing and ability to meet a tight delivery deadline were important factors in our decision to select Ajax Equipment."  
**Stephen Roscoe, Technical Director, Grondon Waste Management Ltd.**

"In my experience, Ajax are the UK experts when it comes to solving process problems using their screw and hopper technologies. Over the years, they have designed several unusual systems for me, and these needed to be integrated into existing cluttered plants. On each occasion, the equipment fitted perfectly, first time, a testament to the professionalism of their designers."

**Richard Hellebrand, Engineering & Projects Manager, Vinnolit Hillhouse Limited.**



Bill Waters  
"in control" 2003



First pharma  
continuous mixer 2006



Intrinsically safe,  
sack tip station 2001



Cereal mixing  
for success 2003

"Ajax Equipment was able to demonstrate that we could introduce continuous mixing without disrupting production. Having now used continuous mixing for a number of months, we are very happy with the results."

**Alan Sheedy, Engineering Development Manager, Halo Foods.**



Pharmaceutical  
screw 2003

"The Ajax keg discharge station saved a good deal of time and provided a bespoke device to extract the waste materials. Manual removal of the waste was out of the question given the hazardous nature of the material."

**Marcus Foweather, Remediation Director at Carillion.**



Screw feeder for  
INEOS Fluor  
production facility 2004



Drum emptying  
station 2006



Cantilever dosing  
screw feeder 1998



Surface finish  
inspection 2005

"This is a significant project for INEOS Fluor, which secures the long term future of our business and meets the needs of refrigeration and air-conditioning companies world-wide. Ajax is a local supplier that we trust. Having worked with them in the past we are confident that they meet the high standard that we require if we are to successfully commission this project in time to meet our customers expectations."

**Justin O'Doherty, Manufacturing Manager, INEOS Fluor.**

"We have worked with Ajax Equipment for many years. Their solids handling expertise and knowledge of our process have contributed greatly to our manufacturing operations. This latest project has drawn on Ajax's engineering skills to come up with a simple, yet efficient way of reducing zircon sand waste."

**Steve Williams, Engineering Manager, MEL Chemicals.**

"Ajax Equipment's vast experience in hopper design and flow inserts has ensured we overcame rat holing problem and gained improvements in coal storage and charge car productivity."

**Ken Picking, Project Engineer, Tata Steel Europe.**

Following a collaboration with Ajax and the Chemical Manufacturer, to investigate the nature of the powder and the failure mechanism, Ajax developed a novel design solution that has completely solved the problem, along with other improvements that minimise powder attrition and dust formation. This revised Ajax design has a well proven track record in numerous systems around Europe where the screw feeder is now generally regarded as a 'fit and forget' component."

**Malcolm D. Stevenson, Lynchet Engineering Solutions Ltd.**



Quality fabrication 1995

OUR STORY **CONTINUES...**



# AJAX CONVEYOR INCREASES PLANT CAPACITY AND PRODUCTIVITY

A poorly performing conveyor can have an adverse effect on plant productivity. By replacing a company's belt conveyor with a screw conveyor more sympathetic with the flow characteristics of the gel being processed, Ajax Equipment was able to increase a plant's Overall Equipment Effectiveness (OEE) from 55% to 76% OEE.

The company's powder is manufactured by taking gel crystals that are washed to produce a slushy, slurry paste. This is then spray dried to produce a dry powder, which is sieved and packaged. It was the performance of a long belt conveyor used to take the warm, wet gel from the plant's washers to a bucket elevator that was shown to be the primary cause of the plant's low 55% OEE score.

The washers discharged the wet gel on to the long belt conveyor, via two feed ports, for transfer to a bucket elevator for turning into slurry. At the end of the long conveyor a short conveyor had been added to cater for the need to intercept a bad batch before it got to the bucket elevator. The belt conveyor's steep incline meant that the wet gel had a tendency to fall back with production losses of around 20kg per washer discharge.

This reduced production throughput - the bucket elevator was not filling efficiently - and the gel deposited on the plant floor had to be scrapped.

In an effort to reduce plant losses, the belt conveyor was run at half speed; this reduced the loss of wet gel from the conveyor but meant the rest of the plant had to run slower.

## Single Screw Conveyor Replaces Belt Conveyors

To solve the gel handling problem, Ajax Equipment proposed a single screw conveyor to replace the long and inclined belt conveyors. It needed to be 6 metres in length and capable of a throughput rate of 3,000 Kg per hour, the output from the washers.

After assessing the flow characteristics of the sticky, damp and hot wet gel, Ajax recommended a Lynflow ribbon screw, made from Stainless Steel 304L and with a diameter of 250 mm.

According to Ajax Equipment technical director, Dr Eddie McGee, the biggest technical challenges were the choice of screw flights and length of the screw. *"The washed, wet gel is a crystalline material that by its very nature soaks up water. The Lynflow screw with its open flights has the ability to handle and positively transfer the gel without running the risk of clogging or overworking. The ribbon flights keep the weight down on the screw but the flights still offer a very positive transfer action with this type of material. On the length of conveyor required, a robust centre tube was needed to avoid using hanger bearings which would have interfered with the effective handling of the gel,"* he commented.

For the final transfer to the bucket elevator, Ajax selected a slightly smaller screw running at a higher speed to provide a positive feed to the bucket elevator. In addition, this smaller screw can be reversed to an alternative outlet if production demands it.

Each batch of the washed gel is quality tested during production. In the unlikely event of a bad batch, Ajax Equipment has designed the conveyor such that the screw can be reversed, allowing the batch to be dropped into drums for subsequent reworking rather than transferred to the bucket elevator.

## Screw Conveyor Drives Wet Gel to Increase Plant Productivity

The Ajax Equipment screw conveyor gives more control and drives the wet gel whereas the belt conveyor simply moved it. Since the Ajax Equipment screw conveyor has been operating, plant operators have shown that the screw speed can be increased to give a 50% greater loading capacity. With the Ajax conveyor and other plant improvement, the plant's OEE is up from 55% to 76% which translates into an increase in production capacity from 825 to 1,000 t per year. The company also saves on the lost product experienced with the earlier unreliable belt conveyor system.

# ASK LYN...

## Dealing with Structural Arches

Solids Handling Problem? Ajax MD Lyn Bates is happy to oblige with some expert help.

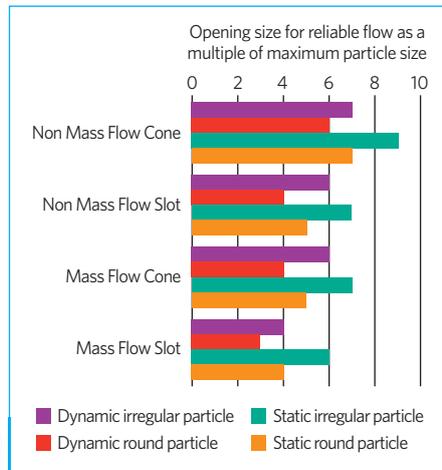
**Q.** We have problems charging a reactor with lumpy materials. Can you help?

**A.** Problems of blockages caused by lumps forming a stable arch structure over a flow channel are generally easy to foresee, but hard to predict with any degree of accuracy because the process is stochastic and depends on many factors. Flow stoppages of this type are often a problem when flow is required through relatively small openings. See the Ajax Equipment website for an example of arching: <http://www.ajax.co.uk/model1.htm>



Simple guidelines for 'safe' opening sizes are often published that quote a single multiple of particle size for circular and slot outlets. In practice, apart from the advantage of a slot over a circular or square opening, reliable flow is influenced by the form of the constituent particles whether the material is dynamic or starting from a static condition. Guidelines taking these features into account are given below based on a multiple of maximum particle size. The advantages of Mass Flow at the outlet region are clearly seen.

Fitting a valve at the opening size for static conditions and converging to the dynamic size



of orifice below the valve can attain the benefits of dynamic flow for the final outlet connection size. Even better results can be achieved in plane flow when transverse relief is provided by 'Sigma Two relaxation', a technique exploited by Ajax to enable reliable flow through openings less than normally practical. Where the particle composition is of variable size, these orifice sizes may be generous, but the tendency for granular products to segregate can form irregular concentrations in a flow system. In circumstances where 'caking' or agglomerations may occur and the size of potential lumps is indeterminate, it is prudent to incorporate lump traps, diverting screens or inserts that provide long slots to allow flow to continue if part is blocked by lumps.

Ajax offers a range of **lump-breakers** to overcome more serious blocking hazards, both as self-standing machines and as integral fittings with hoppers or chutes. A virtue of screw feeders is that they offer large and efficient flow openings and also tend to reduce friable lumps.

*Lyn Bates*

## CHILEAN EARTHQUAKE BRINGS OUT THE BEST IN AJAX EQUIPMENT

When a pharmaceutical company supplying drugs for the Chilean Earthquake disaster relief suffered a screw auger failure, a rapid response by Ajax Equipment, saved the day. A new screw auger was supplied to Apex Process Technology within 10 days, enabling drug production to resume.



Pharmaceutical companies are contracted by United Nations Disasters Relief Agencies to provide large volumes of life-saving drugs at short notice. Apex Process Technology's customer was using a screw feeder to transfer active pharmaceutical ingredient (API) powder under nitrogen to a high speed-milling machine, when the failure occurred.

"We needed a supplier who could quickly supply a replacement auger, constructed to our high standards. Ajax Equipment provided that quick response and high quality in a tight timeframe that we were looking for, enabling API production to quickly resume" said Claud Leonard, managing director, Apex Process Technology.

Ajax Equipment supplied the variable pitch screw auger in quality stainless steel grade 316L with mirror polish finish in a very quick turnaround.

"We were delighted to help out at short notice. Claud indicated the predicament the relief programme was in and Ajax was very happy to assist," said Mark Waters, director, Ajax Equipment Ltd.

## SHEPHERD WIDNES STREAMLINES PRODUCTION WITH AJAX EQUIPMENT SCREW FEEDERS

Ajax Equipment has supplied Shepherd Widnes Ltd with two screw feeders to improve safety and streamline production of metal salts at its Widnes factory in North West England.

Shepherd Widnes Ltd is part of the Shepherd Chemical Company, one of the world's leading producers of speciality metal-based products. From its Widnes manufacturing site, the company manufactures cobalt, manganese and nickel salts for the ShepCo™ range of inorganic cobalt salts.

As part of a review of metal salt production, Shepherd Widnes has taken the opportunity to replace a short conveyor that filled a Bulk Bag with 750kg of filtercake. The Bulk Bag, held in a small truck, was then pushed along a track the short distance to the point where the bag could be picked up by a fork lift truck for warehouse storage.

Ajax Equipment has supplied a longer replacement screw conveyor so that the product is being dumped into the Bulk Bag where it can be picked up by a forklift, thus eliminating the need

to push the bulk bag to the forklift. A second new screw conveyor was also installed with the same features as the replacement so that the new conveyor has the same features as replacement. Each Ajax conveyor features a 190cm screw diameter with ribbon flights to resist clogging with sticky material.

Cameron Ward, senior process engineer, Shepherd Widnes Ltd said, "Pushing the Bulk Bag posed a potential safety issue which we wanted to eliminate. The Ajax solution works well and allows us to streamline production of filter cake."



For further information on Ajax Equipment's range of solids handling systems and problem solving services call +44 (0)1204 386 723, fax +44 (0)1204 363 706, email [sales@ajax.co.uk](mailto:sales@ajax.co.uk) and visit [www.ajax.co.uk](http://www.ajax.co.uk)  
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