

## Ajax Improves Coal Flow at Corus Scunthorpe Steelworks

**Improving the flow of coal from coal bunkers to charge cars feeding coke ovens at the Corus Construction and Industrial iron and steel works at Appleby, Scunthorpe, is the latest success for Ajax Equipment.**

Straddling the Appleby coke ovens, the coal bunkers were built in the 1930s and originally designed to store local coal, but today hold imported coal from Canada and Australia. It is the particularly cohesive properties of the imported coal that creates flow problems, making the material difficult to handle.

In theory these huge bunkers have a potential capacity of 4,000-tonnes, but in reality their true useable capacity is nearer to 1,500 tonnes. This was due to the phenomenon of 'rat holing' where a significant quantity of the contents was effectively trapped around the periphery of the bunker with only the central core of coal directly above the outlets flowing from the bunker into the charge cars. The bunker geometry and construction caused the residue to remain even when the central flowing channel emptied.

To overcome the rat holing effect, Ajax Equipment undertook a detailed review of the bunker design and carried out extensive flow property tests and practical trials. The tests identified that stainless steel inserts could be configured to create a plane flow hopper bottom and spread the flow to previously 'dead' areas of the bunker. Whilst these techniques would improve flow potential and increase the amount of useable inventory there were awkward installation aspects that needed special consideration and there was a critical need to prevent mass flow fully developing in the structure.



*Rat holes in the bunker BEFORE fitting Ajax inserts*

Corus project engineer, Ken Picking said: "We had to strike a fine balance between improving the coal flow by overcoming the rat holing and increasing the operational capacity of the bunkers while at the same time preventing the mass flow which would have put too much strain on the concrete structure supporting the bunkers. Ajax Equipment's vast experience in hopper design and flow inserts has ensured we met our project objectives and gained improvements in coal storage and charge car productivity." *For the full story please visit our website at [Ajax.co.uk](http://Ajax.co.uk)* ❖

## IMechE Solids Handling Award for Dr John Carson

In recognition for his contribution to bulk solids handling technology, Dr John Carson, President of Jenike & Johanson, Inc, the international solids handling consultancy, is the recipient of the Institution of Mechanical Engineers (IMechE) Solids Handling Award.

Sponsored by Ajax Equipment, the award was presented to Dr Carson at the recent 7th World Congress of Chemical Engineering hosted in Glasgow by the Institution of Chemical Engineers and attended by over 2000 delegates from around the world. In presenting the award Lyn paid tribute to Dr Carson's many contributions to solids handling technology, membership of various technical and standards committees and his extensive work in education in the subject. ❖

*Photo shows Lyn Bates with John Carson (right) with his award outside the Congress venue in Glasgow. ❖*



**STOP PRESS... STOP PRESS... STOP PRESS**  
**AJAX Static Screw Nomination for IChemE Award**  
*As we go to press, the Static Screw Elevator has been nominated for an Innovation award by the Institution of Chemical Engineers.*

**WE HOPE YOU FIND OUR NEWSLETTER INFORMATIVE AND INTERESTING**

**YOUR FEEDBACK IS APPRECIATED**

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## Innovative Screw Feeder Design for Pulp Processing

When ATAC (Analytical Technology & Control Ltd.) was faced with overcoming the problem of screw feeder leaks and excessive maintenance caused by handling corrosive chemicals, they turned to Ajax Equipment to manufacture an improved screw feeder. The screw feeder uses a 'pull' type drive to eliminate leaks and provide maintenance free service.

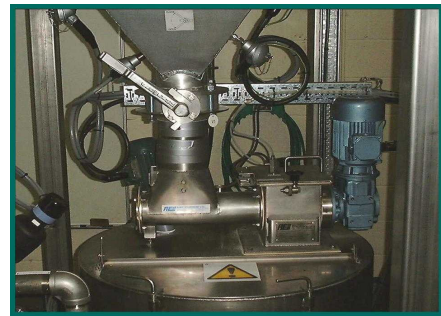
Since 1986, ATAC has manufactured chemical dissolving units for Silox (previously R. V. Chemicals and Clariant), a leading manufacturer of reductive bleaching agents. The Silox process involves transferring a specially formulated hydrosulphite powder blend, trade names HY-BRITE and Hydros, from a returnable container to a dissolving unit to produce a bleach solution. The units are in continuous use in many paper mills in the U.K. and Europe for bleaching wood pulp and recycled fibre, and also in the china clay and textile industries.

Until 1994 these dissolving units used screw type volumetric powder feeders from other manufacturers to control the rate of chemical powder addition to the dissolving process, with varying degrees of success. Although normally a free flowing chemical powder, hydrosulphite is highly reactive with oxygen and moisture and as such, tends to form concretions within crevices in the equipment, particularly in rotating shaft seals, causing premature seal failure and powder leakage. The reactive nature of the powder was also the cause of much external corrosion of the steel chasses and other mechanical components in these original feeders. The general dissatisfaction with the proprietary feeder designs available at the time lead ATAC to contact Ajax Equipment.



“From the outset, it was clear that Ajax had both the willingness and expertise to produce a purpose designed volumetric screw feeder to meet our client’s particular requirements. This has lead to Ajax screw feeders being used exclusively in all subsequent builds,” says Malcolm Stevenson, Development Engineer, ATAC.

The original Ajax feeder design has been refined over the nine years or so following joint engineering consultation with Ajax’s engineering staff, resulting in a robust low maintenance machine that is now in increasing demand as a retrofit upgrade to replace feeders on earlier dissolving units.



### Screw Feeder Design Innovations

Screw feeder design innovations have been the inlet flow geometry and cantilevered screw arrangement. The inlet features an insert to prevent shear, providing excellent mass flow and ensuring good pick up by the screw. A cantilevered screw arrangement creates a 'pull' type of drive mounting, where the geared motor is positioned at the outlet end of the casing. Combined with a box-shaped outlet permitting an unrestricted discharge from the feeder and preventing cross over of the powder to the seal protecting the screw motor, the screw feeder is maintenance free.

*“From the outset, it was clear that Ajax had both the willingness and expertise to produce a purpose designed volumetric screw feeder to meet our client’s particular requirements”* Malcolm Stevenson, ATAC

The Ajax screw feeder is available with a range of screw diameters (50, 75 and 100mm) with flexible speed drive to provide the maximum flexibility and sensitivity of output control. The feeder can deliver between 1.8 to 28 kg per minute of HY-BRITE powder to the dissolving unit. Internally the screws are Teflon coated to prevent damage to the hydrosulphite powder and build up of the powder in the feeder body. Because of the sensitivity of the HY-BRITE, the feeder is seldom opened or cleaned.

The quality of the trial unit is important believes Simon Bennett, Business Development Manager for Silox. “The quality and performance of the unit must be right for companies to feel confident enough to move beyond the trial stage after 3 – 4 months to a fully dedicated HY-BRITE dosing unit. We have been very pleased with the Ajax screw feeder unit. During the past 5 years we’ve had no problems with any of the Ajax screw feeders,” he said. ❖

## SOLIDS HANDLING PROBLEM? AJAX M.D. LYN BATES IS HAPPY TO OBLIGE WITH SOME EXPERT HELP

### Q WHAT IS IMPORTANT FOR FLOW?

A There are a number of parameters:

- Wall friction is always important, because the material has to slip on a contact surface to move in equipment.
- Shear strength determines the resistance to deform, so matters in hopper design and changes of flow channel shape.
- Bulk density counts for capacity calculations and is a driving force for gravity flow
- Cohesion influences flow and how the material adheres to contact surfaces.
- Permeability affects changes of volume and is an indication of flushing and the rate of settling.
- Lump size may be of interest for blocking prospects.

### Q HOW CAN I ENSURE THAT A PIECE OF SOLIDS HANDLING EQUIPMENT WILL MEET ALL MY REQUIREMENTS?

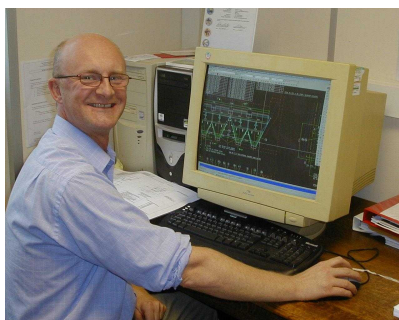
A The best way is to measure the relevant properties of the bulk material, and then conduct a Flow Audit that systematically progresses through the flow route to assess the accumulative influence of the handling at each stage, taking account of the nature of the material. It is false economy to skimp on the assessment of duty, as problems in service can be very expensive. Check that your supplier is

### ❖ Solid News Forthcoming Events ❖

#### 16<sup>th</sup> 18<sup>th</sup> November BULK ASIA 2005

Lyn Bates, managing director of Ajax Equipment, has been invited to present a paper on 'Know Your Materials' and conduct a workshop on the latest developments in screw feeder technology at the 2<sup>nd</sup> International Conference and Exhibition for Handling, Storing and Transporting Bulk Materials taking place in India in November. *For further details visit [www.technicomindia.com](http://www.technicomindia.com)*

**Congratulations  
to Richard  
Newby on his  
appointment as  
Ajax  
Equipment's  
Design Manager.**



## Ajax Announces 'Static Screw'<sup>TM</sup> Elevator Technology



Radically new concepts are rare for elevating bulk materials. However by reversing the basic mechanics of screw elevating such that the screw remains static and only the casing revolves, Ajax Equipment is able to deliver substantial benefits and operating advantages over other types of elevators like bucket elevators, vacuum loaders, disc and wire devices as well as conventional screws.

The static screw elevator offers efficient handling capacity on a like-for-like basis over current elevators. It also allows gentler handling of materials, reducing damage and attrition on friable and delicate products. The bulk material slides smoothly up the helical surface of the screw blade with no back-leakage in the flight tip clearance.

*For improved solids handling productivity, the static screw elevator can also be used as a feeder with the outlet rate being controlled by varying the speed of the drive.*

The Ajax static screw moves powders coherently and avoids the problems caused by other elevators that use or entrain air resulting in powder becoming fluidised or dilated, leading to control, density and packing problems and reducing hopper and bag capacity. By moving the material 'en masse' the Ajax static screw elevator offers positive transfer and stable density control.

Ajax director Mark Waters said "The static screw approach opens up many new opportunities where materials can be elevated easily over distances of up to 10 metres. It offers plant managers and engineers clear practical and process benefits". *For more information visit [Ajax.co.uk](http://Ajax.co.uk)*



## Twin screw conditioners for fly ash and lime waste

Pre-treating unconditioned fly ash and lime waste materials ahead of landfill is a highly demanding process involving aggressive and difficult to handle powders. Ajax Equipment has supplied Grundon Waste Management Ltd with a large diameter twin screw conditioner at its Bishops Cleeve site, the largest air pollution control residues treatment facility in the UK. The conditioner takes fly ash and lime-containing residue and mixes it with water to produce a damp mixture which is transferred to landfill where it then solidifies.

Grundon's waste treatment facility

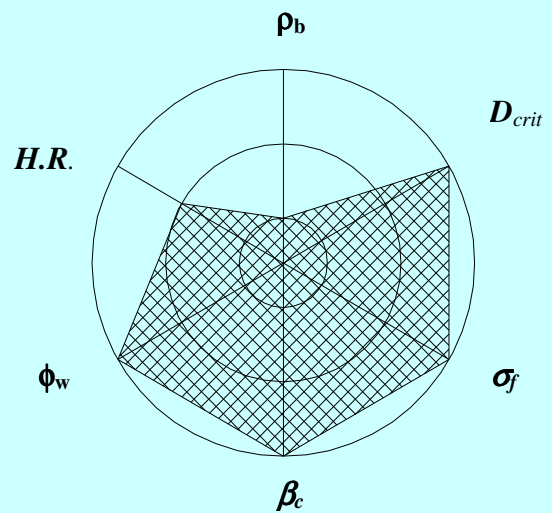


Ajax ash conditioners in service

Commenting Stephen Roscoe, Technical Director, Grundon Waste Management Ltd, said: "Heightened demand for pre-treatment of air pollution control residues before landfill led to us upgrade our Bishops Cleeve facilities. The new mixer sits alongside another 600 mm Ajax ash conditioner, our second Ajax conditioner, which has performed well for many years. Ajax Equipment'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 award them the contract". For more information visit [Ajax.co.uk](http://Ajax.co.uk)

## Eddie McGee presents paper at the World Congress of Chemical Engineering 2005

Eddie McGee, technical manager, Ajax Equipment, presented a paper entitled 'A multifaceted approach to characterising powders for flow' at the recent World Congress of Chemical Engineering held in Glasgow. The congress focussed upon seven key areas that summarise modern chemical engineering, of which the paper formed part of the 'Advancing the Fundamentals - Particulate Solids' stream. Eddie's paper was one of the 800 chosen from the 3000 papers initially submitted, and was the only oral presentation in the 'Particulate Solids' stream given by a UK industrial delegate. ❖



The McGee 'spider' diagram of titanium dioxide showing significantly high wall friction ( $\phi_w$ ) and shear strength ( $\sigma_f$ ); high bulk density ( $\rho_b$ ) and 'average' Hausner ratio ( $H.R.$ ) as material characteristics. The diagram also includes equipment characteristics in this case a hopper will need steep walls ( $\beta_c$ ) and a large outlet ( $D_{crit}$ ) to provide reliable flow.

What can AJAX help you with?

- Please send me your technical sales literature
- I'd like to know more about inserts and hoppers
- I'd like to know more about screw conveyors
- My interest is .....
- Contact me, I have an application to discuss!

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