

# CELEBRATING 50 YEARS OF SOLIDS HANDLING SOLUTIONS



Founded by Lyn Bates and Bill Waters in 1970, Ajax was started with a single purpose - to offer first class solids handling equipment. Since then Ajax's custom-built equipment has helped thousands of companies from a wide range of industries around the world to achieve high performance solids handling.

## How Ajax was Built

*"When Bill and I started Ajax, we decided that it should be distinguished by a reputation for technical excellence," comments Lyn Bates. "To provide our customers with the best equipment we have always actively contributed to the evolution of solids handling through fundamental research and product developments."*

Lyn's theoretical knowledge combined with Bill's expertise of production enabled Ajax to provide high quality, problem solving equipment from the start. This allowed the company to grow and invest, acquiring Milton Works in Bolton where Ajax is still based and taking on more people who shared Ajax's philosophy.

## Ajax's Team

Director Mark Waters has spent four decades at Ajax, completing an engineering apprenticeship and degree whilst advancing the company's production activities. Mark notes, "Ajax's strength has always been its people; from the craft skills developed on our shop floor through to the dynamism of key personnel in design and production management."

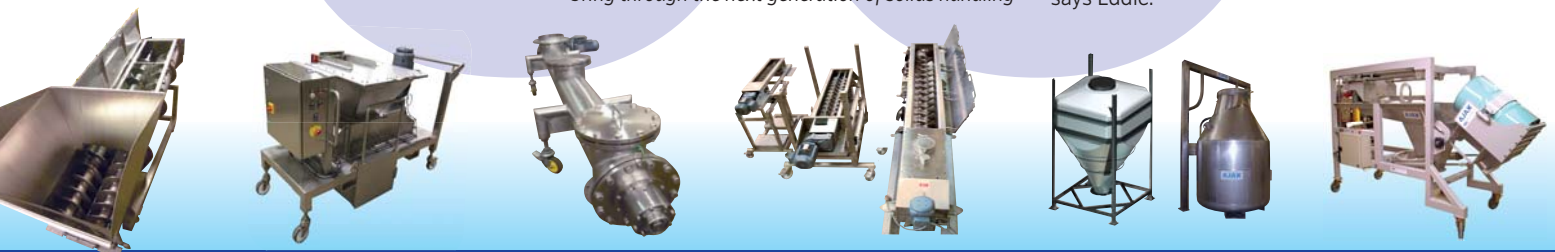
In 1992 Eddie McGee joined Ajax, developing a new approach to predicting powder flow for which he received a PhD, becoming technical director in 2006 and managing director in 2018.

Eddie comments, "This foundation allows Ajax to bring through the next generation of solids handling

innovators as we strive to ensure reliable flow, consistent feeding and effective mixing of bulk solids whether they are fine powders or shredded biomass, dry or damp, at extreme temperatures, pressure contained or used in the most hazardous areas."

## 2020 Vision - What's Next?

*"Ajax's continued aim is to provide the very best solids handling solution to every customer by producing equipment dedicated to the task. We build on 50 years of technical advances, embracing new manufacturing techniques and quality standards as we continue to innovate. We look forward to furthering our understanding of industry needs as they evolve, responding with ever more reliable, efficient and safe equipment."* says Eddie.



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

# PROBLEM SOLVING THROUGH DESIGN

It has been said that solids handling is more difficult than rocket science. However, whether going into space or mixing a cereal bar the key is understanding the forces and materials involved. Ajax gets to know a customer's materials and handling issues in order to design equipment that ensures material condition and process performance.

## The Magic Solution

Bradley Pulverizer approached Ajax to overcome hopper flow problems that caused erratic flow, bridging and disrupted production at a client's fertiliser production plant in Egypt. Powder testing revealed the root cause was the fine powder's flow properties, together with material variability, residence time and consolidating pressures in the silo.



As it would have been expensive to convert the entire hopper to Mass Flow, Ajax proposed replacing the bottom part with a Vee shaped section to exploit plane flow benefits, and a large outlet fitted with a twin screw feeder of special extraction geometry, to draw from the full width and length of the hopper. Ian Hancock, Bradley Pulverizer, commented, ***"Since the equipment has been installed the performance of the process has significantly improved. A welcome improvement to plant performance which the plant operator describes as 'the magic solution'."***

## Quadruple Screw Feeders for 3D Printing

Ajax supplied two hoppers with integral quadruple screw feeders as part of research into large volume additive manufacturing at the University of Sheffield's Advanced Manufacturing Research Centre Design Prototyping and Testing Centre. ***"This was a new application for Ajax, but we are always happy to work with customers to solve a problem or meet a challenge where solids handling is required,"*** says Eddie McGee, Ajax.



## High Pressure Handling

PJH Partnership, a specialist in the application of superheated and supercritical technology to processes involving impregnation, extraction, fractionation and separation, contacted Ajax to produce a conveyor to process biomass.

The process required the conveyor to operate on an incline, at temperature and at 10 bar of pressure. The Ajax screw uses an oil jacket to heat an organic solvent bath though which the biomass is conveyed to alter their surface chemistry.

The conveyor is compliant with PED category III and rated for ATEX Zone 1 internally and Zone 2 externally.



## Efficient Waste Processing

As waste is often irregularly shaped, successful handling requires the expertise to produce a tolerant but efficient design. Ajax supplied Rabbit Waste Management with a range of equipment including a twin screw feeder to replace a previous feeder which had a narrow inlet, resulting in a stable arch forming over the outlet. As a result of material testing Ajax recommended significantly increasing the inlet size and utilising large diameter screws to cover variability in material flow.

***"The original screw feeder provided by a different supplier was very problematic meaning our system was unusable. Ajax undertook tests on the material and came up with their recommended design, which they supplied; this is working very effectively,"*** said Mick Adams, Rabbit Waste Management.





# BOLTON BASED, GLOBAL IMPACT

Ajax has supplied equipment to every continent, resulting in a worldwide influence on solids handling.

Our first pharma continuous mixer is in Puerto Rico, Ajax mixers produce cereal bars in the Americas, throughout Europe and Australia, and we've helped with salt processing in the UK, Middle East and Ghana. From lump breaking in Tasmania to handling and processing fine chemicals in the UK, Italy, Spain and Portugal, Ajax has consistently delivered technically excellent solutions with a focus on quality, price and delivery.

In addition to equipment, Ajax has given technical presentations to over a hundred conferences throughout Europe, the USA, Australia and China.

## Australia

Lyn Bates' Australian Award announced during the International Conference on Bulk Solids Handling 2004 in Wollongong



## Belgium

Continuous mixers for potato products



## Bolton

The late Bill Waters reviewing drawings for manufacture in 2003



## Brazil

Cereal Bar Making



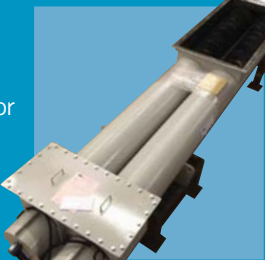
## Canada

Inserts for a coal bunker at a steel plant



## Egypt

Powder Handling for Fertilizer Production



## France

Chocolate and inclusions mixer



## France

Plug screws feeding sawdust into a Pyrolysis system



## Germany

Continuous and batch mixers for organic granola producer Barnhouse GmbH



## Ghana

Conditioning screw for salt iodisation plant



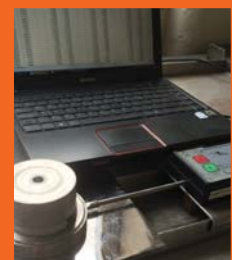
## Ireland

Pharmaceutical Agitated Screw Feeder



## Nigeria

Powder flowability testing for detergent



## North Sea

Mud additive feed systems on Troll oil rig



## Puerto Rico

1st Pharma twin mixer



## Scotland

Filter press cake handling at a specialty chemical plant



## Singapore

Cryogenic Screw Feeder



## Singapore

Hopper and twin screw feeder for reliable cocoa powder handling



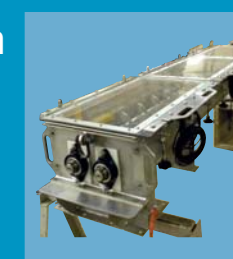
## South Korea

Drum Emptying Machine



## Sweden

Easy to clean mixer for customised plastics



## Switzerland

Pharma feed screw



## Tasmania

Heavy duty lump breaker



## Turkey

Waste-to-energy feed system



## UK

Carbon Black Handling for Hubron International



## UK

Enhanced polymer handling with chisel shaped hopper and triple screw feeder



## USA

Handling equipment for Cornell University research project



## Zambia

Cassava Pre-mill for the World Food Program





# ADVANCEMENT OF SOLIDS HANDLING

Throughout Ajax's five decades it has contributed to the advancement of solids handling knowledge by carrying out research, developing new products and sharing our knowledge.

## DRIVING INNOVATION

In 2018 Ajax completed Project Chariot, a collaboration with Proctor and Gamble, Centre for Process Innovation (CPI) and the universities of Birmingham, Durham, Leeds and Cranfield to develop a novel particle system for fine particles based on the company's continuous screw mixing technology, hoppers and screw feeders.

One aspect of Chariot studied particle journeys, using 'Positron Emission Particle Tracking' (PEPT), through an Ajax mixer; gaining insight into how effective the mixing action was. Now the CPI's formulation facility uses Ajax's equipment to give companies access to a modern small-scale plant for multi-component, multi-phase products including complex dry and wet mixes, particle coating and granulation.



## EQUIPMENT DEVELOPMENT



In response to industry problems and the desire for increased performance, Ajax has continually enhanced its solids handling range. Ajax's latest lump breaker development allows materials to be reduced to under 5mm particles, while recent innovations allowed Ajax to produce a hopper and screw feeder capable of Uniform Flow.

Heating bulk solids can pose a significant challenge to process engineers. By applying its innovative cascade mixing technology, Ajax has developed a thermal blender capable of heating and mixing 5 tonne batches of a mineral product at temperatures up to 150 C.

## PROMOTION OF UNDERSTANDING

### Events

Ajax's 'Lunch & Learn' sessions give companies a chance to gain a greater understanding of solids handling. Commenting on a session at GHD, Nnamdi Nwaokocha, Senior Process Engineer said, **"I really enjoyed and appreciated Eddie's presentation on solids handling. In particular, the information regarding hopper and silo designs. As a designer, the useful tools, equations and parameters to consider will definitely be beneficial for future projects."**



While a seminar on 'Powder Handling for Agile Pharmaceutical Manufacture' hosted in collaboration with the International Society of Pharmaceutical Engineers (ISPE), AstraZeneca and Hosokawa Micron, provided a more advanced level of insight into the use of 'spider' diagrams from powder testing for hopper development.

### Publications

Over the past 50 years Ajax has shared its knowledge through technical papers, magazine articles, and blogs as well as Lyn Bates authoring several books published by the British Materials Handling Board.



### Industry Involvement

As an active member of various technical committees and working parties including the Solids Handling and Processing Association (SHAPA), Institute of Mechanical Engineering's (IMechE) process division and European Federation of Chemical Engineering's Working Party on Mechanics of Particulate Solids, Ajax has contributed to the continued evolution of material handling and increased appreciation of the achievable performance.



# AJAX MAKES THE DIFFERENCE

The equipment produced by Ajax over the past 50 years has helped our customers make a significant difference to the quantity, quality, efficiency and reliability of their production.



## 28m conveyor handles like a Dream(liner)

In 2013 Ajax manufactured a 28m long screw conveyor, around half the wingspan of Boeing's Dreamliner aircraft.

*"Long screw conveyors are a particular speciality of Ajax. The length and stresses on the screws and casing are a common source of problems which are readily avoided by drawing on our experience of similar projects and the materials being processed,"* says Eddie McGee, Ajax.

## Supersized Agitated Feeder

Speciality chemicals producer, Vertellus, has Ajax's largest agitated screw feeder to date, capable of holding 3.5T of damp centrifuge cake.

*"Having operated an Ajax agitated screw feeder, we knew Ajax held the solids handling expertise needed to provide a much larger agitated screw feeder for Vertellus' new product."*

Ajax carried out tests on our material at a range of moisture contents to reflect the array of flow properties experienced, ensuring appropriate storage, feeder and conveyor design. We are delighted with the quality and performance of the products Ajax has provided," said Andrew McNally, Vertellus.



## Increased Productivity

*"Ajax's knowledge of powder handling has enabled us to streamline those processing areas where we had previously experienced problems. As a result, Ajax's solids handling equipment has boosted our packing rate and overall plant productivity,"* said Russell Iveson, William Blythe.



## Bespoke Breaker

*"Ajax have been an excellent company to work with, they listened to our requirements, allowed us to visit site and test various existing machines and then built us a bespoke machine exactly to our requirements that performs the required tasks perfectly. It was a pleasure to work with Eddie and the rest of the Ajax team who were professional from start to finish and delivered a quality piece of equipment on a fairly tight deadline,"* commented Mark Avery, Alexir Partnership.



## Perfect Frozen Potato Production

Ajax supplied leading European pre-fried and frozen potato product producer, Agristo, with two continuous mixers featuring an enhanced mirror polish finish. *"Our Ajax continuous mixers work extremely well, performing their job perfectly,"* said Dieter Raes, technical director, Agristo. *"We have worked with Ajax on several machines and would highly recommend them to other food producers."*



## Setting the Standard

Ajax Equipment worked with leading water treatment manufacturer, Kemira Chemicals, on a range of plant upgrades, supplying equipment including six vertical screw blenders and four screw feeders.

*"The four Ajax batch mixers have performed very well. When the two remaining 30 year old mixers caused some problems, we decided on replacement of them both, standardising on the Ajax mixers,"* said Steve Sanderson, Kemira Chemicals.



Commenting on Ajax's screw feeders, Steve Parkinson, Kemira Chemicals said, *"When the first screw conveyor began operating the difference in performance compared to the vibratory feeder was clear. We can now fill intermediate bulk containers more quickly and accurately."*

**AJAX**  
SOLIDS HANDLING SOLUTIONS

SOLIDS HANDLING EXCELLENCE SINCE 1970

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