



INTERVIEW: Powder milling eyes energy efficiency

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IM speaks to UK-based IIT about sustainability issues in processing

IM: Can you provide some background on IIT and its establishment?

George Ord: International Innovative Technologies Ltd. (IIT) was formed in March 2006 to succeed and bring together the expertise and resources of the former North East Innovation Centre (NEIC), UK.

NEIC was a not for profit organisation that built up 25 years' experience in new engineering product design, process development and manufacturing systems. It helped innovators and designers to develop the commercial potential of new product and design ideas.



When the decision to close NEIC was taken, IIT was established as a private business by its senior team. The company now comprises an experienced management team with backgrounds in engineering, new product development, manufacturing and supply chain management and international outsourcing.

IIT has now introduced a new and patented powder milling process, with supporting materials handling and processing equipment.

Other innovative products are also being developed, including new fuel enrichment technology for improving coal fired power station efficiency.

IIT is a private limited company formed by four founders, including the chairman Tom Wilkinson and managing director George Ord. Tom and George were both former directors of the NEIC.

IM: Who have you worked with to secure investment?

GO: Since becoming established the company has been developing various technologies with early stage investment from Yoeman Protex International Ltd, a private investment company specialising in new technology projects.

More recently, IIT has become the first company in the UK to raise money from an Islamic bond in a move which could herald more firms across the UK taking advantage of untapped funds in Asia and the Middle East.

To help the company develop and take to market our new technologies, we have recently raised \$10m. through the UK's first-ever sukuk.

The sukuk is a way of allowing institutions to invest in companies without breaching Shariah principles. Dubai-based Millennium Private Equity is the investor in the instrument, which is listed on the Cayman Islands Stock Exchange.

IM: Which technology companies have you partnered with?

GO: IIT is working closely with engineering and process specialists from Newcastle University and the University of Leeds.

The team from Newcastle is focused on special research and materials science linked to wear resistance issues with the new powder milling technology. The specialists from Leeds are working with us on the fuel efficiency programme for coal fired power stations.

In developing the new powder milling technology a strong partnership has also been forged with Siemens Industry Sector in the UK.

Siemens motors, drives and control and instrumentation systems are an integral part of our new milling and processing systems. The advanced technology and worldwide support provided by the company means we can compete in global markets.

For example, one of the advantages of the partnership with Siemens is the use of remote diagnostic technology which means that our maintenance team can easily monitor the performance of our installed machines across the world, identifying potential problems before they occur and thereby avoiding costly milling downtime.

IM: What markets is IIT looking to enter?

GO: IIT manufactures a range of high quality, high output grinding mills which are modular in design, cost effective to install and easy to operate.

The company's product line and full process solutions have attracted interest from the minerals processing, aggregates, construction and recycling and other energy intensive sectors.

We have already installed milling plants in the UK and we have enquiries from a growing list of companies interested in utilising our products in a variety of applications.

The patented milling technology, the m-series, provides a higher throughput and significant energy saving when compared to a similar sized conventional ball mills.

The m-series technology has the capability to mill and mix a wide range of materials of varying hardness to a very fine particle size, without making any change in the mill design. The system's modular design enables efficient multi-mill installation possibilities providing an alternative to a conventional ball mill installation.

Powder and aggregate milling operations around the world utilise large scale ball milling or similar processes that require significant capital investment.

Our new m-series mill is low cost, small size and ideally suited to site installations where traditional mills could not be justified. It also allows highly economic milling of fine particle sizes which are currently slow and costly.

Discussions have been held with a number of the leading companies and experts in the minerals processing industry. Milling trials have been successfully completed for these and other companies.

The feedback to date has all been positive and has generated significant interest from many minerals and materials suppliers to a wide range of markets including aggregates, paint, glass, energy, plastics, cement, fuels and others.

In addition, as well as being suitable for the conventional grinding of a wide range of minerals and materials, the highly economic and versatile milling system also has the potential to turn a number of industrial by-products that were previously regarded as waste, into commercial products.

IM: How did your product evolution bring you to mineral processing?

GO: Our new milling and classification equipment was originally designed to enable us to effectively mill the material we use in our new (and developing) project to improve power station efficiency. This is a very hard and abrasive material.

When we were developing the grinding technology for our own use we recognised its potential for milling other materials such as metal oxides, bauxite, blast furnace slag, granite, glass, limestone etc.



From trials conducted during the development phase, it became apparent that the equipment could also successfully mill softer materials including biomass and glass reinforced plastic (GRP).

Additionally, because the new equipment is ATEX rated, it can safely process flammable and potentially explosive substances. Materials such as coal, petcoke and certain plastics can therefore be safely and successfully milled with the m-series mills.

IM: What are the benefits of IIT's systems?

GO: The powder milling technology comprises a technically advanced modular design capable of grinding soft, medium and hard materials to 9.5 on the Mohs scale and with 90% passing 45 microns and below.

The new m-series is available as a stand-alone milling plant or can be supplied as part of a complete powder milling process solution alongside a dynamic classifier for fine particle sizing and a high efficiency cyclone.

The centrifugal grinding mechanism of the m-series is extremely efficient, with the vertical material flow path and special roller assembly ensuring that the force produced is translated into maximum particle grinding power.

As a result, extremely low electrical energy input is required relative to particle size and volume of powder output, with specific energy consumption typically between 5kWh/T and 10kWh/T.

Multi-stage grinding is achieved through the incorporation of a number of grinding modules in series with particle size controlled by the number of modules and rotational speed.

Typically, a standard 600mm barrel operating at 300 rpm produces a very fine powder output at up to 5 tph and multi-mill configurations are available to meet capacities of up to 50 tph.

The m-series mill represents a significant technological development in the processing to powder for a wide range of materials.

Importantly, the low energy performance of the new mill and the potential to convert what might currently be regarded as waste material into a commercial product gives the technology significant green credentials.

The compact size, ease of installation and the opportunity to use the mill for localised milling solutions add to the system's environmental advantages.

IM: What minerals have you tested so far?

GO: A fully operational demonstration plant has been set up at our Gateshead plant to verify and validate system performance on a wide range of materials. Functional efficiency and specification compliance has also been confirmed by client installed systems.

The demonstration plant has established the successful fine milling of a range of materials including aluminium and other metal oxides, bauxite, calcium carbonate and limestone products, silicon carbide, coal, fly ash, blast furnace slag, nickel slag and steel slag.

More specifically, in the aggregates industry successful tests with a leading quarry operator have successfully milled limestone to sub 45 micron for use as a cement replacement.

This material is largely regarded as waste and we believe there is significant potential around the world to economically fine mill limestone for its re-use into cement and in doing so significantly reduce the carbon emissions from lime kilns.

Elsewhere in the cement industry ground blast furnace slag (GBS), a by-product from steelmaking, is widely used as an additive to improve the performance of Portland cement.



The availability of our new milling system capable of the effective fine grinding of GBS opens up the potential for smaller cement operations to source direct from steelworks and economically fine mill the amounts required for their own consumption.

In the glass industry we have successfully assisted recycling by milling waste glass to a fine powder suitable for many applications including filtration and its use as a clay additive during brick manufacture to reduce firing temperature.