



Powder progression

IIT's managing director **George Ord** talked to **IM** about the development of new powder milling technology for mineral processing and by-product recycling

IM: Can you provide some background on IIT?

GO: 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.

When the decision to close NEIC was taken, IIT was established as a private business by its senior team. The four founders include the chairman Tom Wilkinson and managing director George Ord, both former directors of the NEIC.

IM: Where have you secured investment?

GO: 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.

We have raised \$10m. through the UK's first-ever sukuk, which is a way of allowing institutions to invest in companies without breaching Shariah principles, via Dubai-based Millennium Private Equity.

IM: Who are your technology partners?

GO: IIT is working closely with engineering and process specialists from Newcastle University and the University of Leeds. The team from Newcastle is researching wear resistance issues, while 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.

IM: What markets is IIT looking to enter?

GO: IIT manufactures a range of grinding mills which are modular in design, cost effective to install and easy to operate. The company's product line has attracted interest from the minerals processing, aggregates, construction and recycling and other energy intensive sectors.

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

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

The 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.

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 standalone 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.



Managing director George Ord with a sample of processed glass cullet

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

As a result, low 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 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.

IM: What minerals have you tested so far?

GO: A fully operational demonstration plant has been set up at our Gateshead, UK plant to verify and validate system performance on a wide range of materials.

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) by-product from steel making, 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.