What’s new in fine particle separation?
Recent innovations and developments relating to precision screening and sifting of powders and high-grade bulk materials

New range of centrifugal sifters
For more than 50 years Gericke has provided centrifugal sifting solutions to the solids and powder handling industry, gaining unrivalled experience handling a multitude of materials in many applications for a wide range of industries including: food, chemicals, pet food, beverages, dairy processing, infant formula and pharmaceuticals.

The company’s wealth of knowledge gained from supplying complete turnkey systems ensures it is able to optimise the interfaces between the sifter and other essential process components, a critical factor in ensuring a successful installation.

Building on this proven technology, Gericke has now introduced a completely new range of centrifugal sifters with updated design and operational features necessary to satisfy the demands of today’s processing industries especially with regard to seeing efficiency, higher yields, improved hygiene, ease of maintenance and compliance with the latest industry standards including the Machinery and ATEX Directives.

The new range of Mk III centrifugal sifters provides three base modules incorporating 12 standard configurations which can be optimised to suit different processes depending on the requirements of the application in terms of throughput rate, sieve mesh size, materials of construction, surface finishes and hygiene requirements.

The baseline model provides a cost-effective solution for general applications whilst the multi-purpose unit includes additional features such as hinged doors to improve access for cleaning and maintenance.

The Hygienic model has been designed to meet the most stringent of requirements for cleaning and hygiene. It features a cantilevered shaft assembly with bearings only at the drive end, three hinged interlocked doors, quick release fully welded paddle assembly and integral discharge hoppers.

Gericke states that advantages of its centrifugal sifters include:
- High capacity / high efficiency
- Robust and reliable construction
- Quick in situ rotating screen assembly inspection
- Hygienic construction
- Cantilevered design

Applications
Gericke sifters are utilise to ensure product quality within the processing of powdery products, granules, or fibres. Its ATEX-certified sifters provide three main operations of the sifting processes:
1. Particle separation: the separation of two different product fractions with varying particle size, typically a cut at +50µm to 6µm.
2. Safety sifting: removal of foreign bodies and tamp material prior to product entering the production process or to secure product quality before filling processes.
3. Conditioning: to separate foreign bodies and condition the bulk density of the product prior to entering production or immediately before packing.

Sifting capacities can vary from 2-3kg/h, guaranteeing product quality of high value small batch operations, to as much as 120m³/h, minimising the time needed to fill road tankers, a preferred method employed throughout the milling industry for ensuring the production and processing of sugar and starch.

Screen types
A critical element of any successful sifter application is the correct selection of sieve hole for optimum performance. Gericke offers an extensive range of sieve sizes and designs which are available ex-stock, including: HD nylon, anti-static, polypropylene, perforated plate and wedge wire.

ATEX Directive
Gericke centrifugal sifters are widely used.

Revolutionising precision powder screening
The screening of ultra-fine powders with a particle size under 50µm has always been a major challenge for the process industry. This has certainly been the case for those companies constantly seeking to innovate their products in industries such as the pharmaceutical and metallurgy as well as the coatings business. Historically, product development dependent on particle size has, for the majority of materials, been limited to the ‘+50µm zone’.

For anything under 50µm producers have had to constantly make a decision on the lesser of two evils between (a) a reduction of throughput to reduce contamination, or (b) a reduction of separation efficiency to increase capacity.

Ultrasonic technology has provided some relief in the sieving of the 50 – 30µm particle size range, but for ultra-fine powders below 30µm especially when the particles are of irregular shape, there has been no cost effective screening solution.

Difficulties for existing technology sub 30µm
When considering vibrating sifters for screening ultra-fine particles, the shape of the powder in spherical form, low angle of repose or high bulk density all offer little assistance. For decades manufacturers of fine powders have relied on ultrasonic technology and/or air classification systems to achieve desired particle size distribution down to 30µm. However, in so doing, they have sacrificed separation efficiency and/or efficiency needs and have accepted that these technologies (ultrasonic and air classifiers) provide no assistance with screening fine and ultra-fine wet material.

With the demand for finer powders on the increase, there is a real need to develop a screening technology that meets these challenges and provides a solution that enables cost effective, efficient and high capacity separation of fine and ultra-fine powders that are either wet or dry.

A new screening technology
In hundreds of tests and case studies (including gold, biomass, pharma powders, aggregates, coal, recycling, de-watering and metal powders) over many years, with some of the world’s biggest producers, multi-frequency vibration technology (MFV) has proved itself to overcome all of the problems experienced with traditional screening and ultrasonic systems for all particle size separation to 6µm. The MFV screening technology has been designed and refined over 20 years specifically targeting the effective separation of difficult ultra-fine particles that are wet, sticky and agglomerative for particle sizes between 100µm and 6µm. It achieves far greater capacities in comparison to traditional sieving methods due to its multi-frequency technology that accelerates the mesh (and the material) by up to 500% - which is a 10,000% increase in mesh acceleration compared to standard systems.

In effect this 500% of acceleration increases both the amplitude and frequency of the vibration and in so doing overcomes mesh blinding and pegging by harnessing the power of resonance. The chart below shows the higher range of frequencies at which the MFV technology operates, in comparison to traditional sieving technology.

MVF significantly increases coarse powder separation throughput
While this technology is revolutionising fine and ultrafine screening, coarse particle size sieving also benefits from using MFV technology. It achieves higher capacities of not less than 30% compared to standard equipment with the same screening area as well as achieving a significant increase in the efficiency of the particle separation. This has been seen with agglomerates where it has also assisted with the creation of new product lines from what was waste material (wet, sticky, agglomerative).

Overall, what has been seen with coarse material is that it directly helps to reduce the amount of rework or any oversize will require after the screening process which creates valuable energy savings and reduces production time for the reworking of good material.

The ScreenX solution
As one of Europe’s largest producers of screening equipment, Virto-Cuccolini owns the patent and the technology (called ScreenX) that delivers this MFV screening solution. Virto has a 76 year history of producing more than 50,000 screening machines (FDA and ATEX compliant) that provide particle size separation solutions between 10mm and 6µm (0.006mm). Virto has a strong history of developing innovative technology, leading to the revolutionary new product line that is capable of screening what was ‘previously impossible’. The ScreenX MFV line has proved itself on hundreds of applications to be very successful with screening materials that are less than 1000µm (1mm) and are wet, sticky, agglomerative or abrasive and thereby experience separation issues affecting capacity or efficiency. Virto Group offers two very distinct screening product lines for the metal powder industry:
1. Multi-frequency vibrating (MFV) screens.

How the multi-frequency vibrating technology of Virto’s ScreenX compares with conventional screening machines.

These types of machine constitute the Cucolin line. They are among the world’s most popular vibrating sieves used for all standard separation needs down to 50µm.

Product development partnerships
Nearly all, wet, dry, fine and ultra-fine powder tests conducted on Virto’s ScreenX MFV technology, have demonstrated revolutionary particle size separation which has led some companies to redefine their product lines. In light of this, Virto has set up ‘product development partnerships’ with some of the world’s largest processing and manufacturing companies in which Virto modifies its MFV technology to suit the client’s challenging specifications. Following this product development the client is then equipped to create new product lines that were previously not available.

Such is the company’s confidence in the performance of its screening machines that it is prepared to offer the ‘Virto Challenge’ money back guarantee and 24 months warranty. Based on the success of its product development partnerships, Virto firmly believes that for fine and ultrafine particle separation its technology can achieve an improvement on all existing screening equipment. Therefore, it is seeking additional partners and requesting processing companies to send samples of challenging material to its European or US test laboratories to ‘challenge’ the technology where it believes results will speak for themselves.

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A Virto screening machine undergoing final adjustments at the Virto/Cucolin factory.