TELSONIC
ULTRASONICS

Ultrasonic technology for powder processing in 3D printers

Boosting efficiency during sieving

PLASTIC WELDING | METAL WELDING | CUTTING | CLEANING | SIEVING

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Ultrasonic technology is used in all kinds of applications. In industrial environments, for instance, it is an ideal choice for making cutting, welding, and sieving processes efficient and environmentally sound – but, crucially, keeping them cost-effective. As sieving delivers particular benefits in powder processing, 3D printing is one area that is able to benefit from this technique, which involves sieving out clumps and other impurities with the aid of high-frequency ultrasonic vibrations. The sieves can be adapted to suit the needs of the powder processing units in question, and they not only make processes safer, but can also be cleaned efficiently without clogging.

Additive manufacturing that uses series-produced parts from 3D printers has the potential to revolutionize the world's economy, as it provides an economical way of creating everything from prototypes to components of all kinds and products in small numbers, right down to batch size 1. In turn, this means it has a wide range of potential uses – from aerospace and the automotive industry to tool making, machine building, and medical and dental technology. As a term, 3D printing actually covers a whole range of additive manufacturing technologies. Most of these operate with equipment that uses CAD data to create objects layer by layer, working with materials including ceramic, synthetic resin, and metal. If the material's raw state is a powder form, the 3D printer is said to operate with a powder or powder bed technique. Its printing and building area comprises a kind of tray in which the

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01 Powder for 3D printing with an application from a 3D printer

02 Powder recycling system from Telsonic (open)

03 The powder recycling system is available in a range of sizes

04 SONOSCREEN®easy sieving system

05 By Reto Sutter, Head of Process Technology at TELSONIC AG, Switzerland

powder is spread one layer at a time. Depending on the model contours, the powder may also be compacted layer by layer using a binding agent or through an increase in temperature from a laser beam, for instance. Any powder that is not bound simply provides support during this process, and is then removed from the building area once printing is complete. This means that powder residue continually accumulates during 3D printing and has to be reprocessed to make it usable again, as it is such a valuable material.

Ultrasonic sieving for powder reprocessing

To achieve this, 3D printers have a reprocessing unit that screens the powder residue to remove any clumps or other impurities. The powder is very fine, but still needs to be separated quickly and with a high degree of selectivity, making this a challenging process. With mechanical techniques no longer able to satisfy the demands of such cutting-edge technology, ultrasonic methods have stepped in to provide an alternative that is fit for the future.

Ultrasonics specialist Telsonic has already amassed 20 years of experience in this field. It offers tailored solutions that are specifically designed for use in the powder processing units of 3D printers and capable of handling throughput rates from 10 to 200 l/h. As well as this, it provides users with support in everything from design to integration, ensuring the solution is the perfect fit for the application. The installation conditions, product properties, and particle size distribution are all key factors that are considered. Once the most important parameters have been identified, work on developing the ideal ultrasonic sieving system can begin. Systems of this kind are able to reprocess powder far more efficiently than purely mechanical sieving units that use vibrations. Not only that, but ultrasonic sieving units are also easier to seal than older solutions, making them the perfect option for inert cycles that use powder with a tendency to spontaneously combust, such as aluminum, magnesium, or titanium alloys. The low volumes of noise they produce and minor amounts of wear they cause thanks to the microvibrations are yet more reasons to choose ultrasonic technology. The process is environmentally friendly, energy-saving, and relatively inexpensive – and given its ATEX and UL approval, there is nothing to stop these sieving systems being adopted worldwide.

So how exactly does ultrasonic sieving work?

An ultrasonic sieving system generally always consists of three components: a generator, a converter, and a matched screen resonator with installation frame. The generator converts the normal power supply into high frequency and transfers this to the converter, which in turn converts it into ultrasonic vibrations with the aid of the piezoelectric effect. These cause the sieving frame to vibrate by means of the resonator. The vibrations are transferred to the screen fabric, where they are distributed evenly. The sieving vibrations range from 33 to 37 kHz and reduce the frictional resistance between the item being sieved and the sieve fabric. This ensures that the sieves can be cleaned efficiently without clogging – and it improves throughput, optimizes selectivity, and accelerates reprocessing.

These are benefits that feed into both powder processing itself and manufacturing. What's more, customized ultrasonic sieving solutions also enable users to benefit from outstanding selectivity, no clogging, and shorter process times no matter what powder material they are using. That's why it makes sense to bring an ultrasonics specialist on board as early as possible in virtually every sieving process where maximum efficiency is the aim.

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