The screening of metal powders with a particle size under 50 μm has always been a major challenge in the creation of new alloys, as Asad Bilal discusses.

When undertaking product development metal powder producers have had to constantly make a sacrifice in throughput or separation efficiency. Ultrasonic technology has provided a little relief in the zone of 50–30 μm, but for ultra-fine metal powders below 30 μm, especially when the particle is an irregular shape or is prone to electrostatic interference, there has been no cost effective screening solution.

Difficulties for existing screening technology sub 30 μm
When considering vibrating sieves for screening at ultra-fine cut points, the shape of the powder in regular form, low angle of repose or high bulk density, all offer little assistance. Ultra-fine powders often coat the mesh cloth, causing a blinding effect through an electrostatic charge. In addition, irregular shaped particles that are a similar size to the aperture of the mesh get trapped and are wedged firmly in place, ultimately causing the screening capacity to gradually decrease or to tear the mesh.

One example of a major disadvantage for vibrating sieves for ultra-fine powder screening is the fact that it seems impossible to obtain a robust stainless steel screen cloth with an aperture below 25 μm. During the production of fine mesh cloth the delicate wires tend to break and if they survive production the crimps (knuckles on woven wires) wear out very quickly for most metal powders. This has big economic implications for the users of the mesh due to the fact that a short mesh lifetime means reduced production time and/or high mesh replacement costs.

For decades manufacturers of metal powders have relied on ultrasonic technology and or air classification systems to achieve desired particle size distribution down to 30 μm but in so doing have sacrificed capacity and/or efficiency needs. With the demand of finer powders on the rise for multiple industries there is a real need for screening technology to meet these challenges and to
provide a solution that enables cost effective and high quantity separation of fine and ultra-fine metal powders.

A new screening technology for metal powder

In more than 100 tests and case studies (including gold, silver, titanium, graphite and super alloys) run over 10 years exclusively with some of the world’s biggest metal powder producers, multi-frequency vibratory (MFV) technology has proven itself to overcome all of the problems experienced with traditional screening and ultrasonic systems for all particle size separation down to 6 μm. The MFV screening technology has been designed and refined over 20 years specifically targeting the effective separation of difficult ultrafine metal particles that are wet, sticky and agglomerative for particle sizes between 1000 μm and 6 μm. It achieves far greater capacities for fine and difficult materials in comparison to traditional sieving methods due to its multi-frequency technology that accelerates the mesh by up to 500G – which is a 10,000% increase in mesh acceleration compared to standard sieves.

In effect this 500G of acceleration increases both the amplitude and frequency of the vibration and in so doing overcomes mesh blinding by harnessing the power of resonance to achieve efficient and high capacity wet or dry screening of ultrafine and/or irregular shaped particles.

Revolutionizing metal powder separation

The MFV technology has been fundamental in creating new metal powder product lines for some of the world’s largest metallurgy companies. The following table lists some examples of these case studies based on the smallest machine with 650 mm diameter:

<table>
<thead>
<tr>
<th>Material</th>
<th>Aperture size in micron</th>
<th>Capacity kg per hour</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aluminum</td>
<td>6</td>
<td>42</td>
</tr>
<tr>
<td>Gold</td>
<td>7</td>
<td>20</td>
</tr>
<tr>
<td>Titanium</td>
<td>15</td>
<td>67</td>
</tr>
<tr>
<td>Stainless Steel</td>
<td>22</td>
<td>106</td>
</tr>
<tr>
<td>Copper</td>
<td>40</td>
<td>49</td>
</tr>
</tbody>
</table>

The ScreenX solution

As one Europe’s largest producers of screening equipment, Virto-Cucolini 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 across a diverse product portfolio of screeners (FDA and ATEX compliant) that are highly efficient and achieve large capacity screening solutions for particle separation requirements starting at 10 mm and going down to as fine as 6 μm (0.006 mm). Virto has a strong history of developing cutting edge technology, leading to the revolutionary new product line that screens what was “previously impossible”. The ScreenX MFV line has proven itself on hundreds of applications to be very successful with screening materials that are less than 1000 μm (1 mm) 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) Sieves**
   - This is the ScreenX line discussed above that specializes in wet, sticky, agglomerative and difficult powders down to 6 μm; and,

2. **Single Frequency Vibrating Sieves/Tumblers**
   - This line is called the Cucolini line and is one of the world’s most popular vibrating sieves used for all standard separation needs down to 50 μm

Metal powder product development partnerships

For nearly all of the wet and dry ultra-fine metal powder tests conducted on Virto’s ScreenX MFV technology, it has delivered revolutionary particle separation leading 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 metallurgy 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 metal powder product lines that were previously not available. On this basis Virto is seeking additional partners in the metal powder industry to send samples of challenging material to Virto’s US or European laboratories for free tests on its MFV equipment.