

Particle Size Determination (PSD)

Instrumentation and Sample Preparation

Model:

- Retsch Sieve Shakers (Figure 1)
- Uses mechanical shaking and woven wire-mesh sieves to filter material (25 microns to 1.25 mm) (Figure 2)

Sample Preparation:

Powdered alloys are analysed as received to determine if the sample has been milled enough to meet a customer's desired value for the D50 (average particle size).

How does it work?

Technique:

Particle size determination via sieve analysis is the traditional and most commonly used method at LCM. A sieve stack consists of several sieves that are clamped to a sieve shaker with increasing aperture sizes stacked upon each other (from smallest to largest).

Size Fraction Determination:

The sample (~ 100 g) is placed on the uppermost sieve. The stack is set into vibration (~ 60 Hz) for 10-15 minutes (Ref. ASTM B214-07) or when the mass on respective sieves no longer changes.

As a result, the particles are distributed to the sieves in the stack (called fractions) according to their size. Each sieve is weighed, and the volume of each fraction is calculated in percentage by weight.

A graph is particle size vs. cumulative fraction percentage (% CF) is plotted – where the D50 can be calculated. (Figure 3)

What does it detect?

Detection Limit:

The particle size determination using the sieve analysis technique has some limitations, like any other technique. The most common source of errors is overloading of the sieves (causing to block the sieve apertures hence unreliable results).

Using worn-out, damaged sieves may also cause unreliable data collection. In comparison to new, automated technologies, the traditional sieving of samples for particle size determination has limited automated data transfer capability.

LCM is progressing to establish a more automated state-of-the-art particle size determination system for its analytical & characterisation laboratory.



Figure 2: Woven Wire-Mesh Sieves

Figure 1: Sieve Shaker Instrument

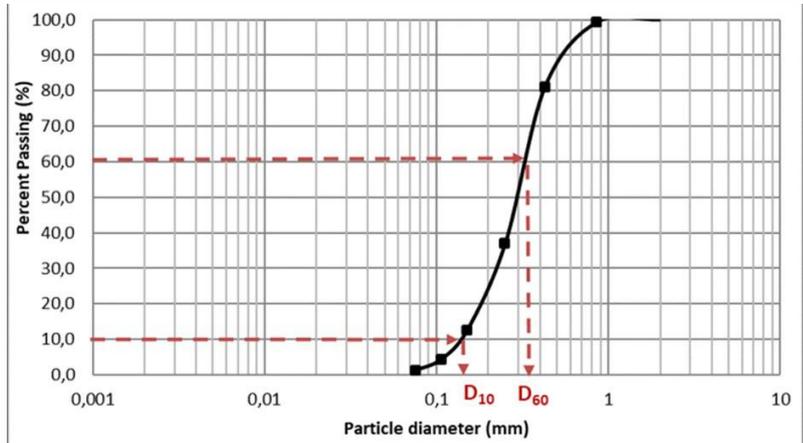


Figure 3: Graph of Particle Size Distribution Showing the 10th and 60th Percentile



Figure 4: Powdered Alloys