

# **Evaluating the spreadability of metal powders for additive manufacturing applications using a new powder spreadability analyzer**

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## **Abstract**

The spreadability of several metal powders manufactured for additive manufacturing applications is measured for a range of layer thicknesses under different application conditions including a range of spreading speeds, different spreader geometries, a range of powder feeding geometries and spreader application pressures and different environmental conditions. The powder spreadability analyzer used for the measurements is a new instrument commercially produced by Mercury Scientific Inc. Data presented include spreading efficiency, mass per spreader travel and spreading uniformity per spreader travel.

## **Introduction**

The ability of a powder to form a layer in a powder AM printer is critical to producing high quality parts. This ability is referred to as powder spreadability. There are many official and unofficial definitions of powder spreadability but there is no consensus on how to test it. Many printers have various in situ techniques for analyzing powder layer formation but these techniques are more for process monitoring rather than predictive testing. These techniques require an available printer and a large quantity of powder. For predictive tests what is needed is a device that uses a small amount of powder to create a powder layer similar to AM printers and can quantify the quality of the layer. Several tests and test devices have been proposed [1,2,3,4]. These include test beds that automatically spread a test powder and manual spreading devices. Typically the measurement performed is an optical analysis of the top surface of the powder layer. In some cases the density of the layer is measured by weighing the powder and calculating the spread layer volume.

For this application, a new device has been introduced commercially to measure powder spreadability. This powder spreadability analyzer creates up to four simultaneous layers of powder using various spreader geometries, spreader speeds and powder feeding options. The analyzer then measures the quality of the powder layer using optical techniques and by measuring the mass of material exiting the spreader. The test powder can be spread on various build plates or on a powder bed.