A new sensor to measure powder layer thickness, powder density, and layer uniformity in a spread powder layer

Greg Martiska
Mercury Scientific Inc.
64 Barnabas Drive Unit 1, Newtown, CT 06470

Abstract

Powders are spread in thin layers by various techniques in AM printers. The thickness, density and uniformity of the spread powder layer impact the quality of the printed parts but are difficult to measure. Powder layers are only twenty to two hundred micrometers thick making measurements of thickness and density difficult, especially over a powder bed. This paper presents a new sensor and method to measure powder layer thickness, density, and changes in both parameters over a spread powder bed.

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. Powders are typically spread in AM printers by horizontal relative motion between the build area and a spreading device. The spreading device is typically referred to as a recoater and can be a flat blade, rounded blade, counter-rotating roller, etc. The recoater is moved across the build area to spread one layer and moved vertically relative to the bed in fixed distances to spread multiple layers. The vertical movement is referred to as the leveling height and it is typically between twenty to two hundred micrometers.

Printer users typically consider the leveling height to be the thickness of the free powder being spread in the printer as in Figure 1 for a solid part surface or Figure 2 for a powder bed.