

Graduate Student Research Seminar

Spring 2022

An Experimental Analysis of Thin Sheet Metal Bending by Laser Peen Forming with Femtosecond Lasers

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3:00 pm (EST) – 132 Fluor Daniel Building



Abstract

Lasers have a wide range of manufacturing applications, one of which is the bending of metals. While there are multiple ways to induce bending in metals with lasers, this study examines laser peen forming with femtosecond lasers on thin metals perpendicular to the laser. The effects of multiple parameters, including laser energy, scan speed, scan pitch, and material thickness, on the bend angle of the metal are investigated. The bend angles are generated in both concave and convex directions, represented by positive and negative angles, respectively. While it is possible to create angles ranging from 0 to 90 or more degrees in the concave direction, the largest average convex angle found was only -26.2 degrees. The positive angles were created by high overlapping ratios and slow speeds. Furthermore, the concave angles were made by a smaller range of values than the convex angles, although this range could be expanded by changing the effective laser fluence. The positive angles also had a higher inconsistency than the negative angles with a higher average standard deviation. The characterization of bending angles will allow for more accurate predictions, which will benefit traditional metal forming applications and more advanced applications such as origami structures with metal.



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