



A Study of the Influence of Machine Control and Dynamics on the Definition of Deposition Strategies and Travel Speeds for Laser Metal Deposition (LMD) Processes

Motivation

Additive manufacturing (AM) machine tools which use the Laser Metal Deposition (LMD) method are often constructed based on conventional machining centers, therefore inheriting several characteristics and limitations, as well as the CAM tools, originally developed for machining processes, which are adapted for AM processes. However, machine dynamic-related limitations may cause undesirable variations in bead morphology. Thus, trajectory generation must include specific requirements for AM processes.

Objective

The objective of this study was to determine a set of guidelines for trajectory generation in additive manufacturing (AM) processes towards the predictability of bead morphology.

Approach

Aspects of Numerical Controls were analyzed and varied and their effects on actual travel speed was assessed. Reading speed, cornering and spiral trajectories were investigated while varying trajectory point density, look-ahead function, advanced surface mode, acceleration mode and corner radius. A full factorial experiment was designed. The relation between programmed and observed travel speed was determined for each combination, and dynamic limits were determined for the ROMI DCM 620-5X Hybrid machine equipped with a Sinumerik 840 D sl controller. A flowchart was elaborated as a guide for the replication of this method for different equipment.



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