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Powder Flow with Normalized Powder Particles Size Distribution and Temperature Analyses in Laser Melting Deposition: Analytical Modelling and Experimental Validation

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Abstract : Powder flow and temperature distributions are recognized as influencing factors during laser melting deposition (LMD) process, that not only affect the consolidation rate but also characteristics of the deposited layers. Herewith, two simplified analytical models will be presented to simulate the powder flow with the inclusion of powder particles size distribution in Gaussian form, under three powder jet nozzles, and temperature analyses during LMD process. The output of the 1st model will serve as the input in the 2nd model. The models will be validated with experimental data, i.e., weight measurement method for powder particles distribution and infrared imaging for temperature analyses. This study will increase the cost-efficiency of the LMD process by adjustment of the operating parameters for reaching optimal powder debit and energy. This research has received funds under the Marie Sklodowska-Curie grant agreement No. 764935, from the European Union's Horizon 2020 research and innovation program.

Keywords : laser additive manufacturing, powder particles size distribution in Gaussian form, powder stream distribution, temperature analyses

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