

# A quest for high-performance laser metal deposition technology

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Laser metal deposition (LMD) is modern, rapidly progressing technology of additive manufacturing. Due to high productivity of 1-4 kg/h and virtually unlimited workspace, it is perfectly suited for large parts manufacturing. Introduction of LMD technology can significantly reduce productions time and material costs, decrease number of technological operations and simplify tooling. On the other hand, manufacturing of meter-size parts is a challenging task. This paper presents a complex research work on laser metal depositions of large-scale parts. Unlike small parts, it is vital to take into account residual stresses and distortion, which can change part geometry by centimeters and even can interrupt deposition process because of loss of stability. Dealing with high stresses requires substrate thickness increase, and leads to problem of handling massive objects with high accuracy. Presented solution with usage of industrial robots brings flexibility in system design, so it become possible to adapt machine to part geometry. Another task is to increase the mass productivity of deposition process by increasing laser power, linear speed, bead width or height. The problem and proposed solution are described in current research, including manufacturing of demonstrator parts with productivity of about 1.2 kg/h for titanium and 2.5 for nickel alloys. However, even with high productivity depositions of 100-200 kg of material takes a lot of time and during this long process equipment reliability and process stability become vital. Usage of intelligent technological system, equipped with sensors, quick nozzle changeover and proper software, can bring laser metal deposition to a new level.

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