# Effect of laser-matter interaction on stability and efficiency of laser deposited Inconel 718

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- Laser Metal Deposition process
- Influence of manufacturing and nozzle parameters
- Transpose of parametric study from one nozzle to another

**Abstract:**

The Laser Metal Deposition process, or LMD, is a rapid free form fabrication method which can be used to manufacture new near net shape metallic components, to repair used metallic parts or to add functional parts on existing ones. During this process, a carrier gas is used to form a powder stream which is fed into a molten pool created by a laser beam on the top surface of a metallic substrate. The delivery system is a nozzle whose configuration and size depend on its manufacturers.

One of the challenging issue of this process is to fully understand the impact of all its manufacturing parameters and to be able to estimate properly the geometrical and metallurgical dimension of the different deposits. This would strongly limit the time and cost of manufacturing parameters development which needs to be done for all new component. If many analytical, empirical, or numerical models have been developed over the years, none of them take an active interest in the impact of the nozzle delivery parameters such as its size, its configuration and the gas and powder particles characteristics which flow through it. Then, the developed models cannot be transpose from one nozzle to another and the parametric study of one component must be develop again.

The purpose of this study is to improve existing models by adding some nozzle parameters linked with the laser-matter interaction to be able to transpose a parametric study

from one nozzle to another. To complete this project, a numerical simulation and different experimental setup will be used to better understand the impact of nozzle parameters.