



SNS College of Technology

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COIMBATORE-641 035, TAMIL NADU



Department of Aerospace Engineering

19AST202 AIRCRAFT PRODUCTION TECHNOLOGY

ADDITIVE MANUFACTURING IN AEROSPACE

DIRECTED ENERGY DEPOSITION (DED)

In this AM process, material in powder or filament form is deposited and melted onto an existing surface using any of several energy sources, such as laser or electron beam. The molten material adheres to the surface and solidifies as an added layer, as in Figure. The deposition nozzle and energy source are contained in a work head whose path is controlled relative to the work part for each layer according to the AM slicing algorithm. The scanning mode is moving spot. An inert gas is required to protect the immediate work environment from oxidation. After completing each layer, the work head is moved vertically upward to begin the next layer.

Materials used with DED include metals, ceramics, and plastics, but the process is especially suited to the creation and repair of metallic parts. Work metals include steel, copper, titanium, nickel, and aluminum, fed into the process as powder or wire. In general, if the metal can be fusion welded, it can be used as a work material in directed energy deposition. One might be tempted to think that when directed energy deposition utilizes a laser as the energy source and the work material is a powder, the process is the same as selective laser sintering because the starting work materials in both DED and SLS are powders. The difference is that SLS operates on a flat bed of powders, whereas the powders in DED are deposited only in the local vicinity of the laser beam.

Within the scope of DED processes are various names that apply to specific applications and energy sources. They include Laser Metal Deposition (LDM), Laser Engineered Net Shaping (LENS™), Direct Metal Laser Sintering (DMLS), and Direct Metal Deposition (DMD™). As indicated, some of these processes are trade-marked and proprietary. The terms Laser Cladding or 3D Laser Cladding are used when the purpose of the operation is to attach a layer of material to an existing substrate.

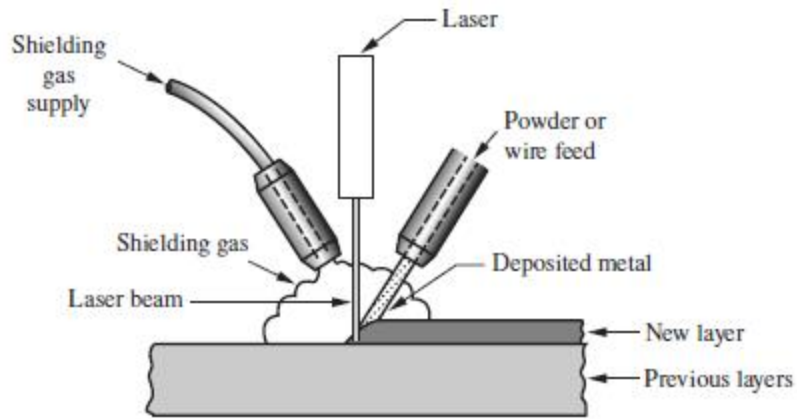
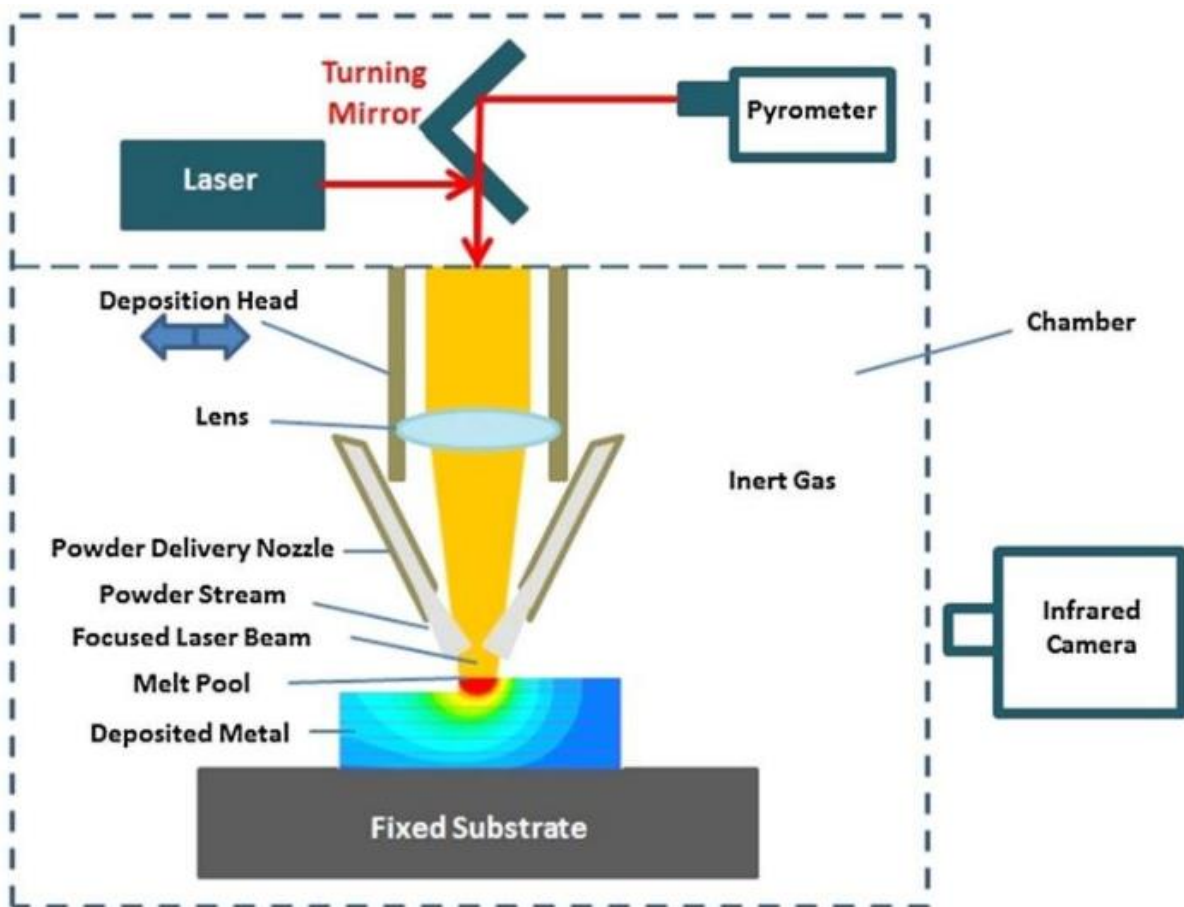


Figure Formation of a new layer in directed energy deposition (DED) using a laser as the heating source.



directed energy deposition process