



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

BINDER JETTING

Like powder bed fusion, the processes in binder jetting operate on powder materials, but instead of fusing the powders, a liquid adhesive is applied to each layer in selected areas to bond the powders together. When the original binder jetting process was developed around 1990, it was named *three-dimensional printing* (3DP); today that term has been generalized to apply to all additive manufacturing technologies. The specific *three-dimensional printing* process in binder jetting builds the part using an inkjet printer to eject adhesive bonding material onto successive layers of powders. The binder is deposited in areas corresponding to the cross sections of the solid part, as determined by slicing the CAD geometric model into layers. The binder holds together the powders to form the solid part, whereas the unbonded powders remain loose to be removed later. While the loose powders are in place during the build process, they serve to support overhanging and fragile features of the part. When the build process is complete, the loose powders are removed. To further strengthen the part, a curing or sintering step can be applied to bond the individual powders. The part is built on a platform whose level is adjusted to the correct elevation for each cross section as in Figure: (1) A layer of powder is spread on the existing part-in-process. (2) An inkjet printing head moves across the surface using a moving-line scanning mode, ejecting droplets of binder on those regions that are to become a layer in the solid part. (3) When printing of the current layer is completed, the platform is lowered for the next layer.

Starting materials in 3DP are powders of ceramic, metal, and sand. Typical layer thickness ranges from about 0.10 to 0.20 mm (0.004–0.008 in). The inkjet printing head moves across the layer at a speed of about 1.5 m/sec (60 in/sec), with ejection of liquid binder determined during the sweep by raster scanning. The sweep time, together with the spreading of the

powders, permits a cycle time per layer of about 2 sec. Allowing for repositioning and recoating delays, this permits the machine to operate at a rate of two to four layers per minute . Applications include fabrication of molds and cores for sand casting operations.

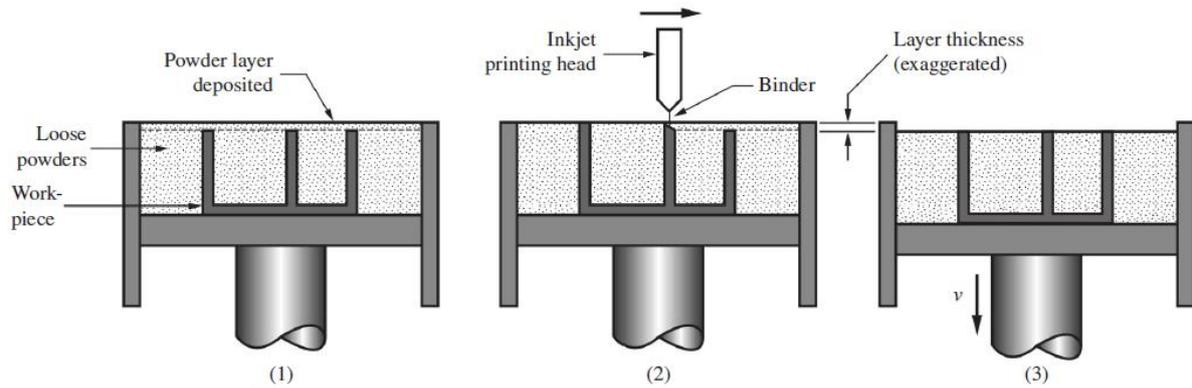


Figure Three-dimensional printing: (1) Powder layer is deposited, (2) inkjet printing of areas that will become the part, and (3) piston is lowered for next layer (key: v = motion).