Material extrusion

Material extrusion uses a heated nozzle to melt and deposit thermoplastics onto a build plate. While following a toolpath, the nozzle extrudes one layer at a time until the final part is created. This method usually has short lead times and creates cost-effective parts. Material extrusion can handle larger parts than many additive technologies and is ideal for creating everything from quick prototypes to final parts.

Industry applications	Aerospace, prototyping, jigs / fixtures, industrial
Material types	Thermoplastic, composite
Environment / certification	UV, chemical, flame (5-VA)
Material options	Many (high temperature, ABS, PEI, composites)
Isotropy	Anisotropic
Multi-material printing	Yes
Process type	Single piece
Process design / NRE required	Medium
Recommended part size	Softball
Throughput / annual volume	Low (100s)
Part color	In-process (single color), post-finishing
As-built texture	Layer lines
Support material required	Required, tear-away or soluble
Minimum feature size	Medium
Benefits: Well-understood thermoplastics, specialty materials (e.g., ULTEM); soluble supports enable design freedom; process has been validated, production-ready (aerospace certified)	

Material jetting

Material jetting deposits photopolymer drops onto a build plate in layers to create a part. The photopolymers are immediately cured with UV light as they're deposited to make the part solid. Material jetting works well for prototyping, overmolds, and models that require accuracy and good surface finishes.

Industry applications	Prototyping, jewelry, overmolds, medical models
Material types	Thermoset
Environment / certification	N/A
Material options	Several (rigid, elastomeric)
Isotropy	Anisotropic
Multi-material printing	Yes
Process type	Single piece
Process design / NRE required	Medium
Recommended part size	Tennis ball
Throughput / annual volume	Low (100s)
Part color	In-process (multicolor)
As-built texture	Smooth
Support material required	Required, soluble
Minimum feature size	Extra small
Benefits: Very fine features; multiple materials, colors are available within a single part	

Polymer Additive Manufacturing Technology

Binder jetting

Binder jetting deposits an adhesive onto thin layers of powder particles. Parts made with binder jetting don't require supports, and they can be printed in color. Binder jetting works well for aesthetic (non-mechanical) prototypes.

Industry applications	Prototyping, sand casting
Material types	Ceramic (sand)
Environment / certification	N/A
Material options	Limited (sandstone, sand, ceramic)
Isotropy	Anisotropic
Multi-material printing	No
Process type	Batch
Process design / NRE required	Minimal
Recommended part size	Softball
Throughput / annual volume	Low (100s)
Part color	In-process (multicolor)
As-built texture	Rough, uniform
Support material required	Not required
Minimum feature size	Small / medium
Benefits: Multiple colors available in a single print; large parts are possible	

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