Description

Image

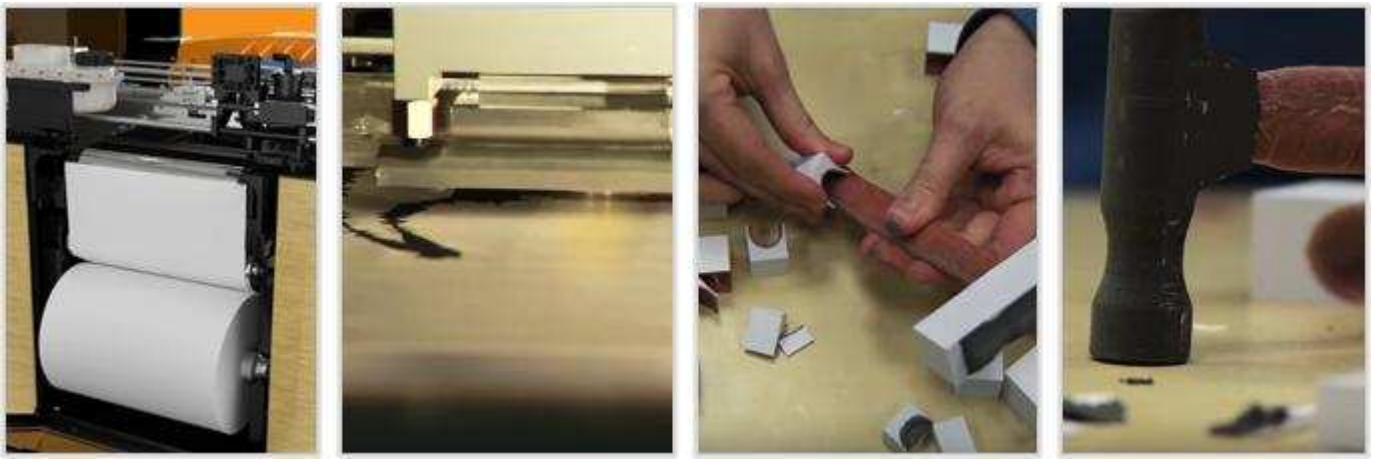


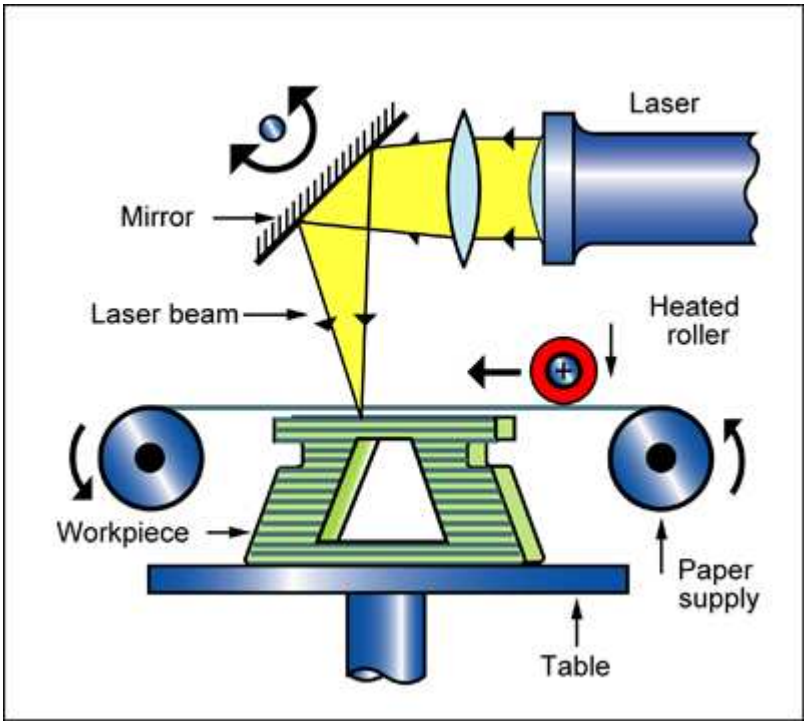
Image caption

(1) Foil supply. Sheet is adhered to a substrate with a heated roller © Mcor Technologies Ltd (2) Laser beam printing the shape in a moving platform © Mcor Technologies Ltd (3) Removing the waste material from the finish object © Mcor Technologies Ltd (4) Finished object © Mcor Technologies Ltd

The process

In LAMINATED OBJECT MANUFACTURE (LOM) the prototype or model is usually built up from layers of paper (polymers or metals are also possible with some machines), laminated with a heat sensitive polymer binder. To create one layer, binder-coated sheet material is fed from a roll, positioned over the model, and cut to shape by a guided laser beam. The cut profile is pressed onto the model by a heated roller, bonding it to the layers beneath and the sequence is repeated. The process is faster than SLA or SLS because only the outline of the part needs to be covered by the laser. When using paper the finished material resembles wood. As with other rapid prototyping processes, a CAD solid model of the part is used to create the instructions to guide the laser.

Process schematic



Material compatibility

Natural materials	✓

Shape

Circular prismatic	✓
Non-circular prismatic	✓
Flat sheet	✓
Dished sheet	✓
Solid 3-D	✓
Hollow 3-D	✓

Economic compatibility

Relative tooling cost	low			
Relative equipment cost	high			
Labor intensity	high			
Economic batch size (units)	1	-	10	

Physical and quality attributes

Mass range	0.1	-	50	kg
Range of section thickness	1	-	100	mm
Tolerance	0.25	-	2	mm
Roughness	100	-	140	µm
Surface roughness (A=v. smooth)	C			

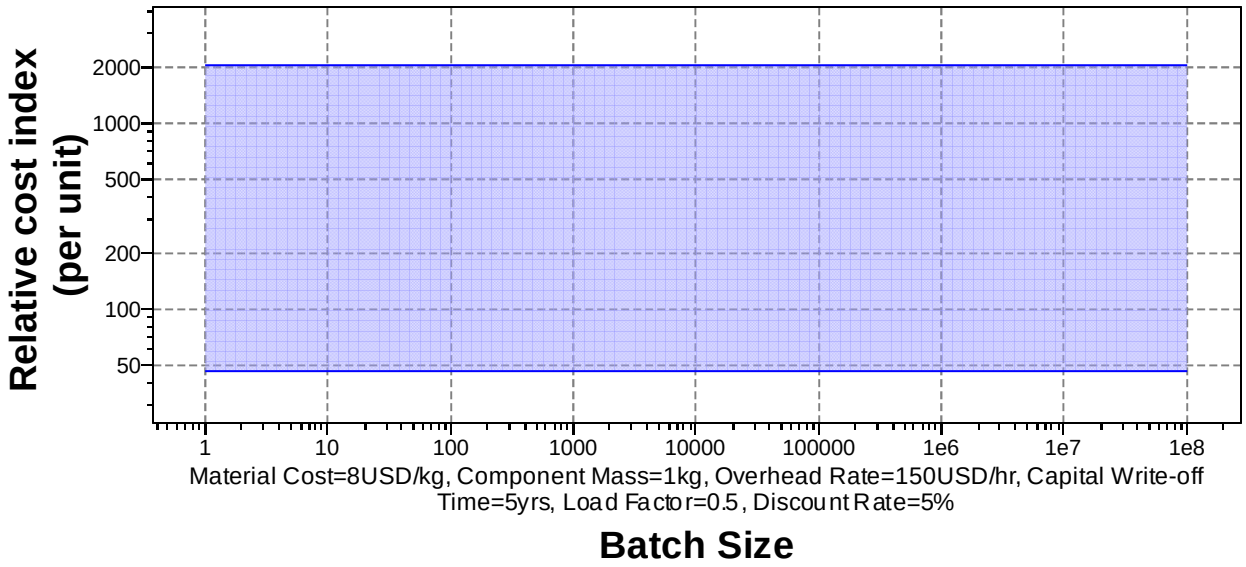
Process characteristics

Primary shaping processes	✓
Discrete	✓
Prototyping	✓

Cost model and defaults

Relative cost index (per unit)	* 45.6	-	2e3	

Parameters: Material Cost = 8USD/kg, Component Mass = 1kg, Batch Size = 1e3, Overhead Rate = 150USD/hr, Discount Rate = 5%, Capital Write-off Time = 5yrs, Load Factor = 0.5



Capital cost	1.13e5	-	2.07e5	USD
Material utilization fraction	* 0.5	-	0.7	
Production rate (units)	0.08	-	5	/hr
Tooling cost	* 0	-	0.1	USD
Tool life (units)	1e5	-	1e6	

Supporting information

Design guidelines

The process can create large objects with thick wall sections, but there are inherent difficulties with undercuts and re-entrant features, and thin sections may warp.

Technical notes

The build envelope (L x W x H) ranges from 160 x 210 x 135 mm to 6050 x 2045 mm and unlimited in the z-axis.
Typical layer thickness is 100 - 190 µm.
Objects may be built at up to 6.35 mm per hour in the z-direction.

Virtually any sheet material can be used: paper, metals, plastics, fibers, synthetic materials, glass or composites.

Typical uses

Making prototypes and models quickly from CAD systems. Patterns for sand-casting; accurate 3D topographical maps.

The economics

After the initial cost of the machine (around $6400), it can cost as little as $10 to make a fist-sized object out of paper.

Links

MaterialUniverse

Reference