19AST202 AIRCRAFT PRODUCTION TECHNOLOGY

ADDITIVE MANUFACTURING IN AEROSPACE

Laminated-object manufacturing (LOM)

Laminated-object manufacturing (LOM) produces a solid physical model by stacking layers of sheet stock that are each cut to an outline corresponding to the cross-sectional shape of a computer geometric model that has been sliced into layers. The sheets are sequentially stacked and bonded one on top of the previous to build the part. After cutting, the excess material in each layer remains in place to support the part during building. Sheet stock thickness is 0.05–0.50 mm (0.002−0.020 in). In LOM, the sheet material is usually supplied with adhesive backing as rolls that are spooled between two reels, as in Figure .

With reference to Figure, the LOM process for each layer can be described as follows, picking up the action with a sheet in place and bonded to the previous stack: (1) The cross-sectional perimeter of the STL model is computed based on the measured height of the physical part at the current layer of completion. (2) A laser beam is used to cut along the perimeter, as well as to crosshatch the surplus portions of the sheet for subsequent removal. The cutting trajectory is controlled by means of an x–y positioning system, and cutting depth is controlled so that only the top layer is cut. (3) The platform holding the stack is lowered, and the sheet stock is advanced between supply roll and take-up spool for the next layer. The platform is then raised to a height consistent with the stock thickness, and a heated roller moves across the new layer to bond it to the previous layer.

When all of the layers are completed, the new part is separated from the excess external material. The part can then be sanded to smooth and blend the layered edges. A sealing application is recommended for paper and cardboard stock to prevent moisture absorption and damage, using a urethane, epoxy, or other polymer spray. LOM part sizes can be relatively large among AM processes, with work volumes up to 800 mm × 500 mm × 550 mm (32 in × 20 in × 22 in). More typical work volumes are 380 mm × 250 mm × 350 mm (15 in × 10 in × 14 in). Thus, one of the advantages of LOM compared to other RP/AM technologies is the capability to build parts that are quite large.

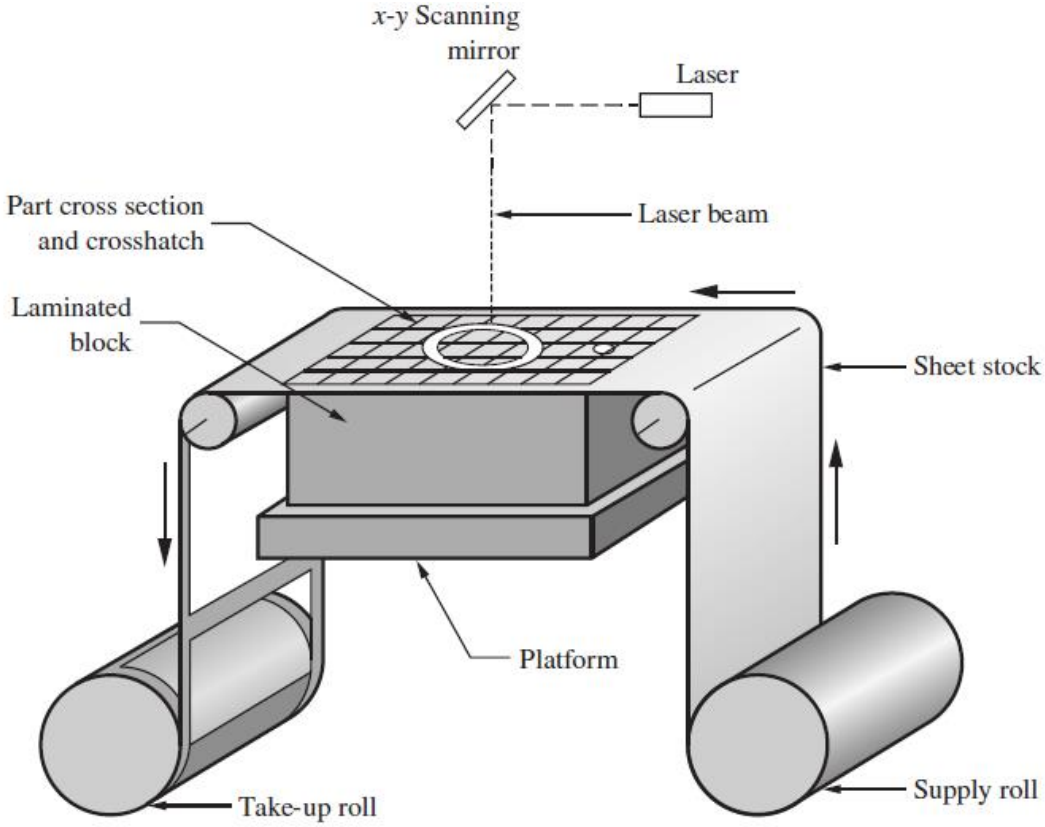
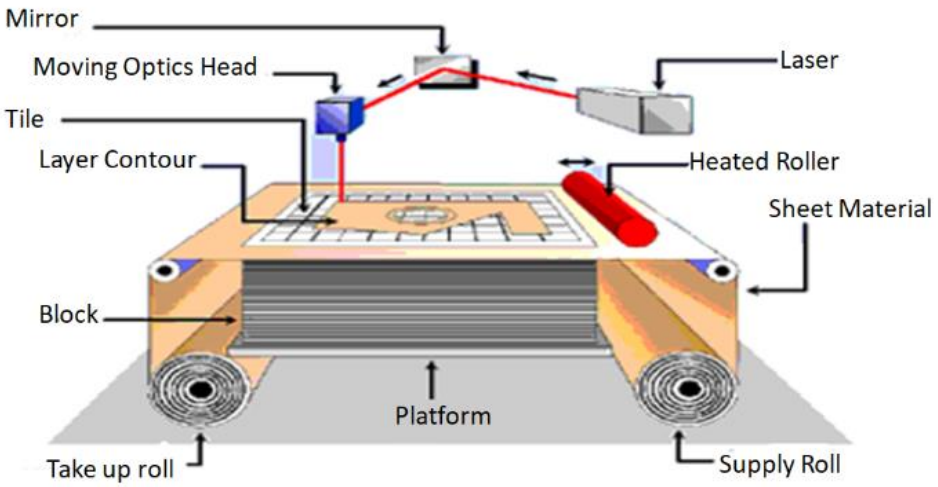


Figure Formation of a new layer in laminated object manufacturing (LOM).

Laminated object manufacturing (LOM) is a rapid prototyping system originally developed by Helisys Inc. LOM technology uses adhesive-coated paper, plastic, or metal laminates as a 3D printing medium. These sheets of material are glued together layer-by-layer and cut into shape using a knife or with laser cutting.



What is laminated object manufacturing?

Laminated object manufacturing (LOM) is a rapid prototyping process. It is generally considered a type of 3D printing. LOM creates models by layering sheets of build material. The sheets are bonded through heat and pressure and shaped using either a blade or a laser. This makes LOM both an additive (like 3D printing) and subtractive process.

Laminated object manufacturing was first developed by Helisys in 1991. It is a lesser known 3D printing method, but it provides several key advantages. LOM is one of the fastest and most affordable ways to create 3D prototypes.

How does laminated object manufacturing work?

An LOM machine uses a continuous sheet of material. The sheet is fed onto the building platform using heated rollers. Adhesive is applied through a nozzle. After a layer has been rolled onto the platform, a computer-controlled laser or blade carves a 2D pattern into it. The process is repeated layer by layer. The cutter also slices up any excess material in a *crosshatch* pattern. This makes it easier to remove said material at the end of the process.

Laminated object manufacturing mainly employs paper as a printing material. This is one of the reasons LOM is considered an efficient, cost-effective technology. LOM machines, however, are not limited to the use of paper. Other usable materials include plastic and some composites. Metal is rare.

What are the applications of laminated object manufacturing?

Laminated object manufacturing is mainly used for **rapid prototyping**. Applications include creating visual prototypes for demonstrations, color matching, and other purposes. LOM systems allow to carry out low-cost, in-house prototyping within office environments. No chemical reactions are involved in the LOM process. This means no enclosed chamber is required.

Paper LOM parts can be colourised. This makes the technology suitable for full-color models, such as toys. Laminated object manufacturing is also useful to create paper **architectural models**. In this area, LOM is faster and more accurate than manual model making.

Laminated object manufacturing can be used to make single-use patterns for sand casting. Manufacturers can print a 3D object in paper and build a sand mold around it. The object is then burnt out, creating a cavity within the mold. Liquid metal is poured in the cavity, to acquire the desired shape.