Laminated Object Manufacturing (LOM)

Developers

- Helisys Corporation located in Torrance, CA
- Michael Feygin in 1985 as president of Hydronetics, Inc., which at that time was located in Chicago, IL. In 1989, the company changed its name to Helisys, Inc., and relocated to Torrance, CA.
- Principal commercial provider of LOM systems, Helisys, ceased operation in 2000. However, several other companies have similar LOM technology.

Sizes

There are currently two sizes of LOM's available

- LOM 1015 – 10"x15"x14" (build area) cost of $95,000
- LOM 2030 – 20"x30"x24"

  cost of $180,000

LOM 2030

Click here to view a picture of a Laminated Object Manufacture machine from Helisys.

Materials Involved

- 1. Paper (most common)
- 2. Plastics
- 3. Composites
- 4. Metals
- 5. Ceramics

Process

- Hybrid process which involves adding and subtracting material to create a part
- Feed spindle supplies the material and a Take-up spindle controls the excess.
- Layers the material with thickness ranges from 0.001 – 0.005 inches
- Each layer is cut with a CO2 laser

Process

- The laser is on a carriage which controls the x direction and the lens moves to control the y direction.
- The material is mounted to a plate which moves along the z axis.
- De-cubing (removing material from the formed cube which houses the part)

Process

Material is usually a paper sheet laminated with adhesive on one side, but plastic and metal laminates are appearing.

- 1. Layer fabrication starts with sheet being adhered to substrate with the heated roller.
- 2. The laser then traces out the outline of the layer.
- 3. Non-part areas are cross-hatched to facilitate removal of waste material.
- 4. Once the laser cutting is complete, the platform moves down and out of the way so that fresh sheet material can be rolled into position.
- 5. Once new material is in position, the platform moves back up to one layer below its previous position.
- 6. The process can now be repeated.

Process

- LOM differs from the systems previously reviewed in that, rather than building up a part by adding materials to a stack through a forming process, layers of sheet materials such as paper, plastics, or composites are attached to a stack, and the laser cuts away the unused portions.

LOM Process

Click here to view a diagram of the LOM machine and more information from efunda.com.

Results

- The excess material supports overhangs and other weak areas of the part during fabrication. The cross-hatching facilitates removal of the excess material. Once completed, the part has a wood-like texture composed of the paper layers. Moisture can be absorbed by the paper, which tends to expand and compromise the dimensional stability. Therefore, most models are sealed with a paint or lacquer to block moisture ingress.
- The LOM™ developer continues to improve the process with sheets of stronger materials such as plastic and metal. Now available are sheets of powder metal (bound with adhesive) that can produce a "green" part. The part is then heat treated to sinter the material to its final state.

De-cubing

Click here to view an example of de-cubing.

Software

- It comes with LOMSlice™ software which controls the operation.
- Uses STL files which are downloaded into the LOMSlice™

Typical Uses

- Investment casting patterns
- Concept verification
- Masters for silicone-rubber injection tools
- Fit-check
- Direct use

Example Parts

Click on the links below to see examples of parts.

Example 1

Example 2

Example 3

Advantages

- Ability to produce larger-scaled models
- Uses very inexpensive paper
- Fast and accurate
- Good handling strength
- Environmentally friendly
- Not health threatening
- Precision claimed to be ±0.005 in.

Disadvantages

- Need for decubing, which requires a lot of labor
- Emission of smoke or fumes
- Can be a fire hazard
- finish, accuracy and stability of paper objects not as good as materials used with other RP methods

References

- Rapid Prototyping Technology
- http://home.att.net/~castleisland/lom_int.htm
- http://www.designinsite.dk/htmsider/p0055.htm
- http://mtiac.alionscience.com/pubs/rp/rp36.htm
- http://www.efunda.com/processes/rapid_prototyping/lom.cfm