



UNIT-1- INTRODUCTION

ADDITIVE MANUFACTURING (AM)

Additive manufacturing (commonly referred to as either rapid prototyping or 3D-printing) is **used to construct simple and complex geometries by fusing together very fine layers of powder or liquid**. The process starts with a CAD model sliced into cross-sections.

Seven additive manufacturing processes

There are seven main additive manufacturing technologies they are **Vat photo polymerisation, Material Extrusion, Material Jetting, Binder Jetting, Powder bed fusion, directed energy deposition, and Sheet lamination**.

Process of AM

The Additive Manufacturing (AM) process is **a computer-controlled process that uses CAD representations to build physical parts layer by layer**. Almost all computer-aided design (CAD) packages allow the creation of stereolithography (STL) files, which are translated into machine commands to drive the AM process.

Main steps of every AM process

The Additive Manufacturing Process

- Step 1: Using CAD Software to Design a Model. As you'd expect, Computer-Aided Design (CAD) plays a critical role in additive manufacturing.
- Step 2: Pre-Processing.
- Step 3: Printing.

- Step 4: Post-processing.

AM process chain

“Additive Manufacturing” (AM) is a **layer-based automated fabrication process for making scaled 3-dimensional physical objects directly from 3D-CAD data without using part-dependent tools**. It was originally called “3D Printing”.

Top Ten Advantages of Additive Manufacturing

- The Cost Of Entry Continues to Fall.
- You'll Save on Material Waste and Energy.
- Prototyping Costs Much Less.
- Small Production Runs Often Prove Faster and Less Expensive.
- You Don't Need as Much On-Hand Inventory.
- It's Easier to Recreate and Optimize Legacy Parts.

This section presents a range of recent applications in different industries along with several case studies where AM technologies have been successfully applied.

- 2.1. Automotive.
- 2.2. Aerospace.
- 2.3. Medical and Dental.
- 2.4. Building and Construction.
- 2.5. Electronics and Communication.
- 2.6. Oil and Gas.
- 2.7. Mining.

AM modulation

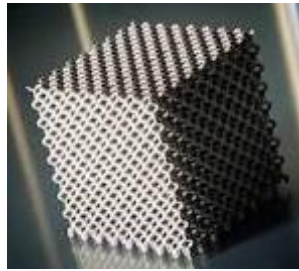
A diode detector is the simplest device used for AM demodulation. A diode detector is built with a diode and a few other components. Modems are used for both modulation and demodulation.

How AM is generated and detected?

AM generation involves **mixing of a carrier and an information signal**. In low level modulation, the message signal and carrier signal are modulated at low power levels and then amplified. The advantage of this technique is that a small audio amplifier is sufficient to amplify the message signal.

What is an example of additive manufacturing?

Direct energy deposition additive manufacturing can be used with a wide variety of materials including ceramics, metals and polymers. A laser, electric arc or an electron beam gun mounted on an arm moves horizontally melting wire, filament feedstock or powder to build up material as a bed moves vertically.



Fundamentals of additive manufacturing

Description. Additive manufacturing technology **uses 3 Dimensional printing technology in order to create parts and assemblies without tooling**. Additive manufacturing reduces design risk, provides efficiencies for the manufacturing process and is used for low-production part runs.

Metal additive manufacturing Work

This is a process that **uses fine, metal powders to create strong, complex components that are designed either by using a computer-aided design (CAD) program or by taking a 3D scan of the object**.

Impact of am on product development

Injection molding: Additive manufacturing **improves cooling performance, extends the life of the mold, and reduces waste**. Light weighting: Many parts and applications benefit from using less material (while improving performance) by producing them with additive manufacturing.

Two major issues involved in implementing AM in the product development process are **the designer's ability to absorb all the opportunities offered by AM** (Campbell et al., 2012), and the designer having knowledge of the numerous limitations in design that these manufacturing processes entail (Thompson et al., 2016).

Most Common Product Development Challenges

- Ideation.
- Market viability.
- Product roadmap problems.
- Workflow management.
- Product engineering issues.
- Pricing policy.
- The pace of innovation.
- Time-to-market.

Seven stages of a new product development process

- Stage 1: Idea Generation.
- Stage 2: Idea Screening.
- Stage 3: Concept Development & Testing.
- Stage 4: Market Strategy/Business Analysis.
- Stage 5: Product Development.
- Stage 6: Deployment.
- Stage 7: Market Entry/Commercialization.



