SNS COLLEGE OF TECHNOLOGY

An Autonomous Institution
Coimbatore-35

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DEPARTMENT OF MECHANICAL ENGINEERING

SOLID BASED MANUFACTURING SYSTEM

IN

ADDITIVE MANUFACTURING

SOLID BASED AM

Solid-based additive manufacturing (AM) systems utilize solids as the primary medium to create the part or prototype. As such, they are very different from the liquid-based photo-curing systems described . They are also different from one another in that the primary form of solid materials in some systems may come as filaments or wires, some as sheets or rolls while others may be as pellets. A special group of solid-based AM systems that uses powder as the medium will be covered separately .

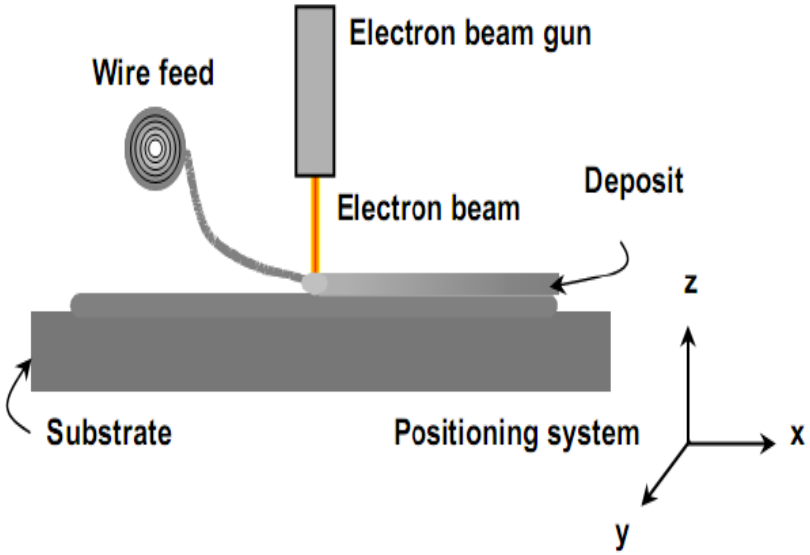
TYPES OF SOLID BASE AM

1. Fused Deposition Modeling (FDM)
2. Wire Arc Additive Manufacturing (WAAM)
3. Electron Beam Freeform Fabrication

Electron Beam Freeform Fabrication

Electron Beam Freeform Fabrication (EBF^3) is an additive manufacturing process (3D printing) being developed by NASA to create metal parts in space.

This process uses CAD drawings and a 3D printer to create parts and tools, which will save NASA time and money by allowing scientists to create parts as needed instead of hauling materials on the space shuttle, which can be quite costly.



Working Electron Beam Freeform Fabrication (EBF^3)

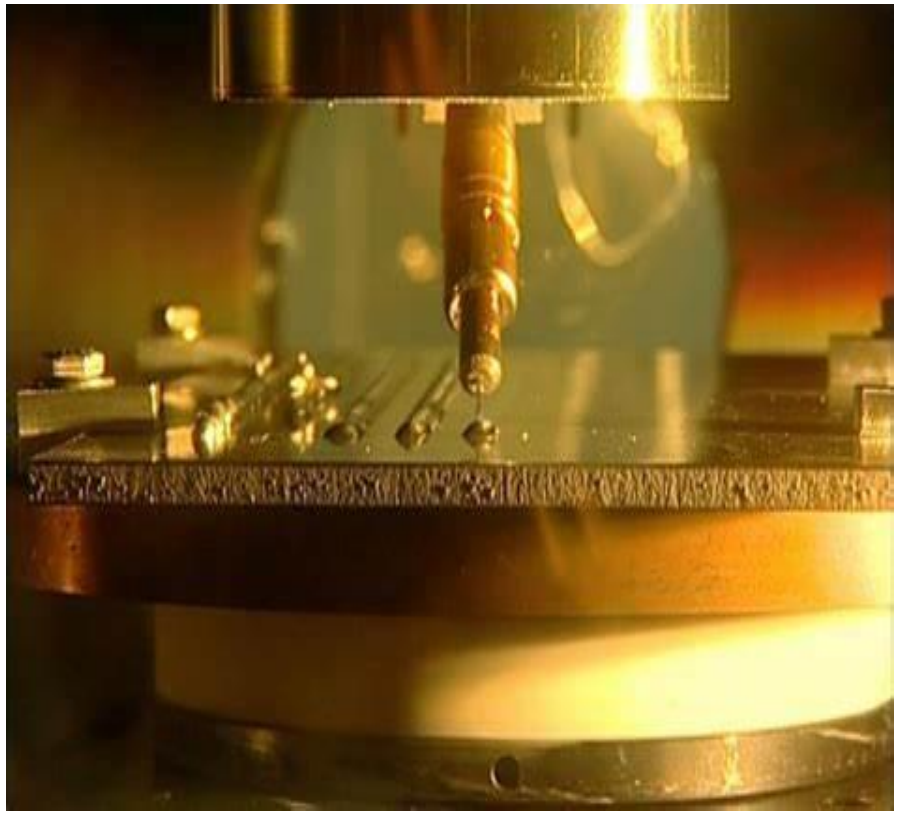
EBF^3 uses a focused electron beam in a vacuum environment to create a molten pool on a metal substrate.

First, a model is created in CAD software and the file is translated into G-code.

The G-code is sent to the printer.

Metal wire is fed into the printer, forming a molten pool in a layer, which solidifies after the electron beam has passed.

Once the layer has solidified, another layer is printed, until the process is complete and the part is created.



Technology of EBF3

- Unlike traditional additive technologies, this method is about creating objects by successively adding consumables.
- Electron beams of high power are used for the step-by-step deposition of materials. The result is a metal wire. The printing process is suitable even for the "space" conditions.
- The main feature of EBF3 is the creation of "near-net-shape" parts. All objects are created using extremely accurate 3D digital models, therefore post-processing is not required. Any part is completed and ready for use.

Uses for EBF^3

EBF^3 can also be used to manufacture aviation parts. Parts can be created using the EBF^3 and will save money by using less material, less electricity, and creating less waste. The first parts created by this technology will be simple, but in the future, it can allow for more complex parts that will improve energy, effectiveness, and endurance.

Consumable

- The main consumable material is metal powder. For example, alloys based on titanium. Many companies use Ti6Al4V: it is firm, has low spec. gravity and corrosion resistance.

APPLICATION

Today, large industrial giants, such as Boeing or General, use EBF3, since this method is economical and practical.

PROS

- inexpensive and accessible materials are used for electromagnetic components;
- the material quickly heats up without additional elements, because the electron beam can be scattered;
- the electron beam moves rapidly over the surface, providing a good performance rate;
- there is no need to clean the site of material residues.

CONS

use of special chambers with absorbing coating to protect the object from X ray beams .

THANK YOU