When elector beam impacts on the Workpiece Surface, the K.E of high Velocity electrons immediatly Converted into heat energy

• Surface Since the power density is very high It takes a few micro secounds to Melt and Vapourise the Material on Impact.

• The process is Carried out In repeared pulse of Short duration

• The pulse frequency range from 1 to 16,000 Hz duration may range from 4 to 65,000 micro secounds

• By alternately focusing and turning off the beam the Cutting process Can be Continued as It is needed.

• A suitable Viewing device is always incorporated to the Machine. So It becomes Easy for the Operator to observe the progress of Machining Operations.

Principle :-

When the high Velocity beam of electrons strike the Workpiece. It is. K.E is Converted into heat. This Concentrated heat raises the temp of Workpiece material and Vapourises a small amount of it. resulting in removal of Material from the Workpiece.

Machining outside the Vaccum Chamber:-

fully Vaccum system is more Costly, the recent development have made it Possible to Machine outside the Vaccum Chamber. In this arrangement, the necessary Vaccum is maintained within the electron gun and the gases are removed as soon as they enter into the system.

Applications:

1. Mainly used for micro machining operation on thin materials.

2. Drilling hole in Pressure differential devices used in nuclear reactors

3. It is used for removing small broken taps from holes.

4. Micro drilling operation for thin orifices die for wire drawing, electronics microscopes

5. micro machining technique known as "Electron lithography" is being used in the manufacture of field emission cathodes,

6. In Particularly use full for Machining of Materials of low thermal Conductivity and high melting point.

Electric discharge machining [EDM] Case study

Edm process used to shape hard metals and Conductive materials using electrical discharges. He

1. Aerospace Component manufacturing :.

Overview :.
EDM is Widely used in the aerospace Industry for mfg Complex precise Components from tough materials like titanium and nickel alloys.

Case Study :.
Aircraft turbine blade require intricate Cooling holes and Precise Profile. EDM allows mfg to achieve these feature without affecting the Material Structure integrity, ensuring high Performance and reliability in aircraft engines.

2. Medical implant Production :-

Overview :.
EDM is utilized in the medical field for Producing intricate and Custom shaped implants made from biocompatible materials such as Stainless Steel and titanium.

Cause study :

· Custom hip Joint implants. for Instance, require

Precise shaping to fit Individual Patient anatomy.

· EDM enable to mtg manufacture to create

Complex geometics accurately ensuring proper functionality

and patient Comfort.

3. Tool and die manufacturing :

Over view : EDM is essential in tool and die making

Industries where hard and Complex shape are needed for

molds, dies and Punch

Case study :-

Injection - molding die used in manufacturing

plastic Parts require higly precise Cavities and insert

EDM ability to cut intricate Shapes with micron level

accuracy ensures the model Produce Parts that meet strict

dimensional tolerence and Quality Standards

Laser beam machining [LBM] Case Study:-

It is a non conventional machining process that utilizes a highly focused laser beam to remove material from a workpiece. Here's a case study that demonstrate the application and benifits of Laser beam mlcing

Over View :-

Laser Cutting, a form of lbm is extensively used in the automotive industry for various manufacturing process. including Cutting, Welding & drilling.

Application :-

1. Sheet metal Fabrication :-

Laser Cutting letidely widely employed for Cutting intricate shapes and profiles from sheet metal which are than used in automotive bodies, chassis

Case Study Examples :-

A major automotive manufacture use laser cutting machines equipped with CO_2 or fiber laser to precisely cut sheetmetal parts for car bodies