

APPLICATION OF EDM :

This process is highly economical for machining of very hard material as tool wear is independent of hardness of workpiece material. It is very useful in tool manufacturing. It is also used for broach making, making holes with straight or curved axes, and for making complicated cavities which cannot be produced by conventional machining operations. EDM is widely used for die making as complex cavities are to be made in the die making. However, it is capable to do all operations that can be done by conventional machining.

Process Parameters

- Voltage
- Capacitance
- Spark gap
- Melting temperature of work

SURFACE FINISH AND MRR :

Surface finish tolerance of the order of ± 0.05 to 0.13 mm are commonly achieved, in normal production and with extra care, tolerance of ±0.003 to 0.013 mm are possible.

The material removal rate, MRR, in EDM is calculated by the following formula:

$$MRR = 40 I / Tm^{1.23} \text{ (cm}^3\text{/min)}$$

Where, *I* is the current amp,

Tm is the melting temperature of work piece

ELECTRODE / TOOL :

Tool is given negative polarity. It is made of electrically conducting material like brass, copper or tungsten. The tool material selected should be easy to machine, high wear resistant. Tool is made slightly under size for inside machining and over sized for cut side machining. Tool is designed and manufactured according to the geometry to be machined.

POWER AND CONTROL CIRCUITS :

Power Supply

A DC power supply is used, 50 V to 450 V is applied. Due to ionization of dielectric solution an electrical breakdown occurs. The electric discharge so caused directly impinges on the surface of workpiece. It takes only a few micro seconds to complete the cycle and remove the material. The circuit can be adjusted for auto off after pre-decided time interval.

Tool Feed Mechanism

In case of EDM, feeding the tool means controlling gap between work piece and the tool. This gap is maintained and controlled with the help of servo mechanism. To maintain a constant gap throughout the operation tool is moved towards the machining zone very slowly. The movement speed is towards the machining zone very slowly. The movement speed is maintained by the help of gear and rack and pinion arrangement. The servo system senses the change in gap due to metal removal and immediately corrects it by moving the tool accordingly. The spark gap normally varies from 0.005 mm to 0.50 mm.

TOOL WEAR :

Tool wear mainly depends on the tool material. Tool material may be copper, brass. tool wear is directly proportional to the current supply of the system.

DIELECTRIC :

During the EDM process the workpiece and the electrode are submerged in the dielectric oil, which is an electrical insulator that helps to control the arc discharge. The dielectric oil, that provides a means of flushing, is pumped through the arc gap. This removes suspended particles of workpiece material and electrode from the work cavity.

FLUSHING :

One of the most important factors in a successful EDM operation is the removal of the metal particles (chips) from the working gap. Flushing these particles out of the gap between the work piece to prevent them from forming bridges that cause short circuits.

WIRE CUT EDM :

This is a special type of electric discharge machining that uses a small diameter wire as a cutting tool on the work. Working principle of wire cut electric discharge machining is same as that of electric discharge machining.

Process Details Of WCEDM :

Process details of WCEDM are almost similar to EDM with slight difference. Its major difference of process details with EDM process details are described below.

Tool Details

The tool used in WCEDM process is a small diameter wire as the electrode to cut narrow kerf in the workpiece. During the process of cutting the wire is continuously advanced between a supply spool and wire collector. This continuous feeding of wire makes the machined geometry insensitive to distortion of tool due to its erosion. Material of wire can be brass, copper, tungsten or any other suitable material to make EDM tool. Normally, wire diameter ranges from 0.076 to 0.30 mm depending upon the width of kerf.

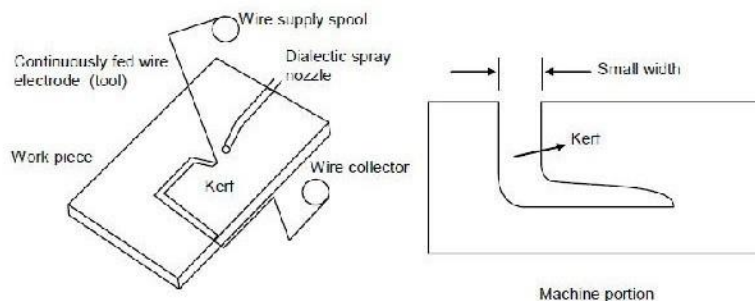


Fig : Wire cut EDM

Tool Feed Mechanism

Two type of movements are generally given to the total (wire). One is continuous feed from wire supply spool to wire collector. Other is movement of the whole wire feeding system, and wire along the kerf to be cut into the workpiece. Both movements are accomplished with ultra accuracy and pre-determined speed with the help of numerical control mechanism.

Dielectric Fluid and Spray Mechanism

Like EDM process dielectric fluid is continuously sprayed to the machining zone. This fluid is applied by nozzles directed at the tool work interface or workpiece is submerged in the dielectric fluid container. Rest of the process details in case of WCEDM process are same as that in case of EDM process.

APPLICATIONS :

WCEDM is similar to hand saw operation in applications with good precision. It is used to make narrow kerf with sharp corners. It does not impose any force to workpiece so used for very delicate and thin workpieces. It is considered ideal for making components for stamping dies. It is also used to make intricate shapes in punch, dies and other tools.