

EDM Machine – types & working principles

- Learn everything you ever needed to know about Electrical Discharge Machining (EDM), and the types of machines used for this unique manufacturing process.
- Read on if you'd like to understand more about a wire EDM machine, a Die Sinker or Ram EDM machine, and a hole drilling EDM machine.
- We'll also show you a list of some modern EDM machines available on the market today along with their key features.
- If you want to learn more about how EDM can be used for your applications, then you don't want to miss this article.

EDM stands for Electrical Discharge Machining. An EDM machine is the piece of equipment used to carry out this manufacturing process.

The principle behind EDM was first observed in 1770 by Joseph Priestley, who was experimenting with electrical discharges. He noticed that the sparks had eroded some of the electrode material.

Almost 200 years later in 1940's Soviet Russia, two scientists Butinzky and Lazarenko took things a step further towards a modern EDM machine by creating a machining process.

The EDM process

The theory behind EDM is simple. An electric spark is made between an electrode and the workpiece. As a spark creates intense heat, in the range of 8,000 to 12,000° C, it melts virtually any surface it comes into contact with.

In the machining process, the spark is controlled very carefully and is highly focused on a certain area making sure that only the surface of the desired material is affected.

EDM will not affect any heat treatment that has been applied to the material.

There are many different specialised types of EDM machine, but they generally fall into three separate categories:

- Wire EDM
- Die sinker or ram EDM
- Hole drilling EDM machines

In this guide we'll look at the workings of each one individually with some examples towards the end.



Wire EDM in process

Wire EDM machine

A wire EDM machine works in a similar way to a cheese cutter or a bandsaw cutting wood, although the wire moves rather than the workpiece. A metallic wire (usually brass or copper) has high voltage electrical discharges passed through it that allows it to cut through the entire thickness of the material. Cutting will either take place from the edge, or a hole will be drilled in the piece to pass the wire through if sections are to be cut out from the interior.

Wire EDM creates a spark in deionised water, in which conductivity is highly controlled. The deionised water cools the material and washes away the removed

particles. Clean dielectric fluid is continually pumped in to flush away debris.

The wire is adjustable and can be inclined to create a taper or to shape a different profile on the edges. The electrical discharges make lots of little craters in the material, and the electrode and workpiece never come into physical contact. Usually, a single cut will be passed right through a solid section, and a scrap piece will drop off when complete.

If accuracy and smoothness are important factors, it may be necessary to skim the rough edges. A skim cut involves passing the wire close to the roughed surface, this time with reduced power, removing as much as 0.002" of surface imperfections on each pass, similar to sanding wood with a very fine grade sandpaper.

Die sinker or ram EDM machine

This type of EDM machine is used to create cavities in a workpiece, which is useful in the manufacture of tools and dies, metal stamping dies, and various plastic moulds, for example.

To bore the cavity, an electrode made from conductive graphite is shaped to form the required cavity and is plunged or 'rammed' into the object. This creates complex, 3-D cavities, but is expensive to produce and perform as the electrode has to be carefully machined, electrode wear is hard to control, and there may be problems flushing out debris from the cut.

Hole drilling EDM machine

The simplest way to drill a hole with EDM is to traditionally drill a tiny pilot hole into the workpiece before use. An EDM wire is then threaded through and used to widen the hole to the required diameter.

If a pilot hole isn't possible, a different type of EDM machine that 'drills' holes, sometimes known as a 'hole popper' can be used. This has a rotating electrode which cuts into the material while flushing it continuously with dielectric.

The 'hole popper' machine is commonly used to make a small pilot hole allowing a wire EDM to be threaded which is used to expand the hole. The advantage of this method is that very precise holes can be made in tough materials. For instance, jet engine turbines have been drilled using this process.

Typical EDM machines

Here is a brief list of some of the various EDM machines that are commonly used in manufacturing facilities today:

CUT 2000S

This is a state of the art easy threading wire EDM that features an in-built measurement device and automatic tool changing. It reduces machining by up to 30% and creates very smooth finishes.

Makino's EDNC85 Ram EDM

This ram EDM machine is very durable and hardwearing, featuring a simple programming interface and highly accurate results, even for large objects. It also has adaptive controls and automated tool changing.

Sodick AP250L wire EDM

The Sodick AP250L is specially designed to eliminate backlash, meaning more precise movement. It also boasts high processing speeds.



Makino's EDNC85 Ram EDM

AU-1440iA Z800 Submerged Wire EDM

This model boasts automated wire threading without having to drain the dielectric. In other words, the workpiece can remain submerged at all times, even if the wire breaks. This is ideal for speeding up the cutting process when multiple pieces are being machined, and tool wear is likely to be high.