Production Wire EDM Techniques That Are Efficient & Cost Effective

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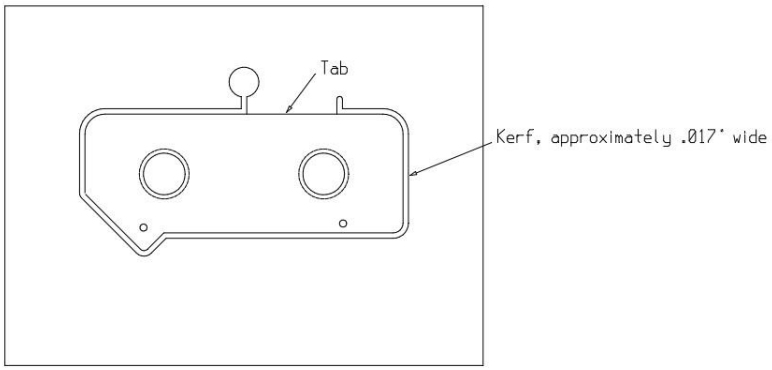
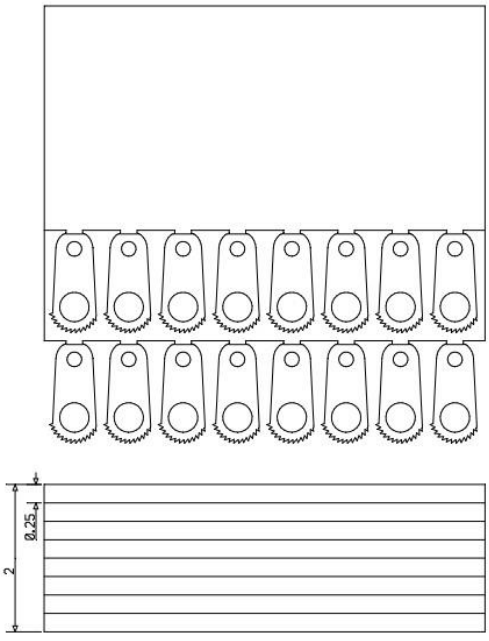
Wire EDM, once considered a non-traditional machining method, has been around for many years now and is utilized extensively in many industries. It is a unique process that is used to produce parts for numerous applications with remarkably high precision from most conductive materials. In today's world, tolerances keep getting tighter and tighter. For this reason, EDM is being used more often as it is one of the best methods for machining accurate parts. The wire electrical discharge machining (WEDM) process is, however, still considered slow by many. However, when making two or more parts, the use of production wire

EDM techniques are necessary to achieve an efficient and cost-effective result. Small parts are especially good candidates for the process.

The cutting speeds have not changed as much over the last 20 years or so as they did early on, so WEDM is not always considered the fastest method for producing parts. However, by combining this unique method of machining with some old techniques, a new approach to wire cutting customer orders with several parts can be fast and practical. It is necessary to understand the scope of a production job before it commences. Many companies use ISO guidelines to ensure that procedures are in place to guide a complete understanding of the project's requirements. There is usually a starting point when a customer places an order for some parts and the quoted details are confirmed. The final result, the finished part, is normally what most customers stress. But the start, is just as critical as the project end, resulting in precision finished parts. You must ensure that the destination is economically obtainable and that you are headed in the right direction together. Good communication and planning are necessary to achieve a quality outcome as is the proper blank-prep layout.



The term “internal skim” is used to rough-cut and then to hold while skimming production parts and to locate the soon-to-be finished part to existing details. Features such as tapped holes and blind pockets can be pre-machined before the WEDM step. The part is not cut-off but instead held within the blank material. More than one part can be wired when the parts are chained together in a row. Skimming greatly improves the accuracy and surface finish of the final part.



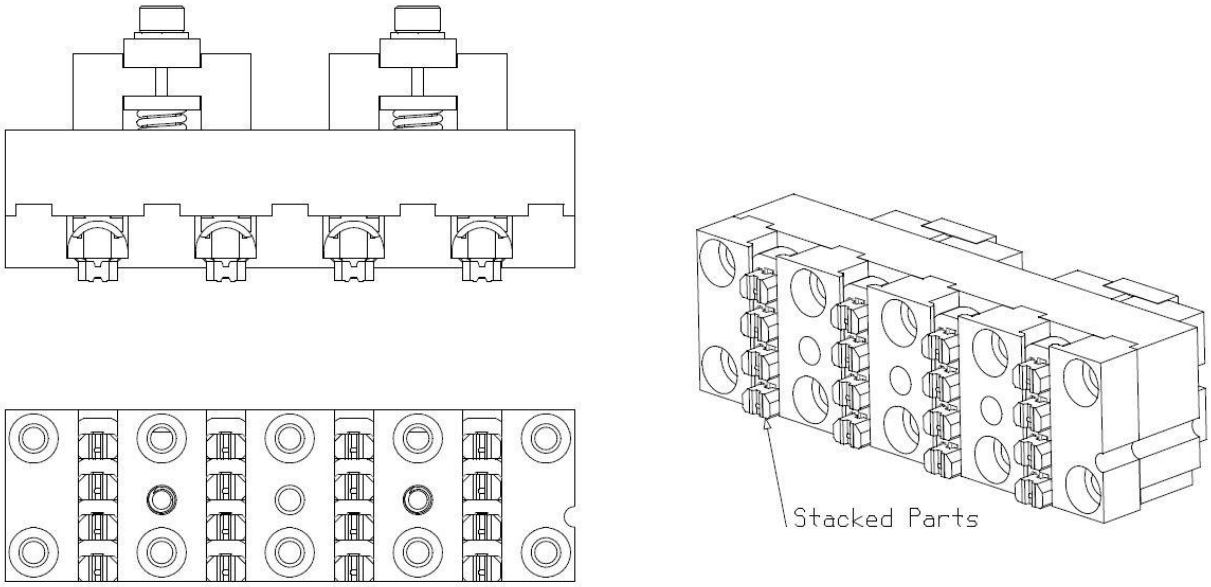
Additionally, stacking the parts in the blank material combined with chaining them together is in many cases the most efficient way of cutting. The scrap can also be cut away and the parts then skimmed. WEDM is many times most efficient when cutting 2 inches thick, although this depends on the wire diameter being used, among other factors.

Frequently these techniques are not possible because production jobs are made from individual blanks. For example, if we have an order to make 100 parts, we start with 100 blanks (usually supplied by the customer). We then cut away anything that does not look like the part and the result is the finished product. Every part requires time and this time multiplied by 100 starts to add up and makes the parts expensive in some cases. If possible, it is better to start with one piece of material. One block of raw material can be used to make hundreds of parts if the approach and techniques as stated above are applied correctly.

This internal skim approach can also be applied in multiple views. However, the use of high tolerance holding systems are now necessary. Better known as a fixture or vice, they need to be dependable. It allows us to wire a part in the machine and

then to remove it from the machine to inspect it. We can inspect it on a camera (or any piece of equipment known as a video inspection station) and then reload the part to within 0.000080” of the original location. Then, additional skim cuts can be made if necessary to hold tight tolerances. This tooling also enables us to make 90-degree rotations from the first wire operation and allows us to cut the parts again in a different plane (First in the X plane and second in the Y plane). Doing this two, or even three times (Z plane), can yield a finished three-dimensional part using the 2D wire cuts. The chaining method, or stacking of the parts, while cutting multiple views is when production EDM is the most economical.

Instead of using only manufactured vices or holding systems, you can machine your own fixtures. We prefer to use a wire cut holding fixture and wire individual “cartridges” to hold prepped parts that are ready for wire EDM. In some cases, we are just adding another detail to an already machined or metal injection molded component. The cartridge allows us to load the prepped parts on the bench while another cartridge is currently in the machine getting wired at the same time. The wire machines use auto-positioning to repeat start points. Therefore, at any time the operator can move the wire machine out of the way to check the finished parts and then resume machining when done with inspection at the touch of a button.



MIM Parts in a Fixture

Also, the cartridge can be placed on the visual inspection equipment and the inspection data can be recorded for numerous parts and saved as needed.

It is obvious that your QA department must be capable of documenting and recording the finished dimensions before doing any production EDM. WEDM is capable of fine detail and extremely tight tolerances. Your inspection equipment must be even more capable. The wire machines and inspection equipment must be

both calibrated and properly maintained when running production parts. You certainly do not want to mass produce non-conforming parts! There are process controls that should be monitored during the entire production run. QA procedures such as SPC are a huge help.

Most of the wire machines today are equipped with an ‘auto-threader.” This is especially useful during production runs to save time and keep the wire machine running when unattended. Auto-threading start holes that are very close in size to the finished diameter will eliminate the time it takes to remove the drops/slugs that have to be discarded. Also known as slugless burning, this technique is best for machining many small round holes or oval slotted cavities. The wire machine can be set to auto-thread and run with little or no down time during the machining process. When there are several blocks to be wire cut, and it can be completed with slugless burning, set up as many blocks as possible in the travel of the wire machine. A command file can be created with stored start locations and all of the blocks can be wired with no down time between each block.

Wire EDM is very cost effective when machining very thin materials. For example, 400 sheets of .005” thick SS shim can be stacked up to two inches in height. Then, with only one wire path, wire cut the desired profile and you will

produce the part 400 times over from that one stack of material. Also, chaining several small shapes together will allow the wire machine to run for many unattended hours and produce 400 parts from every stack. If there is a tight tolerance dimension, the outer drop material can be removed, and the critical dimensions skimmed to proper size without skim cutting the entire profile or perimeter.

Wire EDM does not produce large chips like conventional drilling or milling machines, so wire EDM should be used, or at least considered, when machining expensive materials or precious metals. There will be less waste, and the parts can be produced very close together. The scrap pieces are much more recyclable also. Never position the parts closer to each other than .025" because the current in the wire can in some cases arc or jump across to the part that is not being wire cut. The result will be a pitted or scorched surface called secondary EDM on the adjacent part. The dielectric flushing (DI water) is key to removing the EDM particulates, so a consistent flush is best to help eliminate any secondary EDM.

The term "production" usually suggests an assembly line of people or robots all in a row mass producing parts or assemblies. Production wire EDM is similar in a way that the parts are lined up in a row. Whether it is in a blank piece of material, cartridge, or fixture…the parts should be lined up (or stacked up) for the wire EDM process.

Using the techniques mentioned above, especially if combined, will help reduce machining time and save money. Production wire EDM is one of the most accurate and precise ways to make a part. It saves time and produces parts cost effectively if used properly. If you ever need to produce more than one part, think Production Wire EDM and use the technology to its full capabilities.

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