

The Smallest Part in the World

Smaller and Better

Micromolded parts continue to get smaller and smaller. They are also getting more precise with details nearly invisible. According to SPE:

“The smallest micro molded plastic part ever reported was a PET component weighing 0.00012 grams, which went into mass production in 1998 and was first reported in 2002 (molded by MTD Micromolding in Charlton, Mass., formerly Miniature Tool & Die). A POM micro bobbin weighing only 0.00015 grams was reported by Sodick Inc., Kanagawa, Japan, molded in 2005 on a TR10EH2 micromolding machine.”

From late 2010 to 2012, MTD Micro Molding successfully molded an EVA ophthalmic part that weighs in at 0.00000313 grams. It is an ophthalmic implant for glaucoma treatment. This feat required MTD’s Sarix technology to make a precise gate needed for such a tiny part. The gate measured .0018 x .0008 inches.

Even at 100X, the part is hardly visible.

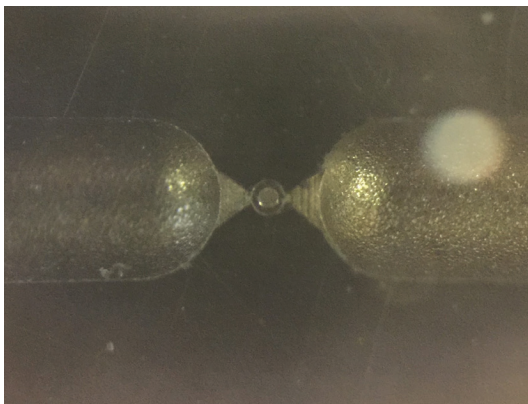


FIG. 1: The “smallest part in the world” (the donut-shaped part) under 100X magnification.

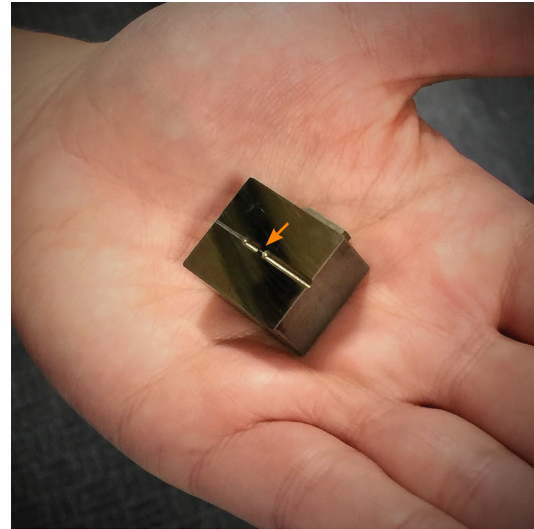


FIG. 2: When looking at the one-cavity mold, the small dot between the lines is the area that creates the part geometry.

Sarix Precision

Sarix milling equipment is well known for its high quality and precision, however, EDM (electrical discharge machining) is 10 times slower than traditional milling and Sarix is 100 times slower than that.

Why is that beneficial? Sarix allows micro-machinists to create fine details with very little electrode wear. While graphite electrodes can machine sharp corners with .001- to .0015-inch corner radii, Sarix has such minimal wear that corners can measure at 5 microns (.0002 inches), with a tolerance resolution of .000004 inches and glass-like surface finish (Ra 0.05).

Sarix micro EDM capability enables us to make edge features that were not possible before, with finishes that are mirror-smooth and perfectly detailed corners, edges and surfaces. This capability gives our customers more flexibility for making more innovative, complex product designs. We brought this capability in-house in June of 2009, making MTD the only mold-making manufacturer in North America with this technology.

How It Works

Sarix micro EDM technology combines conventional 3-axis CNC milling with micro technology. The machine works by rotating a spindle that is loaded with a customized 300mm long solid carbide electrode diameter, which is based upon the spindle collet size. For MTD, that diameter is 0.4mm. The machine is outfitted with a horizontal 0.2mm brass wire that is used for creating custom-sized and -shaped electrodes. With that brass wire you can take the 0.4mm diameter all the way down to 0.005mm and use it as the cutting tool.

The beauty of the machine is once the program is proven out, a workpiece can be set up and operated unattended. The algorithms that run in the background during operation constantly check the electrode for wear. Once worn too far, the machine signals to leave the workpiece to return to the brass wire to regenerate a new electrode. When completed, it goes back to the workpiece and picks up where it left off.

The most significant advantage of using the Sarix machine lies in the Micropulse power generator, which creates such fine arcs that result in essentially zero overcut. This means that if you are using a 0.05mm electrode, you will be able to achieve 0.025mm inside corner radii, which is nearly impossible with a conventional sinker EDM. It is like comparing a hunting knife to a scalpel. In many cases, polishing cores and cavities are no longer necessary due to the ultra-smooth finish that can be achieved with the machine's standard machining operations.



FIG. 3: Micromolding is impossible without an extremely precise tool. And molds with certain geometries are not possible without a Sarix 3D micro EDM milling machine.

Helping to Improve Life.