Designing Micro Parts with High Volume Production in Mind

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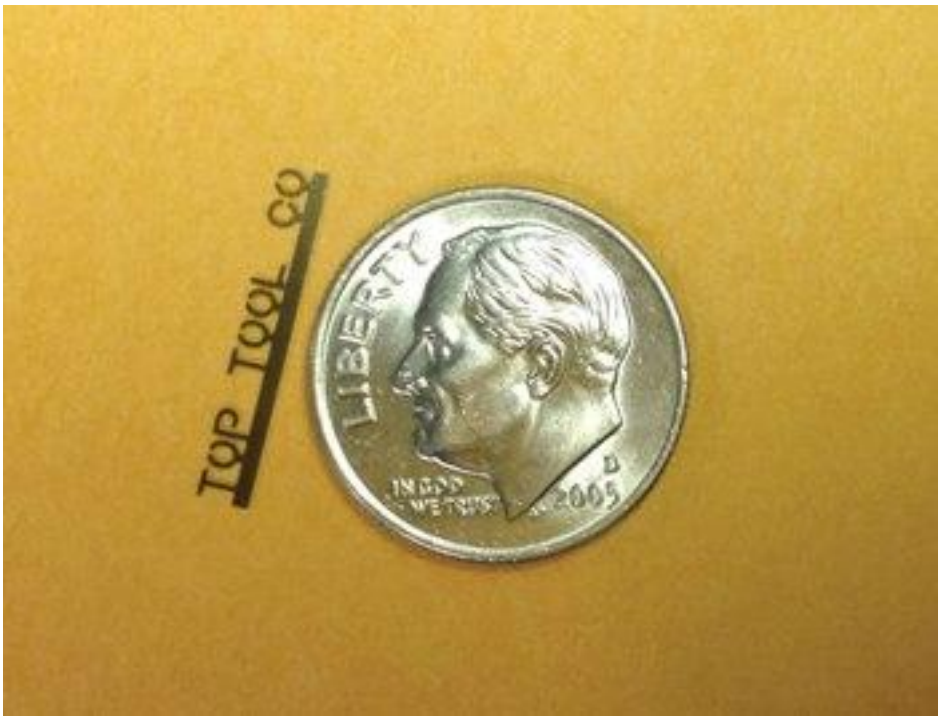
Most often, it seems medical device manufacturers are deciding between machining and molding for their component fabrication needs. However, there are alternatives that should be explored. Stamping offers an array of excellent advantages for designers who need micro parts made from metal materials.



An urgent need to start making parts can make a tactical, short-term approach seem like the answer. But a sprint to the CNC machine skips over the analysis, planning, and decision-making that create long-term, high-impact results. The initial design discussion should be about taking a strategic, big-picture approach that leverages the power in good data and selects the manufacturing approach that's best over the long run. Plan your work, work your plan.

Top Tool [1] regularly works with customers on challenges related to producing complex components that have—in the beginning—no clear (and realistic) manufacturing solution. It's true, right out of the gate, most designers start to think about machining components. As volume production lumes, projects are forced into a cost reduction mode, often including costly requalification of the product.

Why? CNC machining can compress the time frame from raw material to first finished part. But it can also give back that short-term result in the form of material waste and built-in variability that increase actual cost and put the project at long term financial risk—particularly in the case of micro parts with multiple features and ultra-tight tolerances. More complex parts require more machine time and more

material removal/waste.

Precision micro stamping by comparison is immediately more cost effective per part because it’s not a material removal process. Near net shape and scalable to be efficient at any volume, stamping is more sophisticated on validation. Taking risk out of the project, micro stamping has an inherently fixed outcome—raw material enters the die, the press cycles, and the shape of the completed part is the result, like coins at the mint.

In turn, as CNC cutting tools wear, they wear differently from one tool to the next. In a stamping process, the die itself is validated. Additionally, in-die optical sensing (smart tool), tied into electronic press controls, reports on, monitors, and manages production in real time. The tool measures features for up to several thousand parts per minute and relays the data without stopping production. Moreover, it does so before the press runs off out-of-tolerance parts.

Exciting new manufacturing possibilities exist for component miniaturization, involving unique-property specialty metals like Platinum, Niobium, and MP35N. The material is cut, stamped, and formed into complex-featured components, like critical implantable electrodes, continually shrinking pacemakers, and pain management neurostimulators.

One such emerging metal is Nitinol, due to its functionality, versatility, and durability. This material is already proven and appreciated, particularly in biocompatible medical device applications like stents. It is also indicated across a range of non-medical applications, from couplings and actuators to cell phone antennae. The key issue—at least from the perspectives of cost, productivity, and precision—is how best to manipulate the alloy. The typical machining applications are etching, wire EDM, and laser cutting. Now, metal stamping can confidently offer an option for capturing shape memory performance. It’s good news, given the combination of per-unit cost efficiency, precision, and productivity that today's micro stamping can uniquely provide.

Given the range of advantages stamping offers to medical device designers, they really should be certain to review this option for micro metal components. CNC machining certainly has its place for component fabrication, but design engineers need to remember that it’s not the only option when working with unique metals.

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