[Pittsfield, NH – July 2006] Barry Podmore enjoyed a laugh recently when he inquired about an equipment company's definition of micromachining: it was 1/4" diameter parts.

“In our world, quarter-inch diameters are considered huge," chuckles Barry Podmore, president and owner of Barry Podmore Inc., in Pittsfield, NH. “That's the largest size of raw material we use, never mind the parts. Some of our parts have a major diameter of 0.010”.

Barry Podmore has earned a reputation over the last 25 years as a company that can produce these small parts for the electronics, automotive, and aerospace industries. As the end products get smaller and more complex, the technology with which the company produces the parts has become more sophisticated and efficient.

“I started out in 1982 with three Escomatic cam machines. My background is designing and cutting cams for Escos, so it made sense to continue doing what I knew best when I struck out on my own,” says Podmore who came to America in 1976 from England with his wife and three small children.

While the shop in the front yard was a quick commute from the house, the company outgrew the space and in 2000 purchased and renovated a 17,000 sq. ft. facility in Pittsfield. The first things a visitor notices are Gail (Podmore) Glidden's smiling face and gleaming epoxy-coated floors, upon which are rows of dozens of cam and CNC Escomatics lined up like soldiers, and eight Tornos DECO CNC Swiss machines. All of the machines look brand new, even though some of them are decades old and have been very busy. This year alone, Podmore expects to produce almost 100,000,000 parts.

“There are very few companies that can do what we do,” says Barry. “Fortunately, we have the technology and bright people who can keep up with our customer's demands for more parts that are plus or minus perfect and delivered on time.”

In the electronics test and measurement market, Podmore makes plungers for spring-loaded pogo...
probes for testing electronic circuitry. In the test fixture these probes look like a bed of nails, but looking at these parts under a microscope they are intricate, some with holes, 3-sided chisel heads, 4-point crowns, 9-point serrations, etc., for a variety of shaped and sized circuits. There can be thousands of these tiny wear parts in one test fixture, depending on the size of the circuit board and/or how many boards are being tested at once.

“Micro machining is growing, not necessarily because we as a company want to do it, but because it’s what our customers demand,” says Podmore. “When we first started doing these, we produced plungers for what the industry refers to as hundred mil grid pattern, which is a hundred thousandths on centers, then we made parts for fifty mil, then twenty-five, and now ten. The grid pattern keeps getting closer and closer, so naturally the test probes have to follow suit. It’s like, honey, I shrunk the parts again.” Barry says as the probes are getting smaller they are also getting more complex. When he first began making them, the probes he made had fairly simple tip styles and the Escos accommodated them just fine. The simpler tips are still running on the Escos day and night. In fact one machine has run one part continuously for twelve years. All of Podmore’s machines, including the DECOs, run 24 hours with “lights out” from about 10:00 pm to 5:30 am.
“We won’t take a job if we can’t run it 24 hours,” says Barry.

Although Barry’s comfort level was with the cam Escos, he did leap to CNC Escos, with nudges by sons Wayne and Kerry, when he needed more flexibility for shorter runs, and recently added the top of the line Esco, the New Mach 649.

“About four years ago, it became clear we needed to go up several sophistication levels if we wanted to get the more complex work that was out there, and we purchased our first Tornos DECO 10 millimeter, 9-axis machine, and now we have eight. Our customers are pushing us to do additional work, so we may have to expand the building and get even more,” adds Barry.

The ability to perform polygon milling is one of the DECO features most remarked about by the three Podmore men. Polygon milling can be accomplished in both the main and subspindle on a Tornos. The part spindle and the live tool spindle synchronization are key for successful polygonning.

Elaborating on the operation sequence, Wayne takes a visitor step-by-step through a typical application.

The part isn’t necessarily the smallest part produced in the shop, but the beryllium copper test probe barrel has numerous features on it for its size, which is 0.084” long and 0.030” major diameter. The first operation is to spot and drill a 0.016” diameter hole on the front end of the part that goes to a depth of 0.060”. The critical tolerance on the ID, OD, and length is 0.0005”, which is common for Podmore. The DECOs even held a 15,000 part run to +/- 0.000080” recently.

The next operation is turning the first length down to 0.020”, and then put in a cross drill hole of 0.007”. Tooling is a considerable issue with micro machining. Podmore developed a 0.010” cross drill that can drill I.D.s virtually burr-free.

“I break more tools just handling them than the machine does. We have very little breakage on the machine,” says Wayne.

Next the remainder of the part is turned down to a 0.014” diameter and the pick off spindle cuts off the part from the bar and transfers the part to the top of the work area to expose the back end of the part for polygon milling the four-point crown, and the part is complete. Meanwhile the main spindle operations are underway on a new part. Cycle time per part is under 25 seconds.
“I can’t stress enough how important the synchronization is between the spindle and the live polygon attachment. To get the four points, the cutter has to rotate four times faster than the spindle, exactly, perfectly burr-free which they have to be, and the DECO does it every time,” says Wayne who also programs the DECOs with Tornos’ TB-DECO software. “The programming is different, but I think it’s different in a positive way. The way the software is laid out, I have better visualization of each operation than with conventional ISO programming and can readily see what each axis is doing. Bottom line is it helps to cut cycle time. It’s just one more tool that Tornos has developed to eliminate dead time and use that time for tool changes. It just makes sense to me and did from the first time I used it.”

Machining minute parts impacts the entire manufacturing process and even the company culture. It’s more than just having the right machines. The actual cutting tools are an important aspect for success. Podmore sometimes makes their own or uses a handful of resources. The polygon tools and the custom drills, for example, are made in Switzerland.

“We also have to do some work on the collets ourselves,” adds Kerry Podmore. “Any imperfection in the collet is going to create an imperfection on the part. If the collet has a miniscule ding or if concentricity is just 0.0005” off center, the part is scrap. If concentricity is off by 0.001” on a 0.25” part, you won’t even see it, but when you are talking about a 0.012” diameter part it’s a big percentage.”

Other differences with micro parts are the options to accomplish post-processing tasks such as cleaning, heat-treating, finishing, and inspection. Podmore has found that conventional methods simply aren’t appropriate for parts that when viewed with the naked eye look like tiny shards of swarf. The company uses ultrasonic cleaners, chemical etching when a special edge or finish is required, and microscopes, laser micrometers, and video inspection for random batch inspection.

“Perhaps most importantly, along with all of the technology, you must have the skilled people attuned to the mindset of making these small parts,” says Barry. “It’s not for everyone and it takes more than a few months of training. It’s engrained in our culture. It’s who we are. And we’re grateful for the smart suppliers, such as Tornos and Esco, who understand what we are trying to do and have helped us be successful at it.”