



*Polynetics' acting president Robert Pernice programs his new DMU 60 monoBLOCK 5-axis machining center. The machine has a work area of 28.7" x 22" x 22" With it's 18,000 rpm spindle the machine delivers rapids up to 2,000 ipm and cutting speeds up to the rapids rate. The controller is a Heidenhain system that Pernice programs with Open Mind Hypermill software.*

## Business in Balance

***How a Job Found a Successful Niche by  
Combining Machining and Balancing.***

*Story and photos by  
C. H. Bush, editor*

Corona, CA's Polynetics, a dba for Duonetics, Inc., was founded in 1963 by Charles Pernice to perform precision dynamic balancing of rotating components. Today the company offers up a unique combination of job shop machining and precision balancing for companies in the aerospace, commercial and the cryogenics industries.

"Dad moved to California from New York back then and was a sales representative for a company working in the balancing field," says Robert Pernice, Charles' son and acting president of the company. "He saw a need for a company offering balancing services to the aerospace industry and realized it gave him an opportunity to form his own business in a unique niche. He took the opportunity, and we've been at it every since."

Pernice joined his father when he was ten years old, sweeping the floors, and over the years has seen the size and shape of the business change considerably.

"I love this business," he says. "There's always something new coming our way. Our primary customers over the early years were in aerospace, but we also branched into commercial industrial stuff. We've done everything from automotive parts to the cryogenics industry, and everything in between. Cryogenics is a major part of our business now, but we still do a fair share of aerospace and other things. We've stayed alive through diversity, by being willing to do whatever it takes to keep the business going."

At one point during the recession that hit in the late 80s, early 90s, Pernice turned to his passion for jet skis to prop up

***Polynetics founder Charles Pernice, left, and acting company president Robert Pernice discuss a balancing project. In the background is the company's Hoffman HL19.1 horizontal balancer.***

sagging sales.

"Recreational use of jet skis was a big thing in the mid to late 80s," he says. "At the time, I had a personal passion for riding and racing them, and I had lots of friends with the same passion. So, when business got tough, we started making parts for racing applications in jet skis, which was a growing business, but still in its early stages. That passion kept us alive."

Pernice says that most his ideas for parts came from requests from his friends.

"They would come to me and say, 'Hey, Bob, this is broken. Can you fix it?' I'd say, 'Well, let's not fix it, let's make something better.' One thing led to another until we developed a small line of products for the aftermarket jet ski industry. We eventually had a line of flywheels for the engine, flame arrestors, small billet accessories, carburetor parts, linkage parts, parts for the pump, performance boosting products. With my knowledge of the industry and my dad's help, as a consequence of developing some of those parts, I was granted a U.S. patent for cleverly using some new kinds of magnetic materials and iron magnets. Anyway, the point is, diversity helped us pull ourselves out of a bad time. The industry stayed strong until about five years ago."

## **Cryogenics**

With other markets now phasing out, Polynetics' expertise in producing highly precise, balanced rotating objects has moved to the forefront of his Pernice's business.

"The cryogenics industry is now our main customer base," Pernice says. "The industry is really about very cold liquids and the pumping apparatus for them. Many of their pumps run at minus 150°F to minus 200°F. Cryogenics are closely tied to the energy sector, pumping liquified natural gas, and they're used in advanced oil retrieval processes. It's a pretty broad-based industry."

Because of the super cold liquids pumped by the industry, Pernice says the tolerances required are very strict.

"You're talking incredibly close tolerances," he says. "Routinely they run from plus or minus .001" down to plus or minus just a few tenths. Many of the parts we produce are a little bit larger and the tolerances aren't so tight, but we also produce smaller precision parts, too."

Polynetics produces a wide variety of parts, including centrifugal impellers, inducers, multi-blade inducers.

"We make things that look a lot like turbo charger wheels," Pernice explains. "They're called shrouded impellers that are an enclosed pump impeller. They have tops and a bottom on them. A customer will send us an aluminum casting for an impeller, and we'll turn the outside-inside diameters, precision bores, tapered bores, and we'll do labyrinth grooves, seal diameters that are used for precision sealing, that kind of thing. The concentricities and the tolerances are very tight."

***Close up of a part ready to go in Polynetics' new Deckel Maho DMU 60 monoBlock 5-axis machining center.***

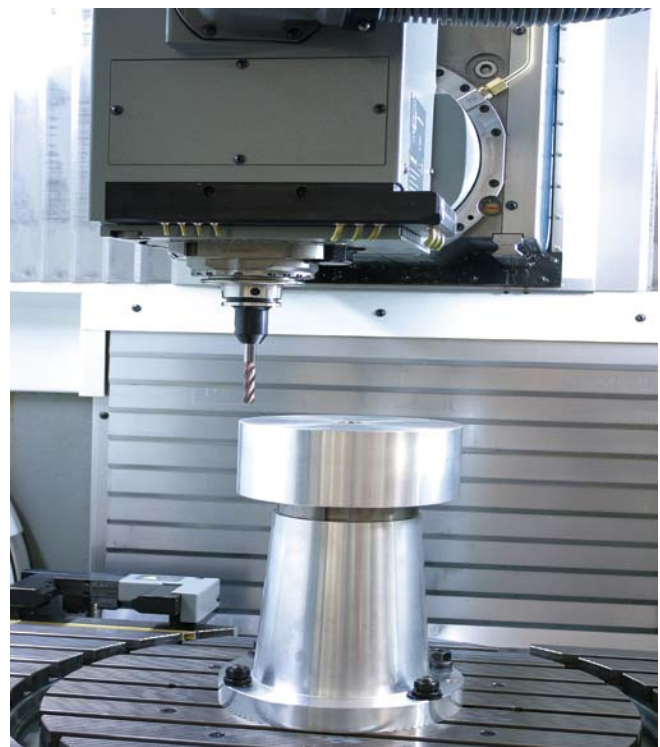


## **New Demands**

Polynetics owns its own 11,000-sq-ft building and leases out 4,000 sq ft of it. In the remaining 7,000 sq ft the company operates a solid line up of precision equipment, including 3 and 4-axis mills, precision turning centers, honing equipment, and 5 Hoffman balancers with capacities ranging from a few ounces to 1500 lbs. The balancers produce about 30% of the company's revenues.

"But even with all our equipment, it wasn't enough," Pernice says. "Some of our cryogenic customers have been asking for very complex machining, and I was having to turn it down. However, I knew I could capture a lot of that work, if I had 5-axis capability. So, I recently bit the bullet and bought a new Deckel Maho DMU 60 monoBlock 5-axis milling mill. It was a big move for us, but we've already booked a fair amount of work for it and prospects are good for more, especially once we let our customers know we have it. We bought the machine because we wanted to expand our capabilities, and it has. It's been on the floor only two months, but it has already opened new horizons for us."

Pernice said he chose the DMU 60, partly because of the



**Polynetics shop foreman Jeremy Drew sets up a YamaSeiki 4-axis vertical machining center.**

Deckel Maho reputation, but mainly because of its features.

“The machine comes standard with a 12,000-rpm spindle, but we chose the 18,000-rpm option,” he says. “It has a built-in self-calibration system called 3D Quickset. It utilizes an on-machine Renishaw probing system. Also, the machine has thermal compensation. But one of the main advantages of the system is what they call the monoBlock. That means that it’s extremely rigid. It’s built with one continuous body, not bolted together from different castings. Plus, the self-calibration assures us we can keep the machine running at its highest precision. It comes with a chip conveyor and a 24-tool magazine. This machine does exactly what we need at the moment. It’s great.”

### **Super Fast Cutting**

The DMU 60 delivers rapids up to 2,000 ipm and cutting speed up to its maximum rapids.

“Our machine is equipped with a really fast Heidenhain controller, so we made the investment in a software package called Open Mind Hypermill to go with it,” he says. “Open Mind is a German company that worked directly with Heidenhain, also a German company, to develop a 5-axis software system to be able to handle this machine’s capabilities and speed. The cycle times on some of the parts we make can run as high as 15 hours, but with the DMU 60 we’ll cut that down to 8 hours. It almost boggles the mind to think what we’ll be able to do with this system, once we conquer all its technology.”

Pernice says that one of his customers threw him a problem recently that he had to turn to DMG and Open Mind to help him solve.

“We had a job that had been on the floor for several months,” he says. “It wasn’t a rush job for the customer, but then suddenly they got a spare parts order that had to ship fast. So, they came to me on a Thursday and said they had to have delivery, including anodizing, of one very complex part by the following Friday. The DMU 60 was the only machine I had that could do the job.”

The only problem for Pernice was he didn’t yet know how to program such a complex part.



“I called a couple of programmers, but they said the part would take 60 hours to program,” he says. “I called DMG for help. I called Open Mind and their guy said it would take 5 hours. Both DMG and Open Mind sent their people in to bail me out of a hole. That’s what I call service.”

### **The Future Looks Good**

Now that he has made the big move to 5-axis machining, how does Pernice see the future for his company?

“Well, we have a really nice niche with our combination of balancing and machining,” he says. “And now that we have the DMU 60, I predict our company will grow rapidly from here on in. I have work booked already, and once I let our customers know of our new capability, I expect all the work we can handle. My long-term goal is to grow, and this machine is our first big step to getting there.” ■



**Typical part produced for the cryogenics industry by Polynetics.**