



Elisio Salgado, front, loads parts into PMD's new Kiramura Supercell, while lapping machine operator, Maria Serna, passes through.

Goal: One-Part EOQ

*What's a Reasonable Economic Order Quantity?
With This Southern California Shop's Kiramura
Mycenter Supercell 400. . . It's One.*

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

Since the notion of economic order quantity (EOQ) was first developed into a complex mathematical formula in 1913 by a man named F. W. Harris, people have spent a lot of time and money trying to find ways to make that number as small as possible. EOQ is defined as “a level of inventory that minimizes total inventory-holding and ordering costs.” The concept of just-in-time manufacturing is one of many different ways developed to help reduce or eliminate the need for costly inventories.

“In my early days as an industrial engineer, doing time studies and organizing the shop for a Boeing hydraulics division, the theoretical goal of achieving an EOQ of one part, was always thought to be a fairy tale,” says Steve Scardenzan, president of Gardena, CA's PMD, Inc, a machining job shop. “An EOQ of one was nothing more than idle speculation. Today, though, with the equipment we have in our shop, it's not just a dream, it's reality.”

PMD was founded in 1964 by Scardenzan's father, a Swiss-trained tool and die maker. The company name (originally Pedavena Mold and Die Company) came from Pedavena, the Alpine village where his father grew up. The company was incorporated California in 1971.

“My father is a highly-skilled manual machinist who has always achieved precision through knowledge, care and a refusal to accept mediocrity,” he says. “If anyone had asked Pops back then to produce the kind of complex parts we make nowadays, and deliver them overnight, he would have laughed at them. Now we takes such things for granted.”

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Steve Scardenzan (left) and quality control manager, Scott Thompson, discuss surface finish requirements for a part produced on the company Mycenter Supercell-400. In the background is a Mitutoyo automated CMM.

Making Changes

Most older companies need some kind of catalyst to kick them out of their old ways. For PMD, that catalyst turned out to be Scardenzan himself, who joined his father in 1987.

“After finishing Loyola University with a degree in marine biology, I joined the Boeing hydraulics division in the purchasing department,” he says. “Then they shifted me to industrial engineering, and, after six months, made me department manager, eventually having fifty people working for me. It was a great experience for a young man, because I learned production and document control, MRP, good shop organization, so many things that have been useful at PMD. After three years, Boeing sold the division, but I didn’t want to transfer to Seattle, so I came to PMD and made a deal with Pops.”

Scardenzan told his dad things had to change. It was time to shift over to CNC equipment.

“The change was not a hard sell,” he says, “because he realized that I couldn’t do much with the manual equipment. Also, it was getting harder and harder to find skilled machinists who met his standards. CNC was the only way to grow.”

Like so many other shops, PMD’s first machines were Fadal’s.

“Back then Pops wanted American-made machines,” Scardenzan says. “At the time there were only big expensive American machines like Cincinnati Milacrons and Giddings and Lewis and things like that. But they didn’t fit into our business model. On the other hand, there was a local manufacturer was just starting out, called Fadal Engineering. So we went to them and struck a handshake deal for a Fadal 4020.”

Scardenzan also bought an early CAD/CAM package.

Business Transition

“One of our customers was excited about our CAD/CAM capabilities,” he recalls, “and they got us involved in making the molds for plastic interior and overhead panels on the Boeing 767 when it first came out. We were still in the mold making business, and that was a good contract. I think we made 30 different molds for them.”

Some of Scardenzan’s Boeing friends moved to Hughes, so he used his contacts with them to further kick start the company’s growth.

“We managed to get a few machine parts from Hughes,” he says, “and then, slowly, but surely, the machined parts overtook the mold making part of our business. We continued to make molds up until a couple of years ago. Now our business is all job-shop machining.”

Currently PMD has 20 employees offering services in 4-and-5-axis, high-speed milling, CNC turning, tool making, wire EDM, precision lapping, polishing and assembly.

“Once we became primarily a job-shop, I moved into what I knew well, and that was hydraulic parts,” he says. “Now we



mostly specialize in making manifolds, bodies and housings out of stainless steel, titanium and aluminum for the commercial and aircraft hydraulics industry.”

Fifteen years back, one of PMD’s customers was a commercial hydraulic controls house, making valves for a number of different applications.

“They gave us an opportunity to get our foot in the door making rotors, which were flat and had to have lapped mirror finishes on them,” he says. “Sizes of the rotors range from a quarter of an inch up to five or six inches in diameter. Some are very complex. Some of them are made out of steel and are heat treated. Some go into oil field applications, others go into trucks, and some go into the jaws of life. We started making the rotors fifteen years ago, and we’ve been doing them ever since.”

Getting the lapping he needed done on time with the quality he wanted was a problem, Scardenzan reports.

“I solved that by buying and rebuilding a couple of lapping machines,” he says. “I also modified the tables on them to give us an edge up on the competition. A lot of people have tried for years to duplicate what we do, but so far, they’ve had no luck.”



CNC operator Elisio Salgado loads a pallet at the Supercell load station

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CNC operator, Mario Rivera, loads a part onto a Mycenter HX500i pallet.

Forging Ahead

Two special skills have helped PMD push ahead and stay alive and well, even during the current downturn.

“One thing is our ability to design and build tooling to hold complex shapes like forgings,” he says. “That know-how came from my father. Another is our ability to produce very precise, complex parts. I made the decision years ago to separate myself from my competition by seeking out more complicated and intricate parts, jobs less likely to be outsourced overseas.”

To play in his chosen market, Scardenzan had to upgrade his equipment.

“We finally bought a more expensive Japanese mill,” he says, “and that opened my eyes. Then we bought a Mitsubishi wire EDM. We realized the advantage of the reliability and precision of Japanese equipment. Finally, I understood the need for even even more capability. So, in 2005 I invested in a 50-taper, dual-pallet 4-axis Kitamura Mycenter HX500i with a 200-tool magazine and a geared head that runs 12,000 rpm. The geared head gives us high speed for machining aluminum, and high torque at the lower end for machining titanium, stainless and other steels. We mounted a rotary table on one pallet, which gave us the 5-axis capability. The other we left as a 4-axis.”

The Mycenter is equipped with glass scales on all axes, which makes it extremely precise.

“That machine is so accurate, so precise,” he says, “that whenever our CMM rejects a part from it, we clean the part, clean the probe and reinspect it before we ever do anything to

the machine. That’s because nine times out of ten it’s a bad reading on the CMM, and not the machine. It’s unbelievably precise. It holds a true position within a thou, plus or minus a few tenths.”

EOQ: One Part

Realizing what he could do with the Kitamura Mycenter HX500i, Scardenzan decided he needed even more production power.

“I wanted more flexibility,” he says, “the ability to machine multiple surfaces in one or two setups instead of four or five. Frankly, I was beginning to believe the illusive EOQ of one part might just be possible. So nine months ago I bought a 20-pallet Kitamura Mycenter Supercell-400 with a 360° rotary table combined with a 110° trunnion table. With its 200-tool magazine, it allows us to machine a wide variety of parts, from a single part up to high-volume, very complex parts. The controller gives us total flexibility in the way we schedule the part runs. The machine totally amazed me.”

With the new Kitamura, Scardenzan believes he now has the ability to price and deliver high quality parts to his customers in economic order quantities of one.

“We give our operator a daily schedule that tells him what we want him to run,” he says. “It was a challenge to transition from batch processing to an economical order quantity of one, but we’ve done it. All my life it’s been batches, the bigger the better to absorb the setup time. But now with this pallet-change machine with a 200-tool magazine an EOQ of one is not only possible, it’s profitable. I love it.” ■