

The Intelligent Approach Behind Intelligent Machining

There's machining intelligence, which means picking the right equipment with the right capabilities to accomplish your production tasks. Then there's intelligent machining, which means combining your people, experience, and equipment options to add flexibility and efficiency to the process.

That's how Advanced Machining Techniques, a contract manufacturer based in Morgan Hill, CA, lives up to its name. With help from his father and wife, company president Frank Dutra started Advanced Machining Techniques in 1986, "with the kids' playpen in the office at one point," he says. Now with 41 employees, Dutra's track record is one of "nice, controlled growth, very manageable. I have a great operations manager and an excellent group of people here. It's easy to be successful with good people around you."

Dutra also credits his shop's equipment, including a six-axis Super Quick Turn (SQT) 18MSY Multi-Tasking turning center, a V-414 Vertical Machining Center with pallet changer, and an FH-480 Horizontal Machining Center with 4th axis and pallet changer—all from Mazak (Florence, KY)—as instrumental in his company's success. Advanced Machining Techniques supplies parts to aviation hardware, medical equipment, automotive aftermarket and high-technology defense customers.

It All Comes Down to Throughput

Dutra bought his first Mazak machine in 1990, the first vertical machining center with a pallet changer. At the time, pallets incorporated into vertical machining centers were not very popular, but Dutra recognized their value early on, "and practically everything I've bought since has a pallet on it," he says. "Our customers want to pay us for the time the tool is engaged with the material; they don't pay us to load a vise. That's the bottom line. What the pallets allow us to

do is load and unload the machine while the spindle is turning. We continue to charge for the time the tool is engaged with the material, and our throughput is enhanced. It all comes down to throughput.”

On turning work, Dutra also emphasizes throughput but through the additional axis on the Mazak SQT-18 MSY. “When you consider buying a machine like that, my concept is to try and obtain a machine with a feature the other guy doesn’t have, and at that time it was the Y axis.” Such additional multitasking capacity under CNC control allows a shop to turn and mill parts in a single setup. “There was an educated buyer at a big company who called Mazak looking for shops with turning centers that had the Y-axis stroke,” Dutra relates. “There were only two of us at the time, and the other guy was a bit larger than us. The customer visited them first, but saw they weren’t programming the equipment to take full advantage of the Y axis. We could show them that we were, and we’ve made more than 10,000 parts for them since. We tell all our customers that our SQT multi-tasking machine lets us perform operations on all sides and the back of any lathe part in a single setup. The machine has live tools and a second spindle, so we can eliminate all secondary operations on their parts.”

Multitasking capability is a major contributor to emphasizing throughput in Dutra’s eyes. “We want to get the part off as complete as possible, deburred and everything,” he says. “Arguments exist about having the machine do the machining and an employee do the deburring, but we’ve found that to be counterproductive. If you have parts that come off the machine with burrs on them, you have to add a separate deburring operation at a separate workstation. What we want to do is machine the part and get it out the door at the last minute. That keeps inventory down, so you’re running only what you need. We want to build as close to the due date as practically possible.”

Setting up the Mazak equipment is an efficient process, helping Dutra’s employees get to the work faster. “When I was a machinist, the thing I hated most was loading all the tools in a machining center’s tool magazine, then manually setting the offset, usually by bringing the tool

down to a piece of paper on top of the part. I hated it. It's very time-consuming, and any shop that manually presets its tools has a story about typing in the wrong offset number and having a Z-axis crash as a result. Mazak has a tool-setting probe on the machine, a proprietary arm that automatically registers the tool data in the CNC program when the tool tip touches the probe. It does all this for you, and when it's done, it's right. We have very few crashes here, which I attribute to that arm."

Ease of Programming

Programming CNC (computer-numerical control) multi-tasking equipment that does turning and milling can be intimidating, but Dutra's shop-floor operators find many advantages in the Mazak Mazatrol interactive programming system with graphic simulations. "What my guys really like is the 3-D modeling right at the control," Dutra explains. "After they program a routine, they can run a 3-D model right on the Mazatrol screen, and if a red line appears that means the tool is rubbing. They can test out the program without having to cut any bad parts."

Because the Mazak control is PC-integrated, machine users have the ability to load CAD models and programs that interface with the machine controls. Mazatrol itself has subroutines that make tool selection less complicated. "As our guy is programming a part and has a part with a tapped hole, the control automatically selects what size spot drill, drill, and tap he needs. It's all right there." And since Mazatrol uses conversational programming, storing or printing a program is much easier. "If you take a complicated part and print out the program, G-codes could mean 10 feet of paper," Dutra notes. "The Mazatrol printout would be a page and a half."

Bringing it All Together

Combining the ability to load and unload equipment while it is working, the opportunity to perform multiple operations in the same setup, and program everything efficiently not only means Dutra can manufacture efficiently, he can often set up multiple jobs. "When we first got the machining centers with pallet changers, we saw ourselves loading and unloading parts on one pallet while the other pallet was running the same exact job in the machine. When we

began looking at and obtaining bigger equipment, we started loading multiple jobs. Bigger parts or a larger number of small parts means it can take two or three hours to inspect them afterward. We don't want the machine to sit idle, so we set up two or more jobs on the pallets. If complicated parts on one pallet need to be inspected, we run the other job, and the machine never sits. It runs fast and can be programmed fast, and we like that. There are never less than two jobs running."

Setting up and running multiple jobs means the purchasing, production control, and material handling at Advanced Machining Techniques has to be as advanced and progressive as its production equipment. "Good people and good equipment is not an either-or thing," Dutra says. "You can have the best people in the world and give them garbage equipment, and you get garbage parts. Good people with good equipment, such as the Mazaks we have, is what you want."

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Photo Caption 1: *At Left:* Frank Dutra, President, Advanced Machining Techniques (Morgan Hill, CA). *At Right:* Pallet-changing capability means parts can be loaded or unloaded while the machine is running. Flexible and efficient PC-integrated programming also means multiple jobs can run on the same pallet.



Photo Caption 2: Advanced Machining Techniques provides part for medical, high-tech, and defense-industry customers, requiring close tolerances and demanding finishes. High-tech production equipment helps eliminate secondary operations.

