Application Story: Micropulse, Inc.

Mill, Grind, Belt and Polish...all on one machine

Opens new markets for Indiana shop

Never rest, never stand still. It's an attitude one job shop in the "orthopaedic capital of the world" has applied since its inception in 1988. Micropulse, Inc. of Columbia City is located near Warsaw, Indiana, home to many major suppliers of orthopaedic implants, instruments and related high-precision medical apparatus. A number of these firms and others nationwide partner with Micropulse, as the company has built a reputation for quality, design assistance, manufacturing innovation and reliable delivery. President and founder Brian Emerick explains.

"Like so many companies, we began in my garage as a tool and die shop, then built our first building in 1990. We were utilizing EDM (electrical discharge machining) primarily, which is where our company name derived. Micropulse was involved in the orthopaedic industry from the outset, though we had some automotive and other business. Shortly thereafter, we became 100% focused in medical and have remained so, to this day. Our customers are located throughout the U.S. and we think that's happened precisely because we never stand still. We're always exploring new ways to improve our company, whether it's through technology, business communications or, our most vital asset, people." Micropulse currently run three shifts, with 120 people employed at its 60,000 sq. ft. facility. More expansion is planned for the near future.

Technology developments at Micropulse have followed the same business model as other aspects of this dynamic company. In the medical market, several factors present unique challenges for the shops who supply its machined metal parts. Material composition of the parts is the first challenge, as titanium, stainless, cobalt chromium, zirconium and now Nitinol, a nickel-titanium derivative that possesses what's called shaped memory and behaves in a manner similar to human muscles. The R&D and prototyping process for medical parts, especially implants and surgical instruments, is among the most rigorous of any industry's in the world. Plus, when the quantities produced are often very low, the extreme challenge for the job shop is profitability. This last factor is by far the most daunting, as even the top quality shops wrestle with the cost issue. Strategies utilized to overcome this challenge are many, but Micropulse has concentrated on two, namely, the introduction of more automation into their process and the acquisition of more sophisticated machine tools, capable of performing multiple functions.

On the automation front, Emerick notes with pride that Micropulse has designed, engineered and built a number of dedicated automation devices such as auto-advance tooling for the electrodes on their sinker EDMs, still the primary machine tools used at this company. Sales engineer Randy Sible notes, "We need to cost justify at every turn, as our customers demand it for their own price competitiveness in the market. Just making a great part and delivering it on time isn't enough. The advancements we've made in the automation area have substantially reduced our time-to-part and our own cost structures, while maintaining the highest quality in the industry."

One of those more sophisticated machine tools had caught Brian Emerick's attention at a trade show, awhile back, and it continued to come to mind, as the process improvement challenge unfolded at Micropulse. "We'd been exploring new market areas where our current machine tool mix was not able to get us the

Above Left: The Schütte WU 305 Linear universal CNC cutter grinder performs milling, grinding, belt sanding and polishing all in one operation. Its purchase opened the door for Micropulse to get more business in the knee joint, hip broach and other medical product market sectors.

Above Right: The five axes of motion on the Schütte machine are controlled by a Siemens SINUMERIK 840D CNC, as well as a Siemens drive package on each axis.

Below: The pendulum slide with CNC rotary axis provides precise radial and axial clearance angle cuts, especially needed on asymmetrical tools.

Left: Operator Kim LeFevre runs the Schütte cutter grinder at Micropulse, a Columbia City, IN job shop serving medical implant, instrument and related component manufacturers nationwide.

business at competitive and profitable price levels. I'd seen a machine at IMTS (International Manufacturing Technology Show) that combined milling, grinding, belt sanding and polishing altogether on one pendulum slide with CNC rotary axis. The machine wasn't simply a glorified tool changer, because it had true five-axis capability and was touted for form tool production, where both axial and radial clearance angles were critical. We were performing all these functions on our parts, but mostly on individual machine tools, too slow and costly, when the part complexity reached certain levels, on a product such as a knee joint or hip broach." In this context, a "broach" is a precision, textured surface surgical tool used to prepare a hip joint for an implant procedure.

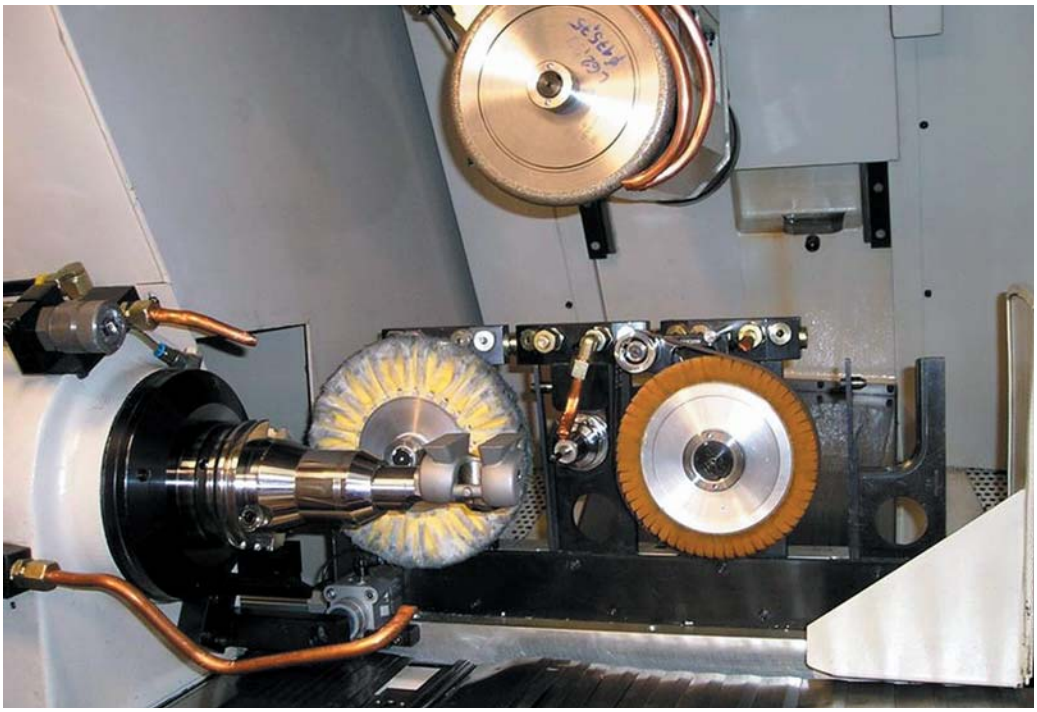
Emerick noted the machine tool, a Schütte WU 305 Linear universal tool and cutter grinder, was costly, but had the ideal rigidity, precision, small footprint, coolant filtration system and sophisticated CNC they needed at Micropulse. The CNC, a Siemens SINUMERIK 840D, offered the flexibility and open architecture to allow all the different functions of the machine to be performed, plus handle the various proprietary part design and machining programs used by Micropulse and its customers. Also, the unique filtration system was capable of handling the milling chips, grinding dust, sandpaper grit and polishing rouge generated by the various machining operations performed, a critical concern in terms of machine uptime and maintenance issues. Furthermore, while a ball-screw version of the machine had been on the market for several years, this version of the Schütte cutter grinder has Siemens linear motors on all five axes, providing a deal-making difference for Micropulse, as both Emerick and Sible mused.

"We talked among ourselves and with our key people, plus we talked to other shops running the machine. Like the proverbial light bulb, Randy and I realized this machine would allow us to enter that knee joint, hip broach and other end product market areas where we'd not been competing," Emerick notes. Within the first year after installation, the Schütte cutter grinder has already helped achieve substantial business gains for Micropulse, from old and new customers alike. The training on the machine was provided by Schütte at its factory in Cologne, Germany, as well as its American subsidiary, Schütte TGM in Jackson, Michigan, a facility managed by company director, Dave Brigham. Dave observes, "With the five-position wheel changer and five-axis pendulum slide, this machine can produce the sophisticated surface profiling Micropulse needs in one operation. The set-up time savings alone versus going from machine to machine are incredible. It's as if this machine was built for applications such as the knee joints, hip broaches and other products Micropulse and similar companies in the medical market want to make." Commenting on the control, he adds, "The CNC Siemens supplies us is the only control capable of processing the software for the cylindrical grinding on our cutter grinder, plus their drive system allows us to achieve this feature and the others, all on the same machine." The Schütte cutter grinder is applicable to the regrind or manufacture of any cutting tool, from simple drills and end mills to complex step drills

and profile tools. In the medical industry specifically, the machine is currently producing knee/hip/shoulder components plus reamers, rasps, broaches and other medical cutting instruments. Schütte machines are also used throughout the automotive and gearcutting industries, states Brigham.

A typical job run by Micropulse on this machine, according to Randy Sible, might involve a Pro-E, Mastercam, Unigrafix or SolidWorks program. Usually, a working model is supplied by the customer, which is then analyzed by the production engineering team at Micropulse. Changes might be recommended, based on the machinability of the material, the particular configuration of the part or the process flow aspects of the job. Because of the SIGS (Schütte Integrated Grinding Software) program onboard the machine, which utilizes CGTech's Vericut machine optimization and part verification, the program is modeled, "...then you just hit the post-processor button and it's goes, nice and quick," Sible smiles. As he more seriously explains, "The SIGS and the Vericut programs accommodate the machine's kinematics in every way, so there's less chance of error. With the lockout keys on the Siemens control, as well, function access is limited, so there's no chance of changing the machine functions or the software on the cutting program, except by the dedicated operator and other select individuals. With the very expensive materials we run and the highly proprietary nature of many customer parts, this is important to us." Further, he notes the Siemens control and drive packages work in concert to maintain superior speed and accuracy. "I've personally worked with several other CNCs in the medical machining market and the Siemens control is very impressive. The large look-ahead feature keeps the speeds optimized, while both the hard and soft set-up times are reduced because of the integration software and the plain language inputs." ■

Above: The highly complex surface of this hip broach was traditionally machined and inspected on separate machine tools at every step. Micropulse now produces the finished part in a single set-up on the Schütte cutter grinder.



Left: A five-position tool changer enables fast and flexible machining options.

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