INDUSTRIAL Laser Solutions® FOR MANUFACTURING

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Accuracy for arthroscopy

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For a medical products supplier, laser technology delivers precise marks and saves time and money

A global medical device company, headquartered in London, with approximately 8500 employees in 33 countries, Smith & Nephew (founded in 1856) develops, manufactures, and markets orthopedic, endoscopy, and wound care products. The company's endoscopy division is recognized as the global market leader for arthroscopy products, claiming to be unique in offering all arthroscopic technologies needed for surgery, including instruments for access to joints, cameras to visualize inside the joint, blades for resecting tissue, and specialized devices to repair damaged tissue.

FIGURE 1. *The laser is used to add depth markings to bone screw taps to guide the surgeon.*

Tucked away in Mansfield, Massachusetts, the endoscopy division currently employs about 240 people across four shifts (three shifts per day in all areas and a fourth shift that works on weekends to address demand in certain areas such as CNC milling and turning). It's important for the crew in Mansfield to be organized and efficient in their 100,000-sq.-ft. facility. That's where laser processing comes into play.

One product line that benefits from the laser is arthroscopic drills and shafts that require depth marks to guide the surgeon (***see Figure 1***). For this application accuracy, obviously, is key. The parts have to be rotated and marked at several locations. Previously, for this application, the company was using an older laser system that required multiple set-ups by the operator, which was not only time consuming but also required manufacturing and choosing the correct fixtures for each laser marking operation. "We have two very ancient laser systems," says Paul Anderson, a manufacturing engineer at Smith & Nephew. "One was purchased in 1997, and it has run 24/7, non-stop, for the last nine years. The other one was purchased in 1989 and still operates between one and two shifts per day. "It's very tough to get parts for this one," notes Anderson. "We have a guy who manages to jury-rig it to keep it going." In other words, it was time to upgrade.

A new laser solution, provide by Telesis Technologies Inc. (Circleville, OH; **www.telesis.com**) consists of a six-axis robot combined with a 100W Eclipse Nd:YAG fiber laser and Telesis AMI software. With the new system, the operator simply scans the work order and loads a part pallet of up to 96 drills at a time. The system then loads the pattern and initiates the robot to start the process. The system takes over all controls of rotation and marking the complete pallet of parts while the operator is free to attend to other tasks. Not only has this system drastically improved productivity, but also the "scrap" rate is now virtually zero. According to Anderson, this system is used to mark a dozen different products with information such as part number, lot number, and depth graduations.

FIGURE 2. *Information such as part number and lot number is marked on the universal instrument handle.*

Another application for which the laser presented a solution is marking a universal instrument handle that is used throughout the entire arthroscopic handheld instrument product line (***see Figure 2***). Originally, the handles were marked by hand using stencils and an electro-chemical etch. Anderson explains that the person operating the electro-chemical etching machine would go into a file, find the part number, select the stencil, set up the machine, mark the piece, clean it, put the stencil back, and so on. Stencils could not be made in-house but had to be special ordered through the manufacturer.

A laser system to replace this process would require a rotary for marking on multiple sides and it needed to offer easy set up and fit into an office-style cubicle in the manufacturing work area. The solution, again provided by Telesis, is a 16- x 16-inch Class I workstation that is almost six feet high and is on wheels for mobility (***see Figure 3***). With a load surface about four feet high, the parts are easily loaded and unloaded by the operator from a desk chair (***see Figure 4***).

The workstation consists of a programmable rotary and "Z" axis along with the Telesis AMI software for ease of operation. The Class I safety interlocked door is pneumatic. The operator loads the part in the rotary chuck, hits the dual palm buttons that initiates the door cylinder to close, and starts the lasing operation. When the lasing cycle is complete, the door opens automatically, and the operator simply removes the part and loads another to restart the process. The system features a 10W fiber laser with an MTBF of 50,000 hours.

FIGURE 3. *The Zenith 10F Workstation.*

Anderson estimates that using the electro-chemical etch process for this part required about 45 minutes to complete a 10-piece order with assembly. Now the process is built into a cycle where the operator assembles one part while another is being marked. The operator receives a

FIGURE 4. *Assembler Bill Barry operates the diode laser marker.*

barcoded order. He scans the barcode to record the product number, which calls up the marking program for that particular number. The work order number, which is also scanned, becomes the lot number for that particular order. "So they scan and scan," explains Anderson, "and then start the marking all inside of their cycle. They're doing this in about 20 minutes. And there's no cleaning, like with chemical etch."

Furthermore, this is a dedicated machine with dedicated fixturing that accommodates two styles of handles. "There is one fixture that accepts both types of handles," notes Anderson, "and from those two types of handles we derive 185 different product styles."

In addition to eliminating the cleaning steps, the laser process also eliminates the risk of mis-marking the part. There's no choosing the wrong stencil or mistyping any numbers. To ensure accuracy, Anderson says they first create the program, process a first article, inspect it, and verify that the barcode has the information that the work order says it should. The information is filed into a database that is kept on the network drive. "This is backed up nightly so we don't lose the programs," Anderson says. "They're in a safe spot and they're password protected. Operators can't modify any programs." Using the 10W laser also helps to avoid any corrosion issues that otherwise might affect the 303 stainless steel handles. In fact, Anderson explains that the process is more accurately referred to as annealing. "We're heating up the surface, so we're discoloring it without actually etching into the material," he explains. "Once you etch, you've broken the chromium oxide barrier and the iron is exposed to the surface."

Because these are medical instruments, they must be able to undergo repeated autoclaving without rusting or discoloration. "The chromium oxide barrier is what makes the material stainless. If you can mark without disrupting that barrier, then you're home free. That's what we've achieved with the diode laser."

Anderson notes that laser part marking is not FDA mandated for these products; rather it is a technology the company chose to save time and money (with a two- to three-year payback) and reduce human error. However, he emphasizes that all marked information is done according to standards, which is critical when doing business overseas.

As for training on the system, Anderson says there's really nothing to learn. The operator simply has to know how to turn on the system, load the program, and scan a barcode. The 10W laser normally runs one shift per day, and three people are trained to use it. Anderson has compiled a written procedure with accompanying pictures so that "you could grab somebody off the street, hand them that procedure, and they could actually start the machine up, mark parts, and shut it down," he says. "That's what I love about it…the simplicity of the machine."

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