Medical Modifications

MAXON UPGRADES TISSUE REMOVAL SYSTEM FOR INTERLACE

Contributed by Maxon Precision Motors

Medical engineers are consistently looking for ways to provide devices to physicians that offer smaller incision requirements, a more accurate procedure and the opportunity for a quicker recovery. According to the Jones Institute of Reproductive Medicine at Eastern Virginia Medical School, located in Norfolk, Virginia, fibroids affect more than 30 percent of women in the United States. Uterine fibroids are noncancerous growths of the uterus that often appear during child-bearing years. The Mayo Clinic states that as many as three out of four women have uterine fibroids sometime during their lives, but most are unaware of them because they often cause no symptoms.

In the past, monopole loop electrodes that scraped tissue from uterine walls slowed and impacted the accuracy of these operations. For years, physicians requested that these devices be replaced with less intrusive equipment. Interlace Medical, located in Framingham, Massachusetts, in cooperation with its motor supplier, Maxon Precision Motors, recently came up with a solution.

The five-man engineering team at Interlace worked on their latest tissue removal system for about two and a half years. Fast turnaround of new devices is always a valuable asset for a company, but it's all about finding and implementing the right components for the results you're looking to achieve.

Interlace's MyoSure Tissue Removal System was designed to remove fibroids found on the uterine wall. The MyoSure device was designed to eliminate the challenges posed by the currently marketed devices. Since the design of the new system was performed largely in-house, the Interlace Medical team was able to get together regularly and go over the pros and cons in each design step. The team was also very sensitive about the way the device went together to hold down manufacturing costs, which could be passed along directly to the customer.

The challenge in developing the company's device was the need to upgrade the present method so that it was fast enough and accurate enough to compete. Interlace's first version used an autoclavable motor manufactured by Maxon. The device used a single motor mounted inside the handle, with all the electrical connections transferred through a tiny cable.

"Interlace contacted Maxon initially looking for a high-performance autoclavable motor, gearbox and control solution for their prototype design," says Joe Martino, northeast sales and applications engineer. After several design tests, the latest version of the MyoSure system had the motor housed inside the controller chassis instead of the probe, eliminating the need for an autoclavable motor. An integral rotary encoder is used for closed-loop control of the motor. Still, because the enclosure for the MyoSure had already been designed, the company had to find a compact motor with the highest performance per size that they could get.

The MyoSure operates from a foot pedal and only turns in one direction, which made motor selection easier. The RE40 motor used in the device is fitted with rare earth magnets to provide its high performance while maintaining a compact size. These motors use a patented rhombic moving coil design to deliver long life, low electrical noise, fast acceleration, and high efficiency. Plus the component's ironless rotor allows for zero cogging and simple, accurate control. Motor efficiency is 86 percent depending on the winding.

Interlace designed a unidirectional flexible shaft into the system that interconnects with the remotely located Maxon RE40 motor. This approach meant that they could go to a single-use, totally disposable probe system, which helped with certification. The MyoSure has obtained FDA 510[K] clearance and expects CE Mark certification to sell in Europe in the next year.

The device and its optical scope are 6.25 mm in diameter. This means that patients require less anesthesia during the operation. Overall, the device can provide a clear operative field, fewer device insertions, reduced perforation risk, and shorter procedure time—which was the primary design goal.

The MyoSure incorporates Maxon's EPOS 24/5 position controller as the driver for the device. According to Albert Chin, vice president of R&D at Interlace, "Maxon worked closely with us from day one. Their application engineers helped us to select the right motor and controller for the

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The RE40 motor used for the MyoSure provides high performance while maintaining a compact size.

The EPOS controller uses simple logic and control functions for monitoring the motor.

The MyoSure Tissue Removal System was upgraded with Maxon's RE40 motor and EPOS controller.

job. This prevented us from over designing the device, which would have increased our production costs."

EPOS 24/5 is a digital motion controller capable of being used in position, velocity and current mode. It communicates through RS-232 or CANopen, with complimentary software for CANopen and Windows DLL. The controller only requires an 11 to 24 VDC input to be capable of operating at 5 amp max continuous current and 10 amp peak current. The 50 kHz switching frequency and built-in choke insure compatibility with most low inductance motors, while the sinusoidal commutation for brushless motors insures minimal torque ripple and low noise.

The EPOS controller uses simple logic and control functions for monitoring the motor's operation, including acceleration and deceleration, as well as speed. The motor control logic is a software program that is burned into firmware at the factory. With Maxon's guidance, the MyoSure control box passed all the electrical safety testing necessary for Class B office use.

"As the design changed through many iterations of development, testing various motion control solutions, Interlace eventually needed a powerful, efficient and high power solution for the final design," Martino says. "The RE40 plus encoder plus customized EPOS 2 controller was able to meet all of Interlace's final design requirements."

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