

Processing Medical Implant Devices

Application Overview

Overview

Medical implant devices fabricated by laser machining and stamping of nickel titanium alloys (nitinol) often contain minute defects and blemishes as a result of the manufacturing process. If left untreated these imperfections will adversely affect the performance as well as the life span of the device. Many of the leading manufacturers of stents, shunts, cages and other medical implant devices have turned to micro-abrasive blasting as an effective means of eliminating these possible sources of problems.

Medical implant devices are commonly blasted to:

- A. Remove discoloration and oxide layers from implant surfaces.
- B. Smooth laser pulse marks and sharp edges.
- C. Remove or cut laser slag (remelt).
- D. Decrease the propensity of micro-cracking.

Remove discoloration and oxide layers

The environment where medical implant devices are placed makes them highly susceptible to corrosion. To reduce the vulnerability of the devices to corrosive elements, it is important for their surface areas to have a smooth finish. Oxide layers and discoloration generated in the laser machining process impair the ability of electro-polishing to create the desired finish. Blasting the devices with micro-abrasives is an effective way to remove the oxide layers and discoloration, ensuring the electro-polishing process imparts the desired finish.

Smooth laser pulse marks and sharp edges

Laser machining leaves pulse marks or striations on the walls of the devices. Corrosion occurs more readily to the uneven surface left by the pulse marks than to a smooth surface. Micro-abrasive blasting on the walls of the devices will smooth out the pulse marks and help prevent corrosion to the device.

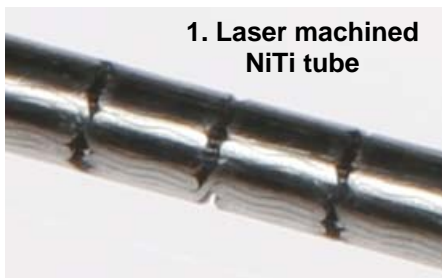
Medical implant devices must be free of sharp edges. Whether a device is manufactured by laser machining or by stamping, sharp edges will develop. A small radius can be imparted to the edges by blasting one or both ends to reduce the sharpness. The strut running along the axis of a stent can be rounded with micro-abrasive blasting to eliminate the sharpness of the strut's edge.

Remove laser slag

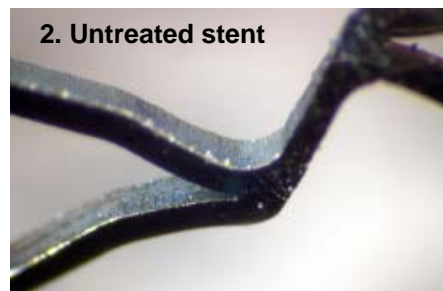
Microblasting is used to eliminate the "remelt" from strut junctions. This occurs where the residual laser slag re-bonds itself to the device, compromising its reliability. Blasting to remove the "remelt" restores uniformity to the material surface and removes the potential for small pieces of laser slag to break off with age.

Decrease corrosion caused by micro-cracking

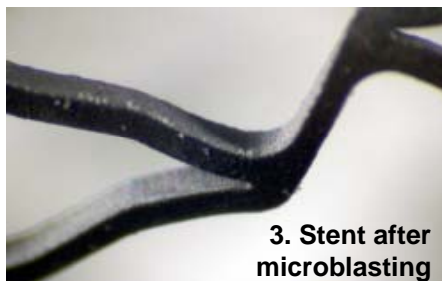
Both stamping and laser machining leave small cavities or micro-cracks on the base material. The cracks will corrode with time, becoming larger, and eventually weaken the structural integrity of the implant device. Micro-abrasive blasting effectively removes the cracks reducing the risk of the failure of the device.



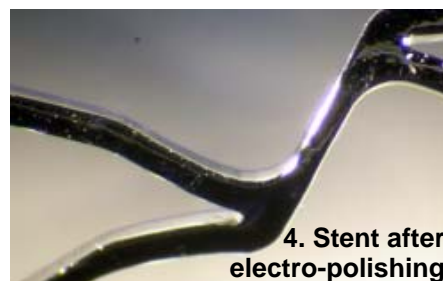
1. Laser machined
NiTi tube



2. Untreated stent



3. Stent after
microblasting



4. Stent after
electro-polishing

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In all of these applications micro-abrasive blasting is accomplished with a high degree of accuracy, precision, and repeatability. The MicroBlaster® nozzle can direct the abrasive on the outside of the device, or using specially engineered nozzles can blast from the inside out. This gives micro-abrasive blasting superior flexibility over other techniques.

Equipment

Each manufacturer has proprietary methods of processing their products; therefore, out of respect for their privacy, we provide the following generic information on the equipment, materials, and methods used.

MicroBlaster®

The MicroBlaster® models are low cost, reliable, and powerful machines for all micro-abrasive blasting applications. Comco's patented modulator system accurately meters the abrasive into the air stream, ensuring a consistency unequalled by any other blasting equipment. The MicroBlaster® models are ideally suited for any manual blasting operations.



Nozzles

Round nozzles in various sizes are used for blasting the OD of most devices. Special nozzles have been designed with extended length and 1 or 2 right angle machined openings for blasting the ID of a device.

Abrasive Media

For the majority of medical implant device applications either 17.5 or 25 micron aluminum oxide is the abrasive of choice. In certain circumstances where specific electro-polishing issues must be addressed, 20 micron silicon carbide is used.



Comco's LA1500 Standard Lathe and LA3200 Advanced Lathe

Comco engineered the micro-abrasive blasting lathes to deliver greater consistency to the process. The Standard Lathe nozzle head travels along the X axis directing the abrasive stream at the part(s) located on a spindle (W axis). Blast parameters are set using manual controls and a Comco DirectFlo™ production blaster provides abrasive to the system.

With the Advanced Lathe, Comco's Total Control Electronics (TCE) architecture controls every aspect of the blasting process. With TCE and the fully synchronized X, W, Y and Z axes, the Advanced Lathe is capable of mixing a variety of motions to clean intricately shaped devices. TCE controls the abrasive flow provided by a PowerFlo® PF2400 blaster.

Contact us today for more information about micro-abrasive blasting and how it can improve your manufacturing processes.

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