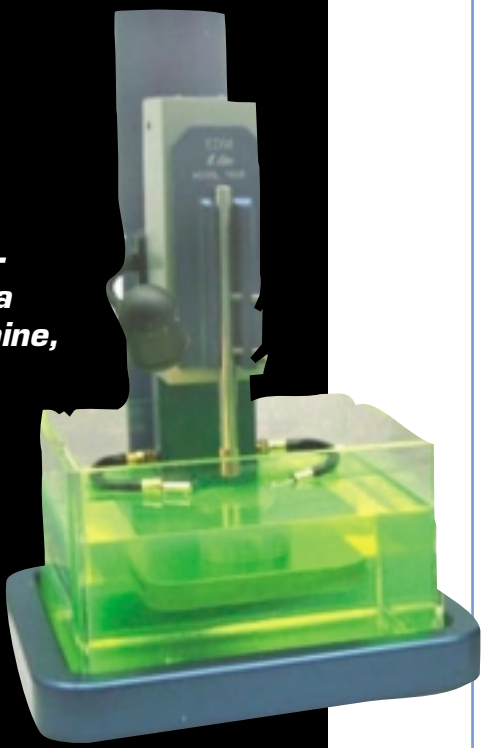
EDM For The Dental Profession

The self-tapping Titanium dental implants are screwed into the patient's jawbone, and provide a permanent, secure mounting for the artificial teeth.



The Tel Med Technologies EDM Machine is approximately the size of a desktop copy machine, and is equipped with a 7Amp power supply. It was developed specifically for use in a dental laboratory or clinic.

The EDM process has had a profound impact on many areas of manufacturing, and in turn, has effected all of our lives. A large number of new developments, resulting in products that range from convenience items, to vital life-saving implements, have depended on EDM machining. The people within the EDM Community can easily recognize the "EDM touch" in the everyday items that surround us. One area of EDM influence however, is not easily recognizable, mainly because the end result is designed to look totally natural, and that area is dental implants.

We recently spoke with Dr. Stephen M. Schmitt, D.D.S, M.S, of Tel Med Technologies, in Port Huron, Michigan, and he told us that dental implants have become a common and highly successful method of replacing missing teeth. However, the ability to attain a perfect fit between the artificial teeth and the implants, has been a bit more complex. The Titanium dental implants are permanently secured by threading them directly into the jawbone. However, a precise fit is needed between the implants and the artificial teeth that will be attached to them with screws. EDM has proven to be the perfect solution for producing the micron-level fit necessary.

A Custom EDM Machine

Dr. Schmitt started using EDM to fit dental restorations over six years ago, starting with a full size Sinker EDM to machine castings. He soon realized that the equipment was far too large for a dental laboratory or clinic. As a result, he has recently developed a 7 Amp EDM Machine, approximately the size of a desktop copy machine, which has proven to be ideal for use by the Dental profession.

Electrodes made of Copper or Graphite are used for EDMing the castings to the precise shape of the implants that are imbedded in the jawbone. Copper electrodes are generally used to EDM Gold based alloys, while Graphite Electrodes are used to machine Titanium.

Rapid Prototyping Employed

Imaging data, about the patient's dental restoration is used in order to make rapid prototyping (R-P) patterns. These patterns can then be employed to produce castings made from Titanium or Gold based alloys. The digital image data about the patient can be sent over the internet or phone lines to have the R-P part made. Once the pattern has been cast, it must be machined with EDM to provide the correct fit to the implants. This eliminates any errors due to the casting process and allows for the fitting of several implants at the same time

Eliminating The Casting Process Altogether

EDM can be used with computer imaging in order to eliminate the casting process

A plaster model of a missing tooth is used to collect digital image data that will be used in rapid-prototyping.

An .STL file of the missing tooth and a wax pattern made from the rapid-prototyping process.

The completed tooth restoration secured on a dental implant looks totally natural, and matches the patients original teeth perfectly.

A Wire-cut Titanium substructure blank is shown in the Sinker EDM, above the graphite electrode of the teeth ready for EDMing. The electrode was machined with a .020" diam. ball end mill, using digital image data from the patient. This Titanium part will become the substructure that will be fastened to several dental implants in the patient's jaw.

altogether. This is especially useful when the restoration is made from Titanium. Titanium is difficult to cast, and requires special dental casting machines that cost as much as $40,000.

EDM can be used to cut the restoration from a blank of uncast medical grade, pure Titanium. First, the blank of metal is cut on a Wire EDM to create the contour of the teeth. Next, image data is used to cut graphite electrodes with a small .020" diam. ball end mill. One electrode is used in a Sinker EDM to cut the biting surface of the teeth, then the second electrode shapes the area of the teeth that go into the tissue. The final fit of the Titanium substructure to the implants, is created by EDMing with electrodes that have the same shape of the implants. After the metal substructure has been fitted to perfection, it is removed and covered with dental porcelain, to create a look similar to the teeth that were missing. The completed artificial teeth are then securely attached to the dental implants with screws. The final result looks totally normal, and is as strong, or stronger, than natural teeth.

The completed Titanium substructure is shown in the patients mouth.

After being covered with dental porcelain, the completed artificial teeth are securely fastened to the implants with screws. Natural looking teeth worth a million smiles.

Dr. Schmitt

In Conclusion

Dr. Schmitt has been using Sinker EDM for the last six years to machine and make dental restorations fit into dental implants. He explained, "Many of the new dental and medical imaging systems allow for the creation of rapid prototyping parts that are castable, but not precise enough for dental application. However, by employing rapid prototyping along with EDM, very precise computer generated artificial teeth and dental devices can be made. I thought the readers of *EDM Today* might find these topics interesting."

We would like to thank Dr. Stephan Schmitt for enlightening us about another application for both Sinker and Wire EDM. The EDM community continues to expand its capabilities, and that's something to smile about. And who can tell if those beautiful smiles are natural, or have been created with the help of EDM?