



Globally Recognised Korean Medical Manufacturer Chooses EnvisionTEC for the Production of Precision Dental Appliances.

Founded in 2007, Dio Corporation (Dio) is a medical manufacturer based in Busan City in South Korea. The company aims to provide the most advanced dental implant and digital dental solutions to professionals across the world.

Dio currently produces more than 4,000 products from its state-of-the-art production facility per year.

Since 2010, Dio has expanded its market share and formed a strategic alliance with Dentsply International, a leading global dental and medical equipment supplier with over a century of experience. This strategic alliance has resulted in Dio products being sold in over 70 countries, with promising continuous sales growth and expansion.

Why 3D printing?

Traditional methods of production, for example dental model manufacture, required many hours of manual hand carving of models. Add this to the molds taken from the patient, the process was messy, slow and even with the most skilled technician resulted in poor accuracy.

When CAD/CAM began to emerge, Dio quickly identified the advantages of the technology. Since these early days the team has witnessed a rise in prominence and the uptake within dental labs and surgeries. They saw dental professionals that still relied on traditional methods starting to lose ground and become less competitive.



Dio offices in Busan City in South Korea

"3D printing was moving from a niche technology to mainstream. We knew that to stay competitive and give customers the quality of product we needed to be investing in 3D printing technology." - Lee Jangseon, General Manager, Head of R&D - Dio

Dio Corporation

Industry:
Dental/Orthodontic/
Implants

Machines:
Vida, Micro, Ultra 3SP

Materials:
E-Model

3D scanning and printing has revolutionised dental manufacturing, with just one example being in the production of Lingual Brackets. These are an alternative to braces and aligners allowing invisible movement of teeth. Dio manufactures a 3D printed, double wire bracket which is produced to the exact specification for each patient.

With all dental devices such as these, accuracy is paramount to ensure that optimum orthodontic forces are applied to teeth and the brackets are comfortable and effective. Manual production of these brackets would be both costly to undertake by hand and not result in satisfactory fit. Additive manufacturing makes the production of these brackets effective for patients, due to the accuracy, and results in a much faster turnaround.

The industry was recognising that 3D printing was bringing better results for patients, through better fitting and more effective appliances. CAD/CAM was increasing the speed of production, and that was resulting in reductions in 'time in chair' for dental professionals and reduced patient waiting times.

Why EnvisionTEC?

With a vision to grow and become the leader in the field, Dio understood that they needed to invest in the best equipment to ensure the best quality appliances for its customers.

The team examined a number of solutions from different manufacturers and eventually engaged with distribution partner Jive Solutions who introduced them to a range of printers and materials offered by EnvisionTEC. After seeing the various machines and 3D print materials as well as the capabilities of the EnvisionTEC range, it became apparent that the products from other manufacturers were not even in the same league.

"We examined our options, and while there are a lot of players now entering the dental market, EnvisionTEC's experience is evident from its focussed product range of 3D printers and materials."

- Lee Jangseon, General Manager, Head of R&D - Dio

The team at Dio opted for a number of models to fulfil the different needs of the business. The EnvisionTEC Ultra 3SP Ortho for example, provides a large build area for the mass production of dental models, bite guards, aligners and indirect bonding trays. Printing in different orientations ensures massive numbers can be produced simultaneously.

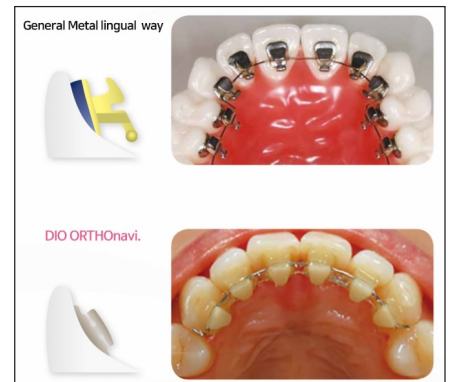
The Micro and Vida desktop models are used in the manufacture of lingual and labial brackets and the direct production of indirect bonding trays. These smaller machines are ideally suited to this task with the production of the tiny appliances being executed with exceptional surface finish and accuracy.

The Future

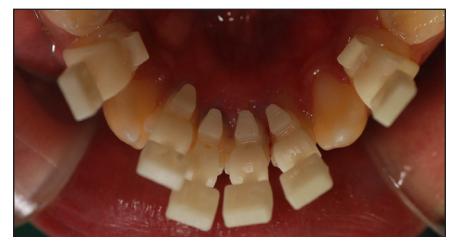
New applications and improvements are discovered all the time. EnvisionTEC continues to evolve and add the applications to benefit dental, orthodontic and medical professionals. In order to grow, Dio will need to accommodate new applications and the requirements of its customers. Dio can rely on EnvisionTEC to support them, and when further manufacturing capacity is required Dio can simply add EnvisionTEC machines without the need to re-train its team.



An example of a 3D-Printed Lingual Bracket



The 3D-Printed Lingual Brackets provide an alternative to metal brackets.



Lingual Brackets attached to the patients teeth.



Lingual Brackets packed under the DIO ORTHOnavi brand.

EnvisionTEC materials and 3D Printers for Dental and Orthodontic applications

EnvisionTEC offers a full range of desktop, full-production and high-speed continuous 3D printers for dentists, orthodontics and dental labs. EnvisionTEC machines are known throughout the industry for extreme accuracy, high throughput and a smooth surface finish.

3D printers deliver tight-fitting crowns and orthodontic models with a best-in-class smooth surface that results in crystal-clear thermoformed aligners. Paired with an industry-leading materials library, featuring a variety of FDA and CE-approved materials, EnvisionTEC machines offer unmatched flexibility and a complete solution that delivers reliable, proven results.

EnvisionTEC Materials

- **E-Denture** - biocompatible Class IIa material suitable for 3D-printing all types of denture bases.
- **E-Denstone** - material developed specifically for the production of scannable dental models.
- **E-Dent 100/400** - printing materials for the production of crowns, bridges and veneers for long-term temporary use.
- **Press E-Cast** - wax-filled material for the production of partial frameworks and full anatomical crowns and bridges.
- **E-Gum** - for use in the creation of flexible gingival masks for use in combination with 3D printed dental models.
- **E-Guide Tint** - biocompatible Class I material for the production of high precision surgical drill guides.
- **E-Guard** - biocompatible transparent material for the production of bite splints and night guards.
- **E-IDB** - material allowing for the production of indirect bonding trays.
- **E-Model** - tough material that is ideal for the production of dental and orthodontic models.
- **E-OrthoShape** - grey ABS-like material recommended for the affordable volume production of models or thermoformed aligners.
- **E-Rigid PU** - material solution for 3D printing dental diagnostic waxups.
- **E-SepFree** - for easy release without a separator when directly building orthodontic appliances. The material is also easy to carve.
- **E-Partial** - castable material developed for the creation of partial frameworks with thin features and some flexibility.
- **Press-E-Cast** - wax-filled photopolymer material for the production of full anatomical crowns and bridges.

Partners

Thanks to Jive Solutions for their support in the making of this case study. Also everyone at Dio for their help and continued support.



About EnvisionTEC

EnvisionTEC is a leading global provider of professional-grade 3D printing solutions. Founded in 2002 with its pioneering commercial DLP printing technology, EnvisionTEC now sells a range of printer configurations based on six distinct technologies that build objects from digital design files. The company's premium 3D printers serve a variety of medical, professional and industrial markets, and are valued for precision, surface quality, functionality and speed.

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