

## Introducing CAD/CAM for mainstream dentistry: Laser PFM™

By Gareth Tomkinson, Renishaw plc

When CAD/CAM burst onto the restorative dentistry scene a few years ago it brought with it a new range of exciting features; precision fit, reduced marginal adjustments and controlled materials to name a few. But so far only the private end of the market has taken full advantage of the CAD/CAM revolution, due to the premium pricing associated with ceramic frameworks. However, recent advances in rapid manufacturing techniques have brought many CAD/CAM benefits within reach of mainstream dentistry. By replacing traditional metal casting techniques with a process called Direct Metal Laser Sintering (DMLS), low cost CAD/CAM frameworks can now be produced in pure, medical-grade Cobalt Chrome. Renishaw's new Laser PFM™ restorations give labs a new opportunity to stay ahead of the competition and keep down costs.

### Confessions from the casting couch

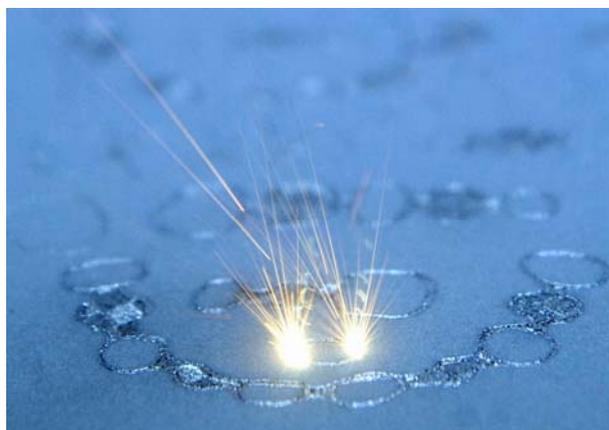
The days of dental labs having to use the traditional investment (lost wax) casting technique to create metal frameworks could be numbered. Although the process is still very common, many would welcome a cleaner alternative and a lower energy bill. DMLS combines low cost with the added benefits of CAD/CAM; precision fit, reduced marginal adjustments, certified materials, consistent frameworks with no inclusions or casting defects, all backed up by electronic strength checks. And if waxing up is still the preferred method of framework design, then, this too can be scanned into the CAD/CAM system to produce a customised Laser PFM™ framework.



**A cast coping (left) and a finished laser sintered coping (right)**

### What is Direct Metal Laser Sintering (DMLS)?

Most CAD/CAM frameworks are manufactured from ceramic, typically zirconia. Where cost is of primary concern, DMLS can replace the zirconia machining process to create a metal based alternative. This high tech process is sometimes described as '3D printing' because it builds up each framework in a series of successive thin layers (0.020mm thick). A high powered laser beam is focussed onto a bed of powdered



**The DMLS laser creating dental frameworks**

metal (in this case medical grade CoCr) and these areas fuse into a thin solid layer. Another layer of powder is then laid down and the next 'slice' of the framework is produced and fused with the first. When every layer has been built up, the solid copings and bridge frameworks are taken from the machine, sand blasted, polished, inspected and ultrasonically cleaned. As the machine can create hundreds of units at a time the cost of each one is relatively low. The unused powder that remains is filtered and used in the next batch so there is very little waste, again helping keep running costs to a minimum.

### Clean, precise and predictable

A CAD/CAM process producing DMLS frameworks offers several key advantages compared to traditional investment-cast metal frameworks:

- Unlike some imported metal crowns, Renishaw's Laser PFM™ frame works are made from a pure, certified form of Cobalt Chrome. Renishaw uses a powder that is free of nickel, beryllium and cadmium, according to standard DIN EN ISO 22674:2006.
- All materials are CE marked and produced to the highest quality standards (certified to ISO 13485-2003, which demonstrates compliance with requirements for the manufacture of Medical Devices in the UK).
- With an automated scanning process and powerful CAD software – which can also be used to produce metal-free restorations – labs have full control over their framework designs. Margin line placement, cement gaps, coping thickness and pontic designs can all be customised. Designs can be 'sectioned' on the computer screen and analysed for strength before committing to manufacture.
- Laser sintering is a precision, computer controlled process that ensures consistent framework integrity. There is no possibility of inclusions or defects that are commonly introduced in manual casting processes.



### Laser PFM™ frameworks prior to finishing

- Multi-unit cast frameworks can suffer from distortion as they cool. The DMLS process produces more consistent results with improved marginal fit.
- Switching to Laser PFM™ means that a messy process can be removed from the lab, freeing up space and resources for higher-skilled ceramic work.

- Furnaces have high power consumption and can give out a lot of heat. These issues can be removed from the lab with the DMLS process.



### How do labs start using Laser PFM™?

Following the recent commissioning of its new DMLS machine, Renishaw now offers a central manufacturing service to labs, catering for bridge frameworks up to 8 units. A digital file is submitted over the internet and the finished framework is returned ready for porcelain build up.

Renishaw is offering no-obligation free samples to UK labs wanting to try Laser PFM™ frameworks. Call Gareth Tomkinson on 01453 524153 to find out how to take advantage of this offer.

Laser PFM™ is a trade mark of Renishaw Plc.