

# Chrome partials join the CAD/CAM revolution

A look at CAD/CAM chrome partial frameworks created with the SensAble System

By Peter Newman



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**L**ate last year Silvia Newman, Paul Wingate and I set of to the US on behalf of the Pearl Group in search of new technologies. Paul’s wife, Leonie, also joined us. It was quite a whirlwind tour, travelling through 11 States in 16 days, including a 3000 mile road trip. By the time it was over, they had all agreed that I should not be allowed to set the itinerary ever again.

I have to say that we were very warmly welcomed everywhere we went, with all of the American technicians happy to share their experience and ideas.

Obviously, the US dental industry is much larger than our own but even so, the issues of international competition, training and digital technology were identical to the issues facing Australian technicians.

Of all the technologies we saw, we all agreed that the one that stood out as offering immediate benefits in accuracy and productivity was the SensAble Dental Lab System. The Pearl Group subsequently purchased and installed this system in our Sydney lab in Park Street in January this year as the first step in the building of a national network of digital chrome laboratories. Pearl currently produces over 10,000 chrome frameworks per annum and all are manufactured in Australia (none are sent overseas).

Developed by SensAble Technologies in Boston, this system allows dental technicians to go digital in a very unique way. The combination of SensAble’s Haptic device and their software enables the technician to literally feel the virtual 3D model and the virtual wax that they are applying to it. With

Park Street already using three crown and bridge CAD/CAM systems using only a mouse to draw on the screen, I firstly thought this device to be a good marketing gimmick but having now worked with it for the last seven months, I can’t imagine designing the complex shapes that chrome partials entail without it.

Haptic device or not, there are good reasons for going digital with chrome partials. Firstly, by scanning directly from the master model, we have eliminated the refractory model and associated duplicating of the master model. This increases our accuracy and saves time. Secondly, we eliminate the hand waxing process completely; this has greatly increased the consistency of design and style of our frameworks. Thirdly, all of the usual advantages of the digital process such as recordable and transferable data, recordable styles that can be individualised for each client including clasps, mesh, connectors, retention, relief, stipple, etc are all on offer. This move also prepares another department in Park Street for the introduction of intraoral scanners.

SensAble currently uses a 3D printer - the DP3000 from 3D Systems - to produce a resin framework which is then invested and cast with the usual methods but it is also capable of adapting to any future production techniques and I am sure that we will eventually be producing our frameworks directly in metal and bypassing the lost wax technique completely. Such production systems do already exist but none have been able to match the smooth and accurate castings that we currently produce.



Figure 1. Occlusion recorded in PVS key.

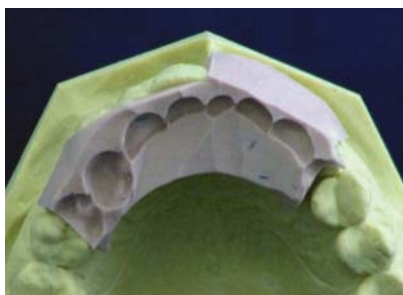


Figure 2. Trimmed PVS key.

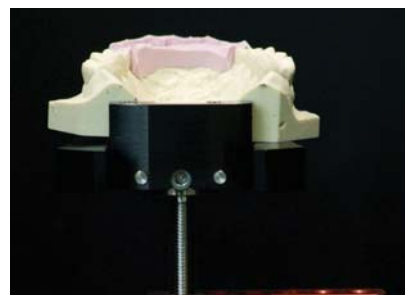


Figure 3. Model and Key mounted in Digital Scanner.



Figure 4. Case data is entered into the SensAble Dental System.



Figure 5. 2D and 3D scan of bite key.



Figure 6. Virtual 3D model of bite key.

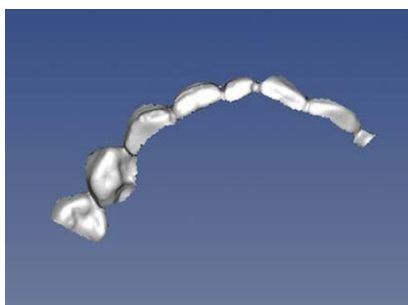


Figure 7. Trimmed virtual bite key.

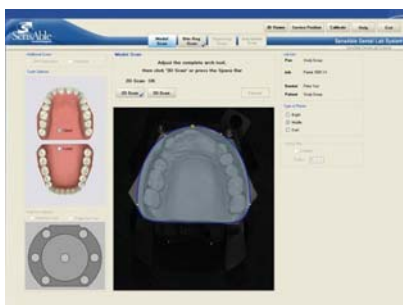


Figure 8. 2D and 3D scan of model without key.

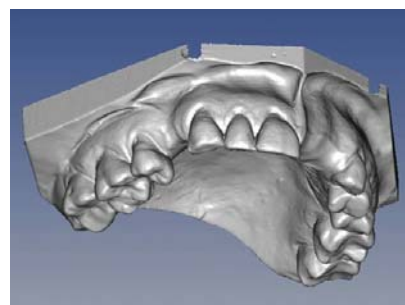


Figure 9. Note the clean and accurate virtual 3D model produced by the SensAble scanner.

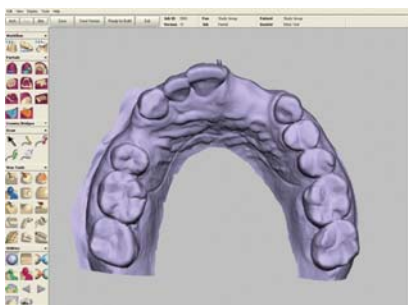


Figure 10. The model is automatically transferred to the Design Station.

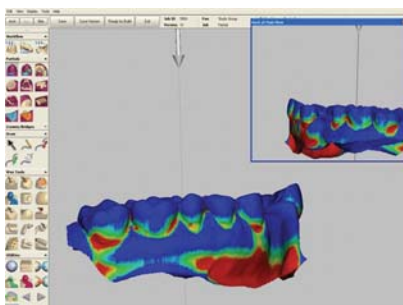


Figure 11. All teeth surveyed simultaneously.

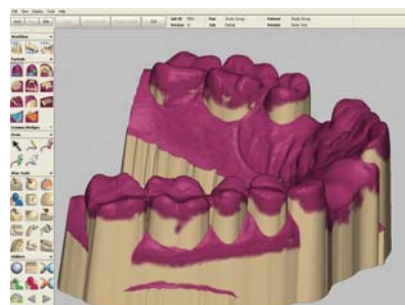


Figure 12. Once surveyed all teeth are blocked out instantly.

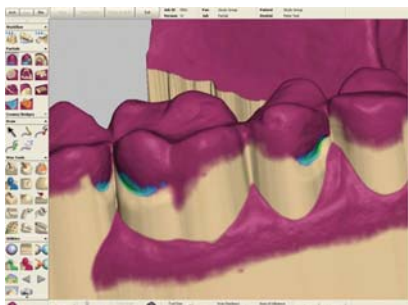


Figure 13. Undercuts exposed by technician for clasp retention.

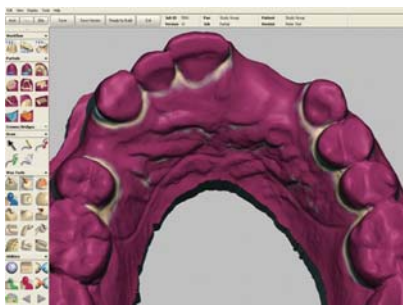


Figure 14. Gingival areas are relieved where necessary.

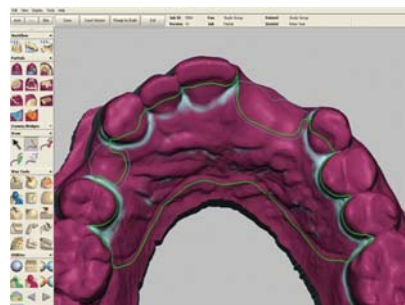


Figure 15. Mesh area and major connector are drawn.

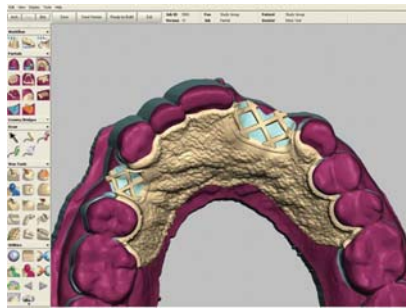


Figure 16. Mesh and connector applied.

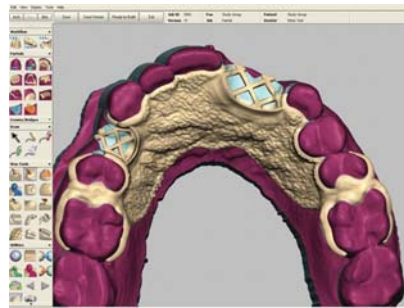


Figure 17. Clasps, rests, reciprocating arms and finishing lines applied.

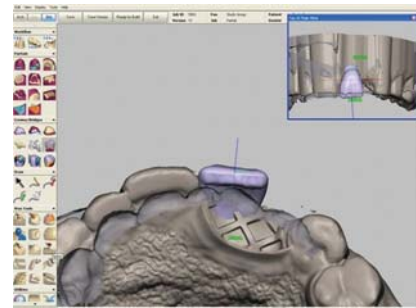


Figure 18. Virtual denture teeth placed with opposing dentition activated.

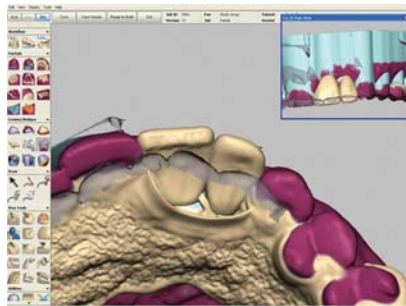


Figure 19. Added to frame as hollow crowns.

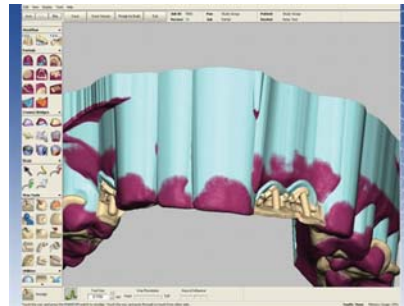


Figure 20. Labial face removed to form backing.

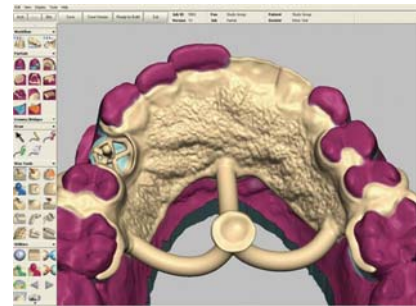


Figure 21. Sprued before being sent to 3D Printer.



Figure 22. 3D Systems DP3000 with Paul Wingate of Pearl South Australia.



Figure 23. Completed resin frames on printing plate.



Figure 24. Frames with support wax removed, shown here with clear prototype resin.



Figure 25. Prepared for investing. Note that there is no refractory model and therefore no "flash".



Figures 26 and 27. Finished casting.



Figure 28. With digital anything is possible!

The SensAble System also comes with powerful C&B software and in the next software release, will be open to third party zirconia milling systems as well. Park Street has already started to shift its PFM framework production to the DP3000 printer through one of our other C&B scanners. With digital anything is possible.

I will let the pictures tell the rest of the story but I would just like to mark the passing of Bruce Pardey whilst this article was being written. Bruce was a true gen-

tleman and excellent dental technician and at the age of 80, was right up to his last days furthering the world's understanding of the production and properties of zirconia. Bruce never stopped believing in Australia's ability to compete in the dental market and that should serve as an inspiration to all of us as we move into the digital age.

**About the author**

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