



Metal implant using CAD-CAM with Dental Wings, the Asiga printer Pro and the DETAX cast resin

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There are many pieces of software that can create a frame. I work mainly on Exocad, 3 Shape and Dental Wings. The latter is the most sophisticated, the most fluid and offers the best fusion and better meshing.

In 2016, the removable prosthesis, too often the poor relative in our laboratories, is not of much interest to the young prosthetist. Designing it using IT gives value to this complex and magnificent prosthesis that offers an excellent service to patients.

Software makers are now offering ever more sophisticated solutions that offer freedom to create models for our cases as intuitively as by hand, and to add back plates, metal blocks etc. In fact, importing STL files into our models enables us to give free reign to our imagination. An efficient IT prosthetist can create a frame model in 10 minutes using an STL file from an impression or a model recorded with a table scanner or an

optical impression without having to make refractory copies or carry out thermal processing of the latter before creating the frame by hand from preforms. The time saved is considerable. As soon as you arrive at work, the design can be carried out, and the amount of material saved is far from negligible, especially in terms of coatings and preforms. The production quality is improved; thickness levels can be checked and controlled, have no weak points, and remain stable during the production phase.

In the latest version, 6.1., Dental Wings software cleverly offers a way to combine the creation of a fixed and a removable prosthesis.

Fixed prostheses are prepared through milling, using cleats, attachments requested by the practitioner and the frame is designed immediately using STL files.

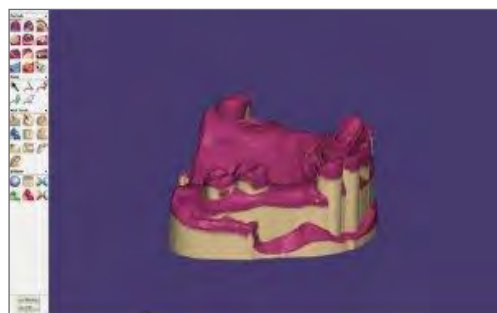
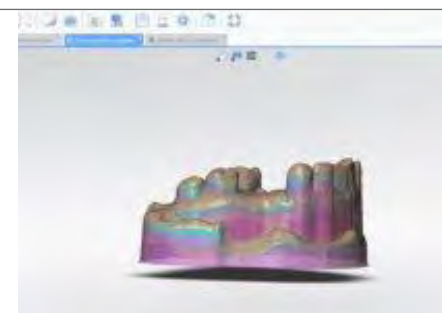


Photo. 1 Exocad



3Shape



Dental Wings

Photo 2 Axis by default, which can be modified.

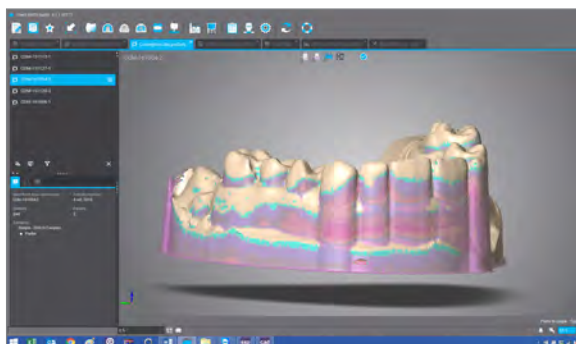
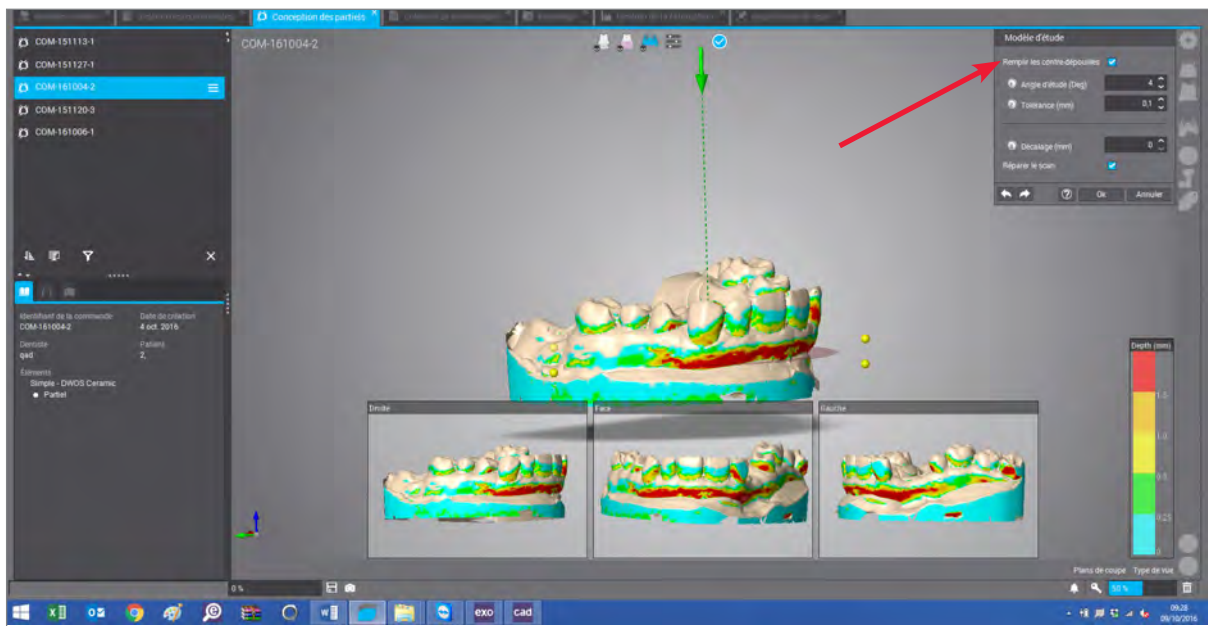


Photo 3 Parallelisation of the model by adding virtual wax.

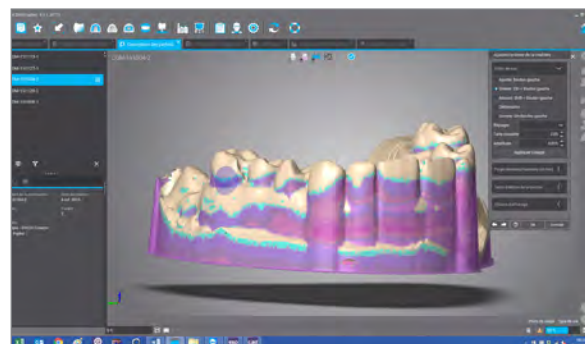


Photo 4 Control of the thickness of the retainer by way of a coloured surface.

1/ Preparation of the model

This image shows the model after being scanned in an Imetric LIm scanner that gives an axis (photo 1). Depending on the scanner used, we have different axes by default, which can be modified in the modelling software to obtain a better insertion and better retainer of our prosthesis (photo 2). The software will parallelise the model by adding wax virtually (photo 3). We can add or remove material on request to create the desired retainer. The colour of the surface shows the retainer thickness, shown against a scale comparable to that of the screen in photo 1. In the "Study model" square on the right of the screen (photo 1), there are parameters that are vitally important for the success of partial metal prostheses.

Incorrect or imprecise parameters will result in the prostheses being too loose or too tight. The study angle must be controlled (to prevent tapering) and movement (tightening).

2/ Modelling the frame

Dental Wings Partial software offers various preforms which are available by default. The dimensional parameters can be modified, and we can incorporate our own preforms as STL files to personalise our own items more. In the Partial design tools section, all the preforms available to us are shown (photo 5). The hooks, plates, grids, brackets, lingual bars, resin blocks, cleats, retainers and reinforcement bars.

Choice of design order

We create our frame on demand, and can choose to work in the order we want. Personally, I work in this order. Cleats (photo 6), grids (photo 7), resin blocks (photo 8), hooks (photos 9 et 10), brackets (photos 11 to 13), plate (photos 14 and 15) or the lingual bar and retainers (photo 16).

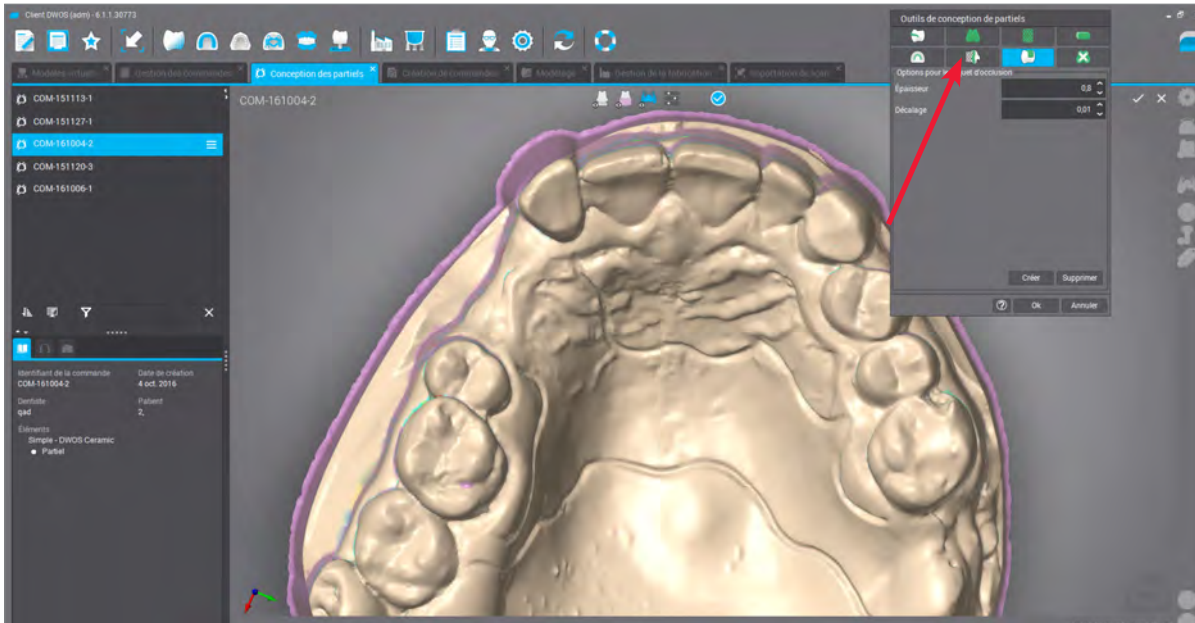


Photo 5 Presentation of all preforms in the partial design tool

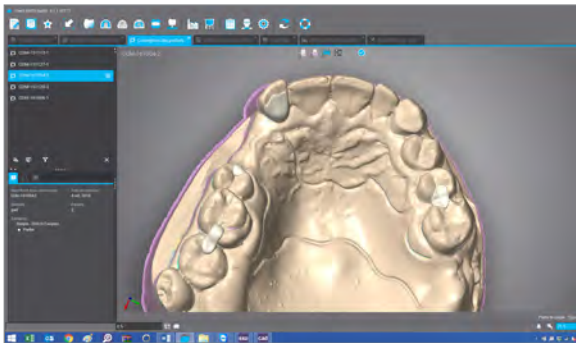


Photo 6 The cleats.

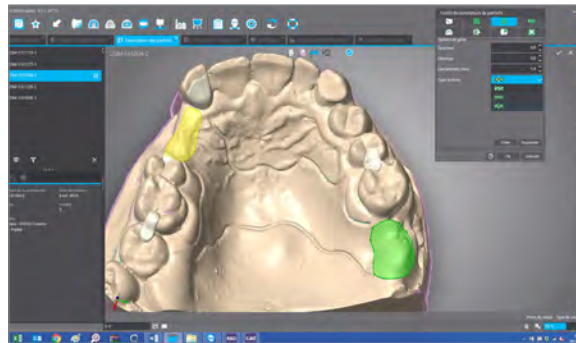


Photo 7 The grids.

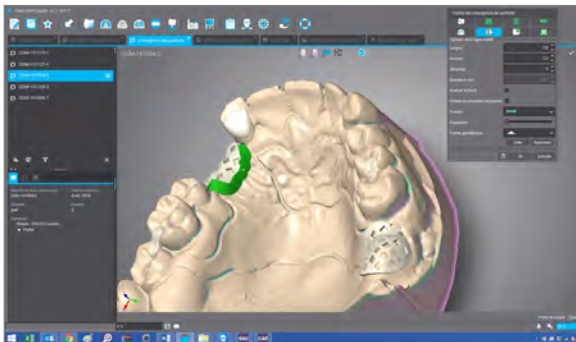


Photo 8 Resin blocks.

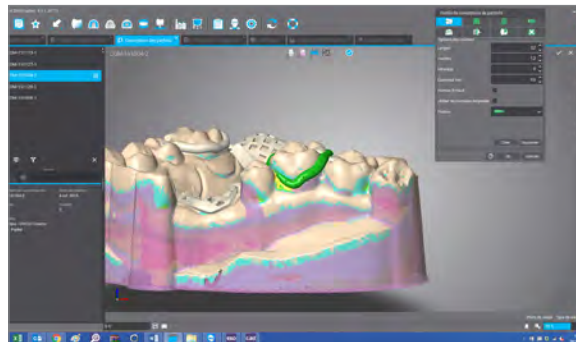


Photo 9 The hooks are in place.

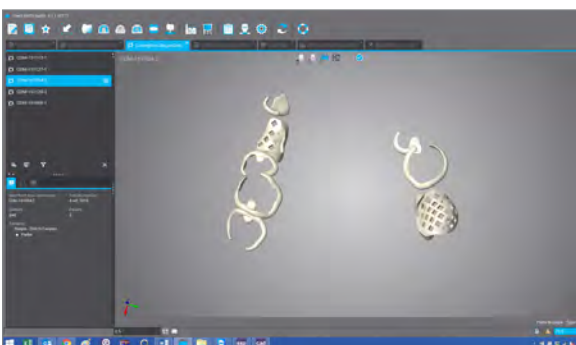
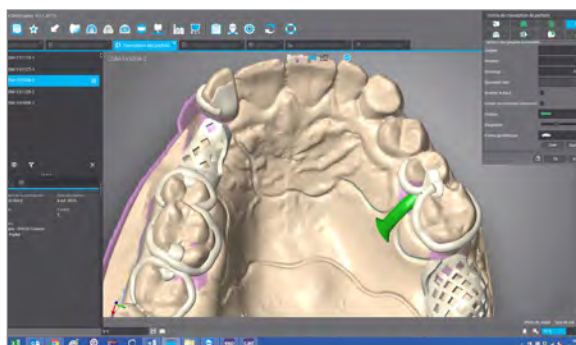
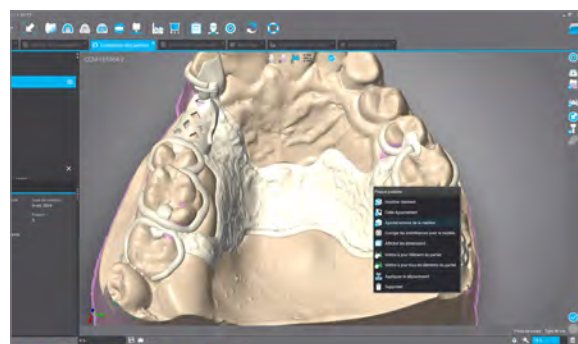
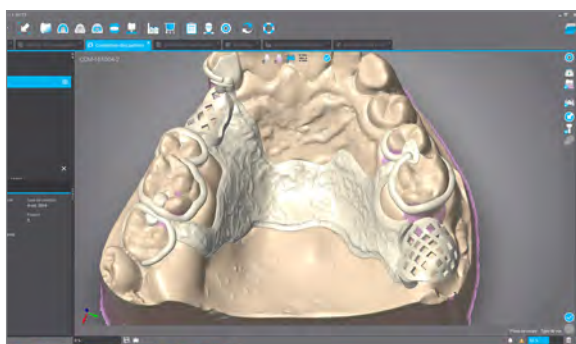
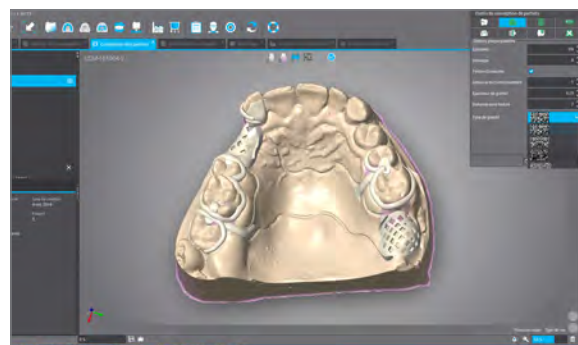
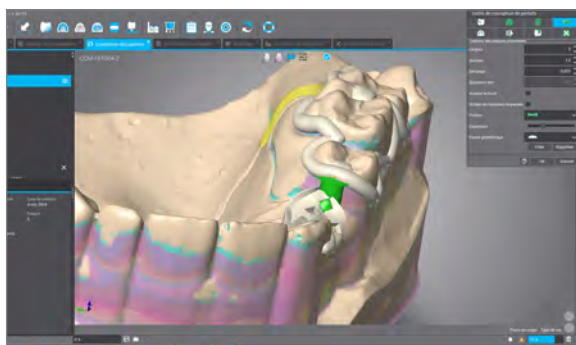


Photo 10 The hooks.



Photos 11 to 13: The brackets.



Photos 14 and 15: The plate.

Throughout the entire modelling process, we can adjust the parameters to our parts, and a toolbox enables us to add, remove or smooth the wax. The modelling process is more and more like manual modelling.

Merging the elements and obtaining the STL

Once all the preforms have been put in place, all

that remains to do is merge together all the elements. We will obtain a single STL item. At this stage, we suggest cutting out a plate and adding reinforcements as required (photo 17). We can check the dimensions of our item in a box (photo 18) for which the dimensions show us the footprint on the print plate.

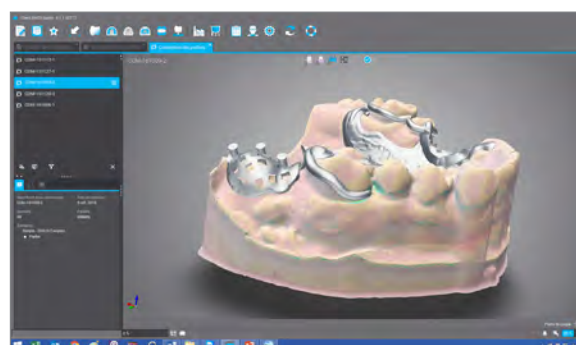


Photo 16 Retainers.

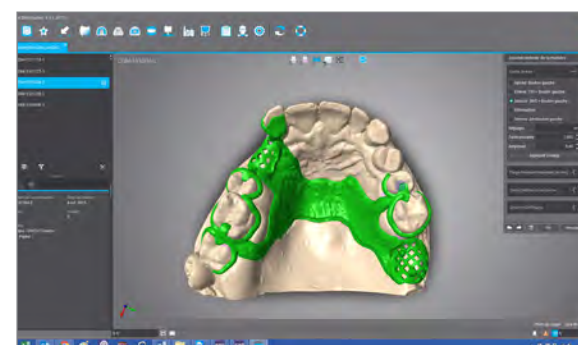


Photo 17 After fusing the elements, a single STL item remains.

3/ Positioning in the printing machines

From the Asiga Composer software, we are going to import the files from Dental Wings in the form of STL (photo 19) to carry out the printing in an Asiga Pro (photo 20) with red calcinable resin, Detax. The material and the thickness of the layers that define the precision of the item can be selected in the list of materials in the Composer (photo 21). We place the items on the tray (photo 22), and select the connection rods for correct printing (photo 23). The following stage is setting the advanced parameters that are often

given by the manufacturer. The printing time is indicated by the software (photo 24). All that remains to do is start the machine.

This is result of the printing (photo 25) – the Detax Cast resin (photo 26) has very fine grain, provides optimum precision and calcinates perfectly. It can be used for fixed prostheses (photos 27 and 28). The concept is perfectly suited for small structures. This technique requires the frame to be cast in metal.

3D MEDICAL PRINT

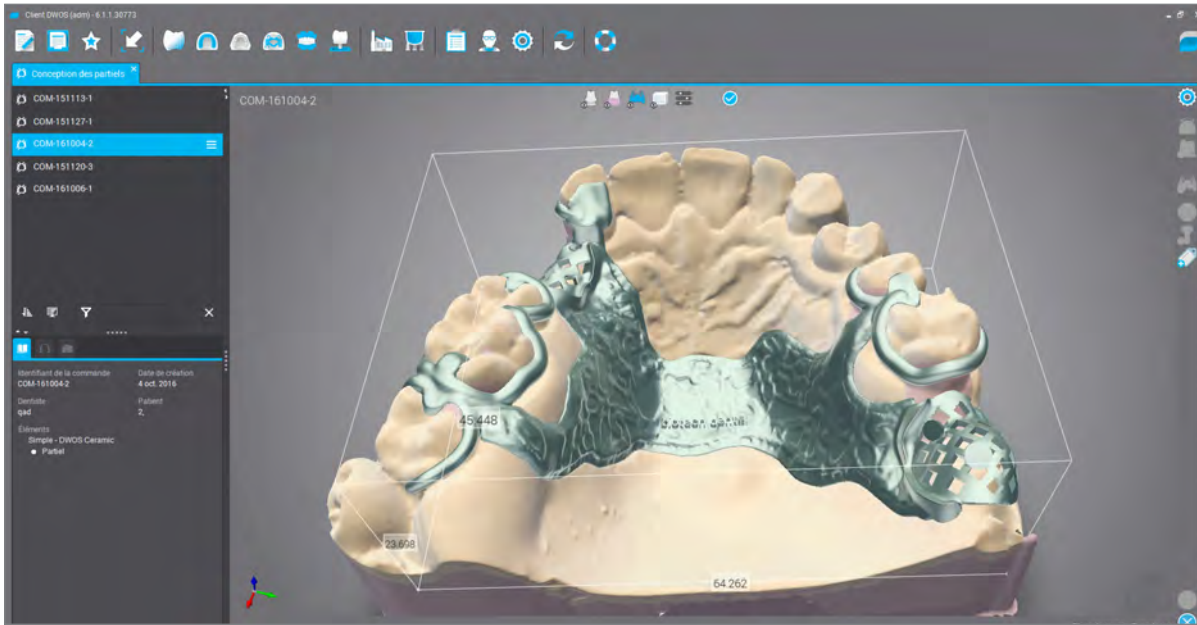


Photo 18 Check the dimension in the measuring box.

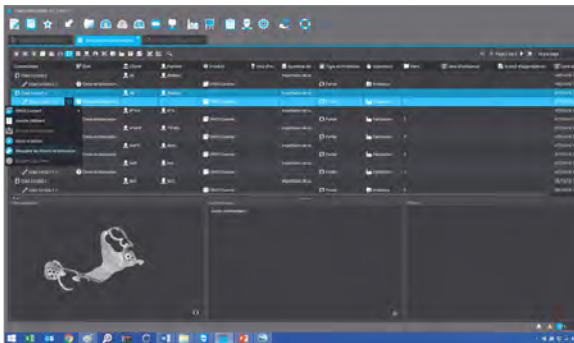


Photo 19 Import the items from Dental Wings.



Photo 20 For printing in Asiga Pro.

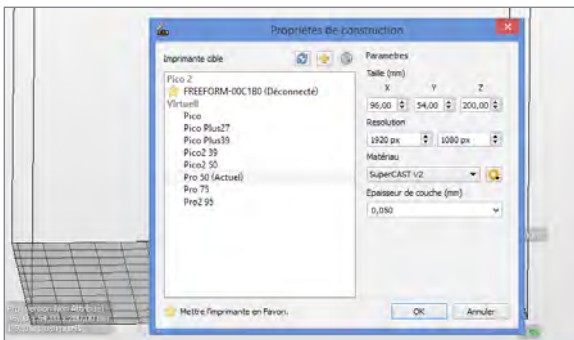


Photo 21 Choose the material and the thickness of the layers from the list of materials in the Composer.

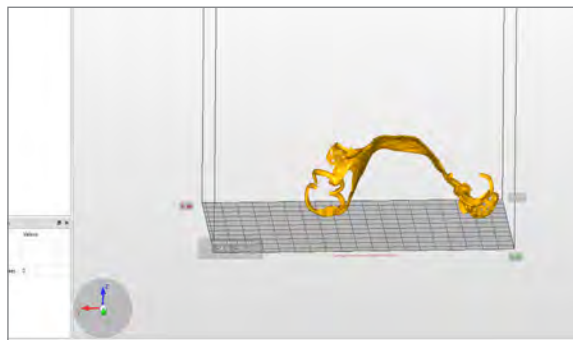


Photo 22 Position the items on the tray.

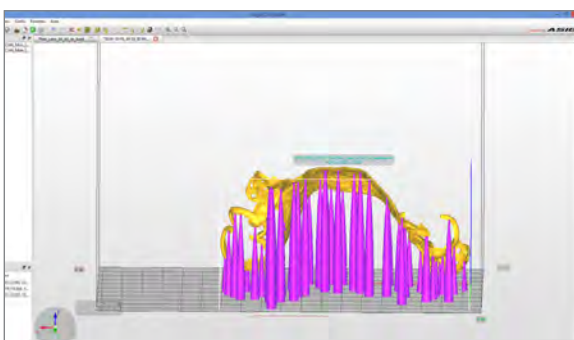


Photo 23 Position the connection rods.

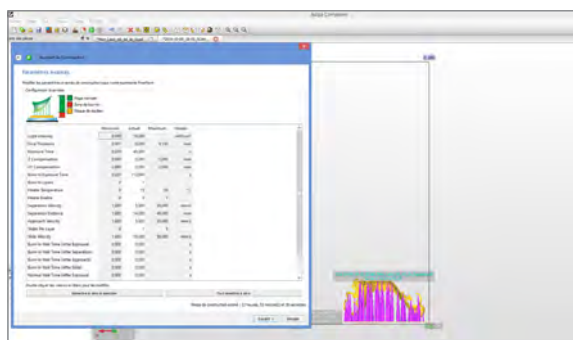


Photo 24 Set the Advanced parameter.



Photo 25 Results of the printing.



Photo 26 Detax Cast resin is very precise and calcinates very well.



Photo 27 Ideal resin...



Photo 28 ...for fixed prostheses, too.



Photo 29 Merging with a cobalt-chromium, using 3Shape CAMbridge software



Photo 30 Special powder for creating the frame.



Photo 31 Denteo Cad-Cam production centre.



Photo 32 Results of the printing after 18 hours

Direct metal manufacturing

For the cobalt-chromium laser merge, we use 3Shape CAMbridge (photo 29) software. The process is identical to that of the Asiga Composer. A powder from the EOS machine has been specially designed for making frames (photo 30).

The costs and size of the machines is considerably higher. These materials are, therefore, clearly found more in production centres such as Denteo CAD CAM (photo 31).

Results of the printing after 18 hours (photo 32).

A little bonus – combined production

Making a bridge with 6 elements with clasp and milling (photos 33 to 36). Modelling of the plate with back plate on 14, sheath on 24 (photos 37 and 38) and counter-milling on 13/23.

A last example

Creating the frame (photo 39), false gum and teeth (photo 40), the assembled case (photo 41).

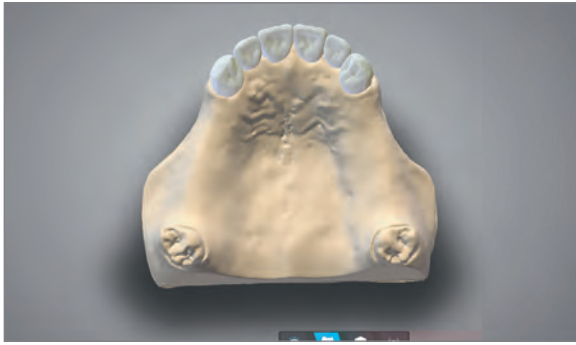


Photo 33 Creating a bridge...

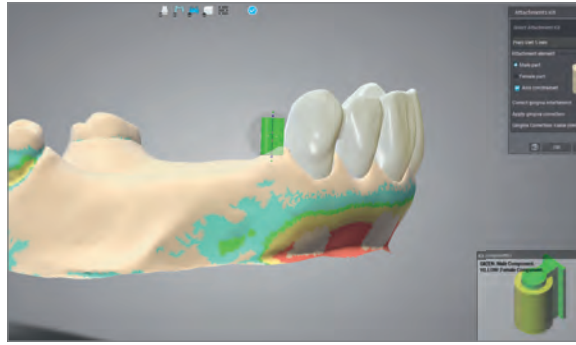


Photo 34 ... 6 elements...

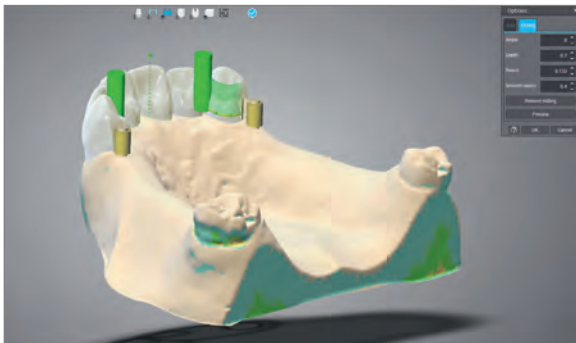


Photo 35 ...with clasp...

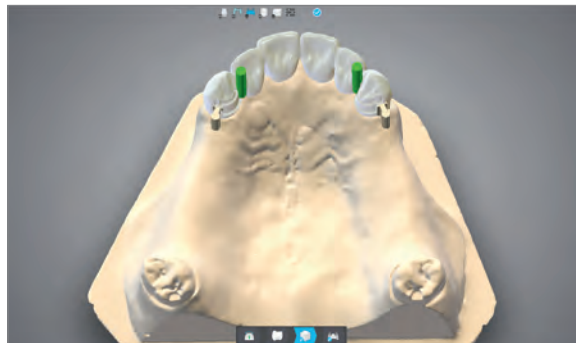


Photo 36 ...and milling.

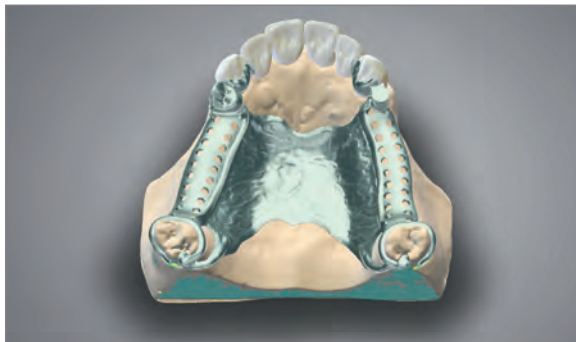


Photo 37 Modelling the plate with back plates on 14...



Photo 38 ...and sheath on 24.

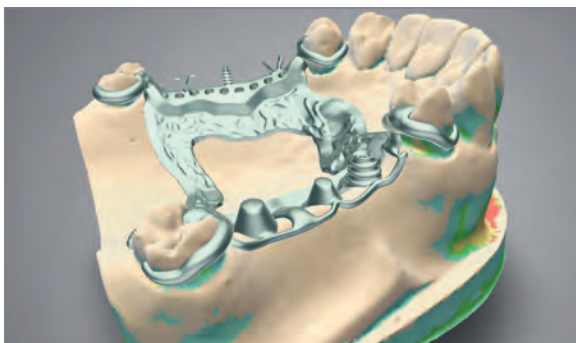


Photo 39 Frame.

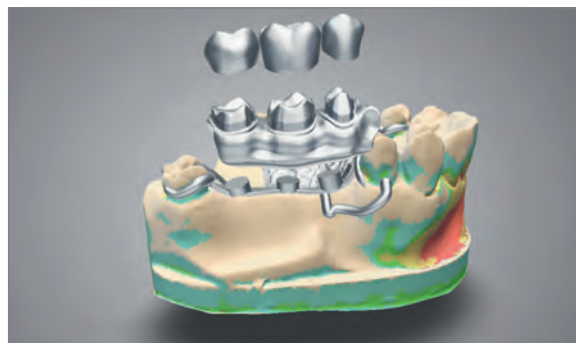


Photo 40 Teeth and false gum.

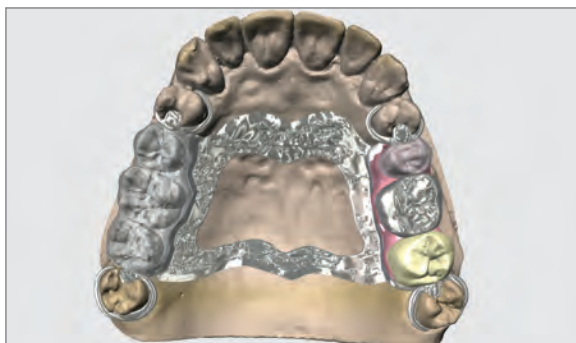


Photo 41 The assembled case.

Conclusion

So sum up, the development of CAD-CAM in French dental laboratories, especially for additional prostheses, offers new equipment, such as accurate printers, like the Asiga, and new materials that we can process in machines, such as the Detax Cast resin. It is, however, necessary to be careful with machines that offer no guaranteed validation by the material manufacturers. The quality of the machines is very sensitive, especially for class 2A materials that are worn permanently and which required a rigorous process to ensure their biocompatibility. With regard to manufacture in the final material – in this case cobalt-chromium – there are no small workbench machines on the market. We, therefore, have to use industrial machines, which not everyone can afford. So, prosthetists have to know how to work with specialist production centres. Quality manufacture and advanced machine will end up being the standard in the future.

Thanks to Dental Wings and Stéphane Buy for his cases.

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New Premium Materials
for open 3D printers



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