ASIGA pro075

An impressive laboratory printer

The **ASIGA pro075** printer used in our centre is a resin printing machine that offers multiple applications, also for numerous other professions.

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In terms of dental prosthetics, this device prints models of different colours, transparent surgical guides, occlusal transparent rims, custom impression trays, full denture bases for temporary verification, frameworks, frames, attachments, temporaries, verification models, full denture bases and monobloc teeth for occlusal verification, prototypes, etc.

DLP technology

The technology used is known as digital light processing (DLP), and comprises LEDs that project a beam of light in a selected shape, thus enabling the resin to set at specific locations across an entire surface (photo 2) in order to reproduce the shape in an STL file. This technology can be understood by comparing it to a film projector that projects an image, in this case in the shape of the item to be printed. By superimposing successive layers in this way, a solid object is obtained. It is both a simple and a reliable technology.

Efficient use of material

The machine features a vat with a base that is covered with a silicone film and offers a resin capacity of approx. 600 ml (photo 3). Low liquid thickness is required in order to print your objects, and thus several vats are possible containing different reasonably-priced resins. The large 3D systems machines (Prodways) that offer a high level of printing capacity feature vats that require 50,000 euros worth of material in order to operate. If you wish to work with 5 different types of material, it's easy to do the maths: material costs of 250,000 €.

Fig. 2 DLP technology: light projection via LED

Option of using different resins

To come back to the Asiga, this Australian machine provides an outstanding service due to its versatility as well as the option of using resins from different manufacturers. In the case of casting resins, for example, we use Asiga resins for the models (photo 4), the custom impression trays, and the full denture bases (photo 5). However for guides, rims, and temporaries of different shades (photo 6), we use Detax resins that are suitable for prolonged use in the mouth. The main requirement is to understand the sensitivity of the materials to light. It is crucial to ensure that it is within the light spectrum of 405 nm (nanometres), which is the range in which this machine operates. When using Asiga-brand resins, all the technical parameters are already automatically adjusted in the software that controls the machine. On the other hand, if you use Detax resins, for example, you must automatically use the Asiga parameters that most closely match the material in question for the first printed object, and then adapt these to the Detax resin in accordance with the results obtained.

Operation

The items are virtually attached to the metal platform, than positioned above the vat of resin, and inserted into the resin. The LED lamp is activated, the support platform is raised again, and the layers follow each other in this way until the required item has been shaped (photo 7). The quality of the condition of the surface of the models is among the most accurate, similar to the quality of the models fabricated using Prodways. The technology used enables a result of this kind to be achieved. It is possible to adjust the thickness of the layers of the printed object from between 10 to 150 microns. In our profession, we work with layers of between 50 to 75 microns, or even 100 microns in the case of guides, and this is one of the parameters that will determine the time required for printing the object.

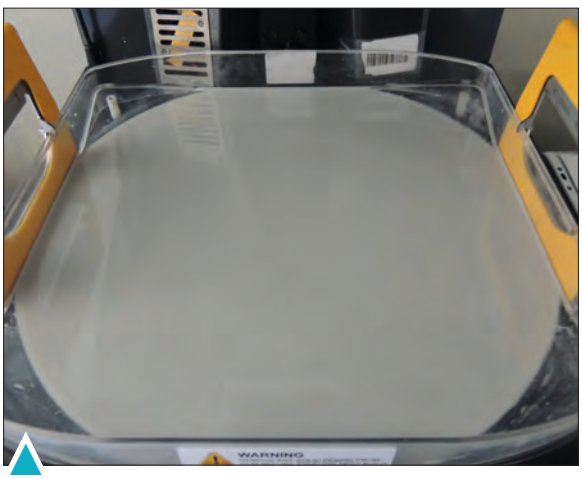


Fig. 3 Vat of resin (600 ml).

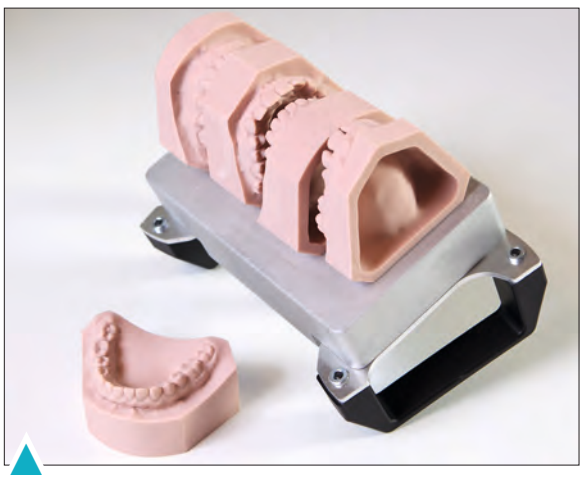


Fig. 4 Use of Asiga resin for the fabrication of models...

Fig. 5... and of full denture bases ... amongst other things.

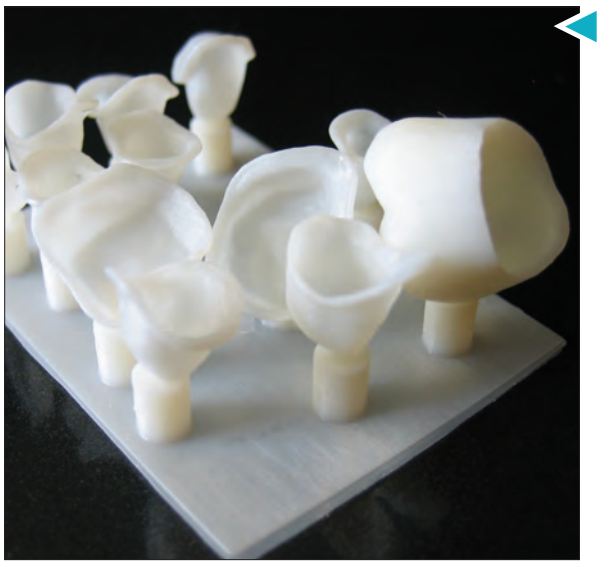


Fig. 6 Use of Detax resin for the printing of guides, rims, and temporaries of different shades.

Some specific cases carried out using different software packages

Different models on the same support plate

3Shape, Dental Wings, 3DReshaper, exocad; here are the models designed based on 3M and TRIOS optical impressions.

The objects should of course be designed using the CAD system with the settings adapted to the technology in question. The models created using 3DReshaper and Dental Wings are placed in the machine (photo 8), after which the files are retrieved in the different folders (photo 9). On the screen, all the items are placed on the support plate, and the grey resin and layers of 50 microns are selected (photo 10). Note that the models are in direct contact with the metal support platform unlike the rim created using the Dental Wings software, which is linked to the platform by small support structures that maintain the shape of the rim (photo 11). Verification of the different parameters prior to printing (photo 12). Activation of the printer using the machine's touchscreen (photo 13).

Printing onto the support platform takes an average of 4 hours: a competitive time. Once the printed objects have exited the machine (photo 14), the elements must then be detached from the metal support plate (photo 15), and the items immersed in alcohol and in an ultrasonic bath for 90 seconds. The models must then be dried and light-cured for a few minutes in a light box available in your laboratory. The result following assembly by the laboratory of the models created using the Dental Wings software is more than satisfactory (photo 16).

Another case carried out based on a 3M TDS optical impression, processed using the 3Shape software (grey model with green dies, photo 17).

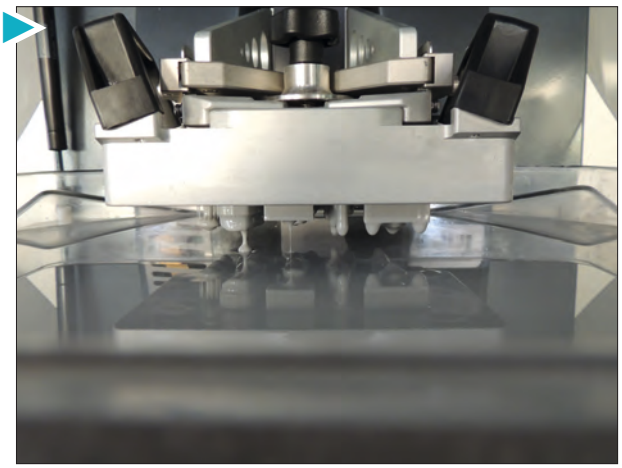


Fig. 7 The metal platform is to be inserted into the vat and the LED lamp activated.

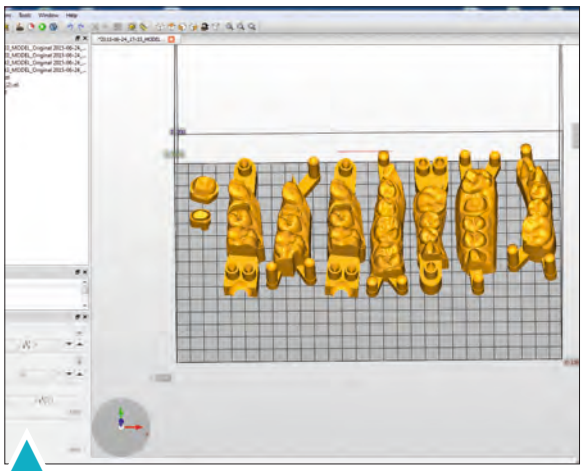


Fig. 8 The models are selectedand positioned on the building platform on the screen.

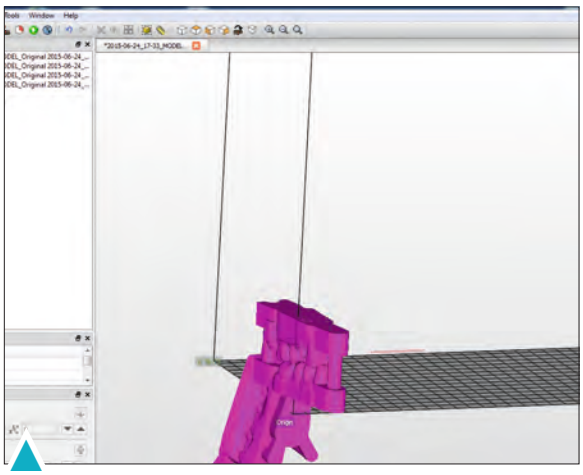


Fig. 9 Positioning of the items on the support platform

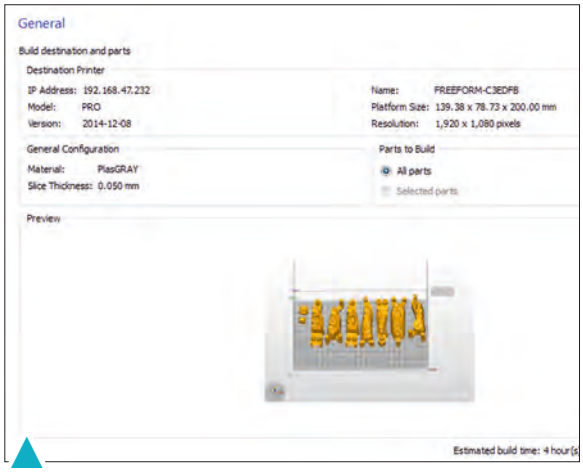


Fig. 10 Selection.of then layer thickness

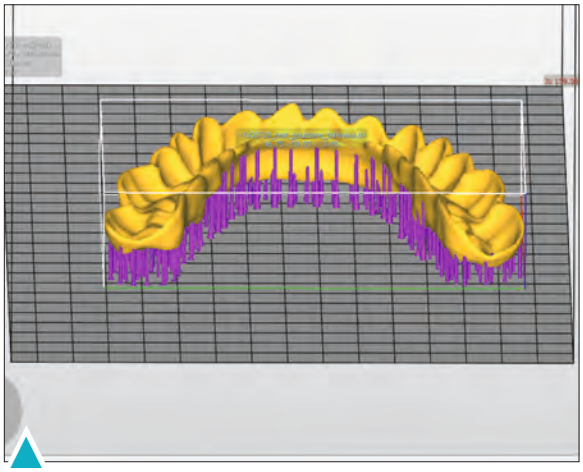
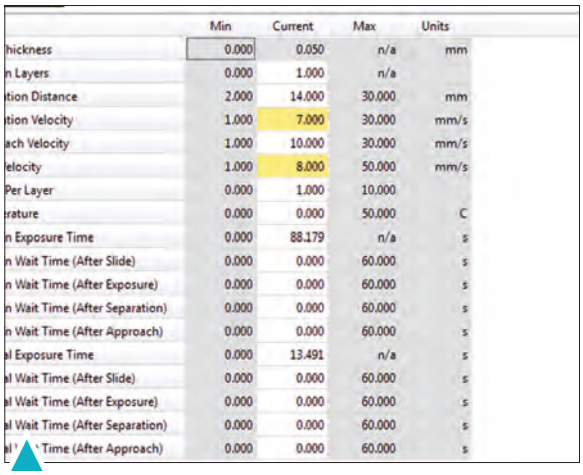


Fig. 11 Splint created using Dental Wings with support structures.



	Min	Current	Max	Units
hickness	0.000	0.050	n/a	mm
n Layers	0.000	1.000	n/a	
tion Distance	2.000	14.000	30.000	mm
tion Velocity	1.000	7.000	30.000	mm/s
ach Velocity	1.000	10.000	30.000	mm/s
elocity	1.000	8.000	50.000	mm/s
Per Layer	0.000	1.000	10.000	
rature	0.000	0.000	50.000	C
n Exposure Time	0.000	88.179	n/a	s
n Wait Time (After Slide)	0.000	0.000	60.000	s
n Wait Time (After Exposure)	0.000	0.000	60.000	s
n Wait Time (After Separation)	0.000	0.000	60.000	s
n Wait Time (After Approach)	0.000	0.000	60.000	s
l Exposure Time	0.000	13.491	n/a	s
l Wait Time (After Slide)	0.000	0.000	60.000	s
l Wait Time (After Exposure)	0.000	0.000	60.000	s
l Wait Time (After Separation)	0.000	0.000	60.000	s
l Time (After Approach)	0.000	0.000	60.000	s

Fig. 12 Verification of the parameters prior to printing.

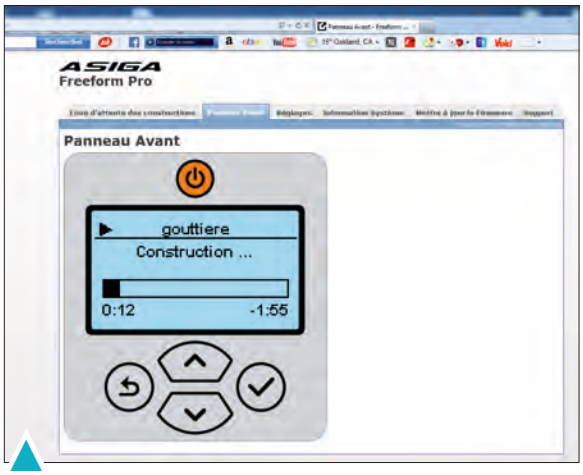


Fig. 13 Activation using the touchscreen.

Fig. 14 Object printing completed.

Fig. 15 Separation of the items.

Model with implants

Case carried out based on a MHT optical impression with NT Trading implant locators, enabling creation of the model using 3DReshaper software with integration of NT Trading implant analogues into the model, as well as creation of a removable soft tissue mask, all printed using the pro075. Note the pink or transparent shading of the gums, it's amazing (photos 18 to 20).

Surgical guide

Case of an implant guide created for the spanish dental company Phibo using the Implant Studio software from 3Shape based on a TRIOS 3 optical impression and printed using our Asiga with Detax resin, followed by varnishing (photos 21 to 25). A final case of an implant guide created using the coDiagnostiX software and printed using Detax resin, followed by varnishing (photos 26 and 27).

»Printing onto the support platform takes **an average of 4 hours**: a competitive time.«

Fig. 16 Assembled result of a model designed using Dental Wings.

Fig. 17 Another case of a 3M optical impression created using 3Shape

Fig. 18 Case fabricated with a removable

Fig. 19 ... soft gingiva mask (rose and transparent), ...

Fig. 20 ... and integration of the implant analogues.

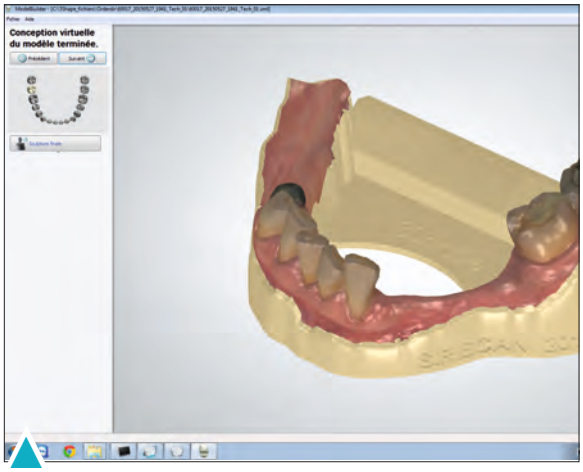


Fig. 21 Generation of a dental implant guide...

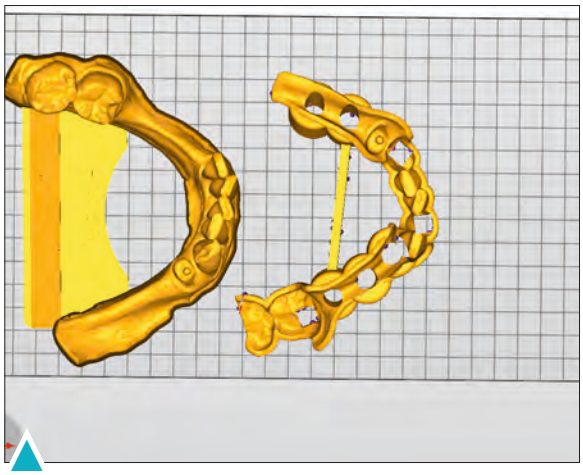


Fig. 22 ...created using Implant Studio.

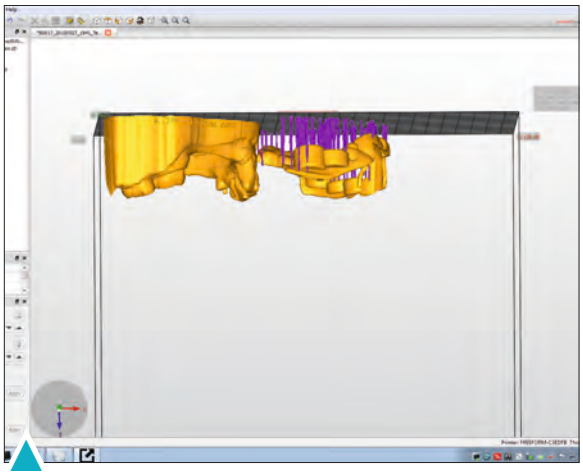


Fig. 23 based on a TRIOS impression...

Fig. 24 ...printing result using Detax resin.

Fig. 25 Varnished.

Fig. 26 Another guide using Codiagnostix...

Fig. 27 ... then varnished.

To conclude, Asiga appears to be a dream printer for a laboratory seeking for CAD/CAM production and using optical impressions to increase market shares.Handling of the software (always in English) is a little tricky, and the vats must be stricktly controlled and cleaning of the machine is easy. This technology requires accurate work. Post-processing of the items can be completed quickly with excellent results and the models are highly appreciated by dental surgeons and technicians for the quality of their properties and colours. Numerous applications may still be developed as the materials continue to evolve, generating permanent options for the mouth. The printing machines are available in two sizes, with pro075 being the largest. This 3D printer is economically priced with low maintenance costs as well as a good performing team during installation. Training and customer service are essential for this technology.

Thank you to the entire Kreos dental team and particularly to Denis and Marc for their steady, essential and appreciated supervision.

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