

3D printing process with 3D printing resins made by DETAX

A case study by Ralf Schieweg and Hans Peter Seidel of Dentaltechnik Knebelsberger GmbH

We have recently integrated the Asiga 3D printer PRO75 UV together with 3D printing resins made by DETAX into our everyday laboratory routine.

The issue upfront was: "Is this progress that provides relief, or is it more of a burden?"

Since the first 3D printers of several renowned manufacturers appeared at the IDS just 2 years ago, we were faced with the question when to enter into additive manufacturing technology or whether the time is not ready yet.

- Are the material properties satisfactory in daily routine?
- Do the printed cast templates warp?
- Is the splint material stable, yet elastic enough and still easy to polish?
- Are the trays torsion-resistant, do the tray handles hold?

Questions over questions for a dental technician when it comes to balancing investment versus success.

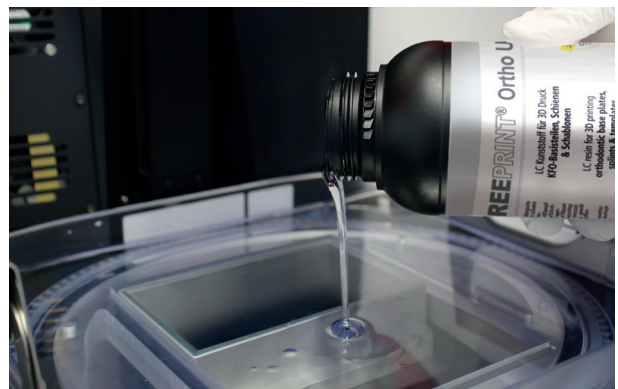


Fig. 1 Filling the resin into the material bath

But now let us go to the individual work areas and the corresponding materials:

Splints, templates

Splints were our first project. Following a brief introduction by the product management and application technician of Detax and the 3DXS company (Asiga Sales Germany), we started with the first splints. These are positioned vertically and printed after approx. 3 hours. Due to the size of the building platform and the material bath (Fig. 1) of the printer, this layout allows printing approx. 12 splints in a single process. The "building job" is

cleaned after draining the non-polymerized resin. The residues of the 3D resin adhering to the surface are removed in an ultrasonic isopropanol bath for 2 x 3 minutes. Final polymerization is performed with the Otofash G171 curing unit by NK Optik



Fig. 2 Otofash G171 – post-curing 2000 flashes

(Fig. 2) under protective gas (nitrogen). 2 x 2000 flashes take only approx. 6 minutes to complete post-curing. Quick removal of the supports, and the first splints

were finished. A convincing result with little effort. The biocompatible Freeprint® Ortho UV (MedProd 2a) material by Detax (Fig. 3) is easy to process and polish with just a few moves after curing.

Just in case post-working is necessary, for example, if a change in cuspid guidance needs to be incorporated, the Detax company includes a material in its portfolio to handle this task without problems: Freeform® (Modelling Composite transparent).

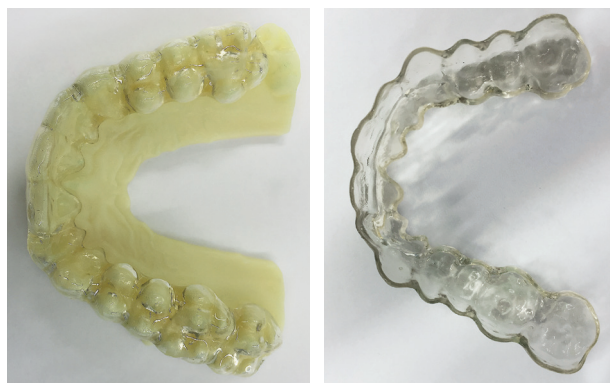


Fig. 3 printed splint on printed model

Individual trays

We design these with the 3shape Software and the 3shape Scanner. What needs to be observed? Determine the tray length, blocking out is performed automatically by the software, select the matching tray handle from the library and position in the desired place. The design process is completed in only a few steps. Then we printed the STL file in the Asiga printer with the Freeprint® tray UV resin by Detax (Fig. 4).

After a few tests, we found the construction parameters and minimum thickness of 3 mm as being perfect for providing good stability during demolding in the mouth.

The printing time took 1.5 to 2 hours (horizontal) or a good 4 hours (vertical), then the tray is transferred into the ultrasonic isopropanol bath for 2 x 3 minutes, same as for the splints. Post-curing is also performed in the Otofash G171, so that the tray material achieves its final hardness.

After removing the supports, the trays are finished. The feedback from the dental practice regarding our printed objects was positive throughout. To put it in words: "They look good, as smooth as a customized industrial product."

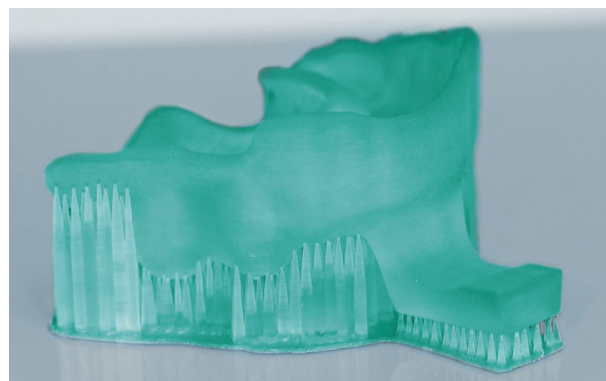
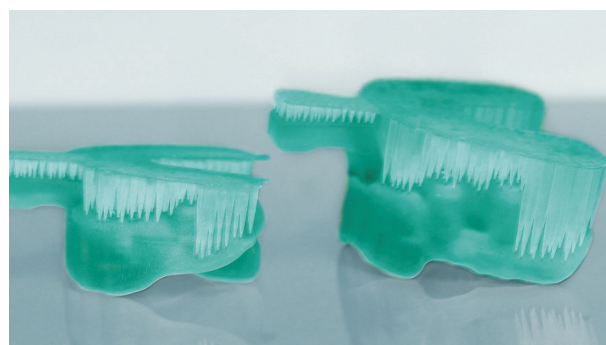


Fig. 4 individual trays, printed from Freeprint® tray UV

Model casting

We also designed frameworks for model casting with the 3shape Software and printed them with the Asiga printer. To do this, we used the Freeprint® cast UV resin which remains slightly elastic after



Fig. 5 model casting on plaster model

curing and can be processed further easily on the working model (Fig. 5). Again, cleaning is performed in the isopropanol bath followed by curing. Steps which quickly become a routine.

The construction of the model casting plate is quick, placing the supports is rather more elaborate than for splints and trays. We need to place supports at every clamp arm and angle. But after a few attempts, this also worked. The result was very convincing as the fit on the model was extremely good.

We only printed model casts horizontally in a time between 1.5 and 2 hours. Detax has also developed a modelling resin, easyform LC, for this material for manual addition, if required. Implementation of casting was unproblematic, and demonstrated clean burn-out, good cast surfaces and fits.

Models

Model production would have been of interest to us. Unfortunately we had no clinicians working with intraoral scanners with an STL output format. Thus we were regrettably unable to test the corresponding freeprint® model UV material (Fig. 6). However, we are convinced that practices will be providing us with such data in the near future. Then in-house fabrication of the model in the laboratory will be able to utilize fast fabrication on the market.



Fig. 6 model materials Freeprint® model

Polymerization unit

Otoflash, post-curing with 2 x 2000 xenon flashes under nitrogen for 6 minutes.

Produced excellent surfaces for all pieces of work.

Sterilization

Freeprint® ortho is validated for sterilization in autoclaves according to EN ISO 17664.

Disinfection

Wet disinfection of the Freeprint® ortho components can be performed with the MD 520 disinfectant by Dürr applying the immersion process.

Conclusion

3D printing with materials made by DETAX is convincingly easy, in all aspects! We have obtained fantastic printing results with maximum precision & accurate fit, with both fast fabrication and low efforts in time. Uncomplicated handling through exchangeable material baths, no loss of material, orderly storage of the resins & attractive prices. That is dental progress which provides relief.

Equipment:

ASIGA Freeform PRO 75 UV,
NK Optik Otoflash G 171

Material:

Freeprint® ortho UV Class 2a
Freeprint® cast UV
Freeprint® model UV (sand, ivory, grey)
Freeprint® tray UV Class I (coming soon)
Freeform® Class 2a (gel/plast)
easyform gel

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STAY FREE – PRINT FREE

**MEDICAL
DEVICE**
CLASS IIA

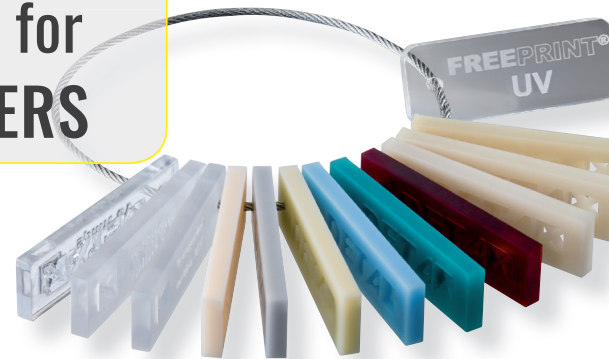
DETAX.DE/MEDIKLIDE



FREEPRINT®

High-end materials for OPEN 3D PRINTERS

FREEPRINT® 3D
Application clip



Freeprint® ortho

Orthodontic basic parts,
Splints & Templates

- clear-transparent
- autoclavable, for wet disinfection
- Medical device Class Ila

Freeprint® model

Dental master and
work models

- Max. surface hardness
- Excellent building precision
- Grey, ivory, sand

Freeprint® cast

Casting objects for
precision casting

- Residue free burning
- Low viscosity
- Precise reproduction

Freeprint® temp

Temporary crowns & bridges

- Natural tooth aesthetics, A1, A2, A3
- High mechanical stability
- Medical device Class Ila

Freeprint® model T

Dental models for
thermoforming technique

- Temperature resistant
- High edge stability
- Efficient use

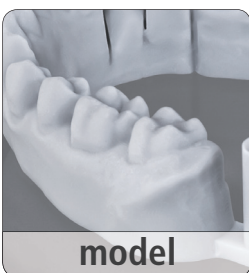
Freeprint® tray

Individual & functional
impression trays

- High dimensional stability
- Max. building speed
- Medical device Class I



tray



model



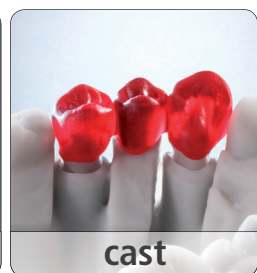
model T



ortho



temp



cast