TINKER inkjet pilot line celebrates completion

The TINKER project celebrates a huge milestone in its progress – the TINKER Pilot Printer is ready to print the two demonstrators for the RADAR sensor package use case: Inkjet printed waveguide antenna structures on PCB & assembled and connected daisy chain bare dies in cavity (inkjet wirebonding).

Fig. 3: Silver conductive ink printed on a 3D surface

All developments of the laser system at Forth for the laser sintering and laser drilling processes are complete and the laser setup is ready for integration into the inkjet printing platform. Similarly, the R&D Setup from Profactor (LP50, Multi-Material-Printer, Laser Stage) is now fully upgraded – and the TINKER Pilot Printer is now printing the first samples.
The Pilot Printer was developed, assembled, and commissioned by Notion Systems, as an essential part of the project to be used for the prototype fabrication of RADAR sensor packages via inkjet printing. It is equipped with four printheads and integrated post-processing tools (UV-LED and NIR-Lamp). Complementing the printer is the Laser System developed by Forth for laser sintering of conductive inks (Ag NP inks, Cu NP inks) and laser drilling of dielectric inks.

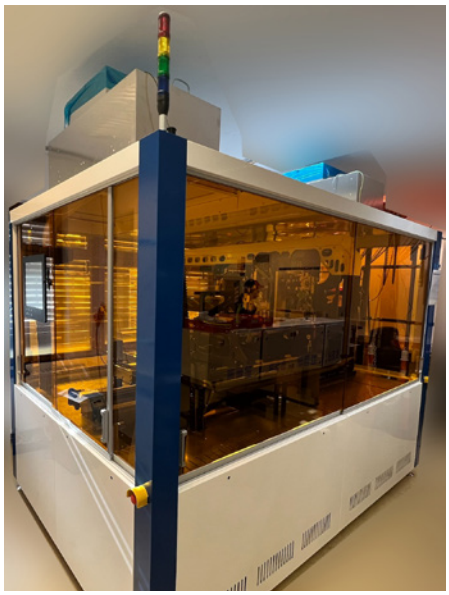

Fig. 1: TINKER Pilot Printer from Notion Systems

Conceptually, the 3D printed parts are manufactured on a moving print table that travels below the printing and curing processes to add the functional inks layer by layer. The machine is highly precise and allows for the highest achievable placement and dosing of individual inkjet droplets. Hence, it unlocks the full flexibility of digital inkjet printing. The printer carries four different process inks simultaneously and its productivity far surpasses standard laboratory inkjet printers.

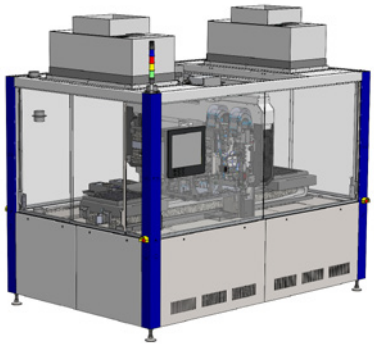

Fig. 2: Digital rendering of the Pilot Printer Concept

How did we get there?

To generate 3D printed samples for the TINKER consortium prior to the commissioning of the TINKER inkjet printer platform, an n.jet lab printer at Notion was upgraded to print UV curable dielectric Ink from Tiger and conductive nanoparticle silver Ink from PV Nanocell.
Forth contributed with their expertise on laser sintering and drilling processes, to create the in-situ integrated laser system for the inkjet platform, taking into account characteristics of the light source, active cooling, optics related and connectivity optimisation. Their team has developed a dedicated hardware to support the additional optics, a customised software to control the parameters for laser processing and performed laser matter optimisation parametric studies and characterisation of the produced structures. The Forth-developed prototype laser sintering and drilling station is now used for sintering of both Ag and Cu nanoparticle-based inks and laser drilling of dielectric inks.
During the project, upgrades were made to the R&D equipment at Profactor, such as the printers (LP50, Multi-Material-Printer) and the post-processing devices (laser stage). The multi-material-printer is an R&D prototype inkjet printer capable of printing up to four different materials in one printing process, with integrated lamps for post-processing (UV LEDs, high-power NIR), which enables to print both dielectric and conductive inks in a single printing process with subsequent curing/sintering in a single machine.

What's next?

As the Pilot Printer is printing the first samples with UV-curable dielectric ink and silver nanoparticle ink, the next steps will be to generate 3D printed structures at high throughput, and to implement an interoperable interface, which will showcase the closed-loop capability of the TINKER process chain.
Demonstrators printed for the RADAR sensor use case and the TINKER project partners will be on-site at LOPEC 2024 Exhibition & Conference.

Image sources: TINKER