

FRANCE

3DCERAM Sinto: Turnkey Provider for Ceramic Additive Manufacturing

3DCERAM Sinto, founded in 2001 by Christophe Chaput and Richard Gaignon, is a process provider (machine, mix and services) in three areas of application for ceramic Additive Manufacturing (AM): industry (e.g. defense, automotive, investment casting/foundry cores), aerospace and aeronautics (e.g. mirrors), and biomedical (e.g. eye implants, cranial implants, etc.). Since end of 2017, the Japanese company Sinto is the main shareholder and then 3DCERAM took a new dimension and increased its growth, growth in terms of geography (the market coverage ranges from Europe, the Americas to India, Asia and Russia) and growth in terms of printing solutions comprises basic versions dedicated to prototyping and R&D up to printers for industrial mass production. Richard Gaignon (RG), CEO and co-founder, explained the progress the company has made in spite of COVID-19.

CA: *How have you reacted to the problems that have come up as a result of COVID-19?*

RG: The answer is quite easy. 3DCS digitalized its whole chain: from first virtual contact to customer to online commissioning and maintenance. It sounds easy to do but in fact this has been a lot of work!

At a very early stage of COVID-19, the French President Macron predicted that the world AFTER will not be the same one as the one we used to live in. And this is absolutely true. Back at the beginning of Q2/2020, we started working very intensively on new strategies:

- How to communicate or get in touch with customers as travelling is getting quite difficult;
- How to organise installations abroad and start machines without sending any commissioning engineers.

In October 2020, we launched our new website, which includes an innovative way to communicate with potential customers: a virtual showroom. The visitors on this virtual show room can choose what they are interested in and send their questions to our regional sales managers who can or-

ganise a live demo though a pre-fixed appointment. We prefer live demos to webinars, as they are individual interactive appointments. The customer can visit and see the site or the machines as if he was physically in Limoges.

Interactivity is our motto and thus we also launched a video concept called “3DCeram Inside” which consists of short videos, in which experts answers questions about ceramic 3D-printing, we get from beginners or confirmed users. All those videos, as well as “marketing” videos of machines, are all on our own YouTube channel. In addition, we are quite active on social networks – mainly LinkedIn.

In the meantime, 3DCERAM Sinto’s business has been very focused on equipment supply and we had to find solutions to put equipment sold abroad into operation. New systems have been set up to remotely support the installation of machines.

This was especially important in the period with lots of travel restrictions, especially on international scale. We have trained our local re-sale partners to provide assistance, and we are combining this with our remote services. We gained

valuable experience with this new approach in 2020 e.g. with installations in Russia, Asia and USA. We have invested a lot in this remote way of doing business to increase indirectly our expert/support capacity. We are breaking down barriers and we can see changes in the mind-set of our customers towards digitalization. We shall continue to work on these tools, analysing customer feedback and developing them accordingly.

I have to admit that COVID challenged, and is still challenging, a lot 3DCERAM. We had to adapt ourselves fast and in an efficient way to this, it is a FULL DIGITAL challenge which also tightens our relationship with our resellers.

CA: *What are the challenges involved in getting AM from prototyping to mass production?*

RG: We have developed tailored equipment step by step to meet different customer needs. We offer machine type C100 in two versions: C100 EASY LAB, e.g. for universities to study the technique and develop materials. It is an entry level product and is easy to use. The C100 EASY FAB version is designed to switch easily to the industrial printer C3600 ULTIMATE with its huge building platform (600 mm × 600 mm × 300 mm). As a process provider, we are responsive to the needs of our customers and we are keen to adapt our offer to those needs. Thus, in some very specific cases we can rent the C100 FAB printer for a certain time to allow the customer to master the process and to validate this technology in his production line.

AM has its own unbeatable advantages: manufacturing without moulds, but also providing high flexibility, individual design and the short reaction time to market. But AM will really take off if it is considered as a fully production method for the ceramic industry. 3DCERAM Sinto is offering automated production lines for all following steps: unloading



*Fig. 1
Christophe Chaput (l.) and Richard Gaignon*

ing of the printer C3600, sleeving of the slurry to be reused in the printer, pre cleaning of the parts, and finally loading/unloading of the furnace for debinding and sintering. The entire process with the C3600 is designed to be efficient with minimum human intervention to achieve simplified production management in an integrated chain. In our vision, 3D-printing is evolving to become a fully-fledged production tool able to take up the challenge of mass customisation as opposed to traditional mass production.

The sanitary crisis, we went through, shows another big advantage of 3D-printing: local production near to the need. AM is fundamentally changing the spirit of production in the basic sense of the word: It reduces the need for expensive stocking of multiple parts and is part of the solution for environmental issues, to produce the right quantity of parts with little or no waste and low CO₂ impact.



*Fig. 2
Live demo*

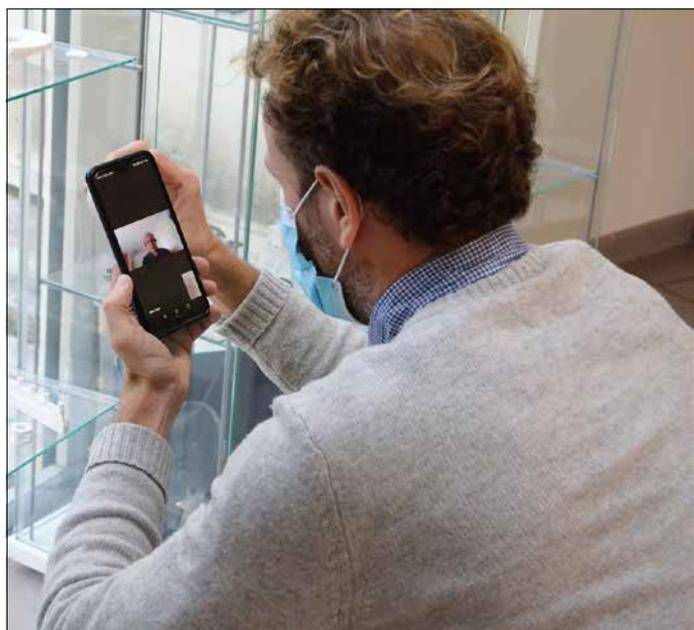




Fig. 3
The printers range of 3DCERAM Sinto

CA: How do you support customers in training with AM technology?

RG: We support our industrial customers from the beginning to the delivery of the 3D-printing production line and even after. For industrial people, we study their ROI needs, a key indicator in production tool investments. We showcase the machine printing parts in our facility. Remember what I told you before: now we are able to do live demo even with customers living in countries far away from Limoges! We provide on-line process support for users from beginner to confirmed level. This includes CAD file creation, design of 3D-print support, a manufacturing troubleshooting guide, as well as preparation of the building platform and sintering process. But once the machine is delivered, our partnership is far from being over. The after sales, training and process audit allows the clients to develop their skills further and then reach the intended ROI.

As the different user segments have specific needs, it is key to partner with key players in certain markets. This is why, we have started new collaborations with technology partners in 2020. One example is AVIGNON CERAMIC, which specialises in the design and manufacture of ceramic cores and offers high end CIM solutions for production of casting parts to the investment casting industry. The partnership is

willing to give the answer to the expectations of the actors of the investment casting, founders and manufacturers of nuclei, of an interlocutor able to propose a turnkey solution. This new service proposed ranges from the definition of raw materials, depending on the alloy chosen and the casting mode, to the realisation of test cores to validate the process at the foundry. We will support companies wishing to integrate 3D-printing into the various stages of the process, as well as carry out tests to integrate this new technology.

CA: You can provide various ceramic pastes (oxide and non-oxide ones), do customers ask for individual formulations, too?

RG: Sure! This what we do from the beginning and we are increasing our portfolio every year! We offer a full range of ready-to-use ceramic mix suitable for our CERAMAKER printers.

We can develop a formulation for mix on request based on materials the customer is already using. We provide a definition of the printing and firing parameters specific to this formulation.

CA: What is 3D-AIM?

RG: 3D-AIM is customised support for aerospace companies which want to switch to AM for their future projects. This means we help the company to develop the ceramic application from scratch to part production. We start with the definition of technical specifications, mechanical preferences, economic specifications and so on. It's a flexible approach that can be adapted to different project phases. The project can start from a blank page to end in the production of parts, or can target only modifications to existing ceramic parts. Overall, 3D-AIM is a global approach to manage the design and the production phases and then the technology transfer to the customer based on very advanced software. It also reduces the need for highly skilled operatives. It consists of three steps – analysis of feasibility, definition of a risk analysis and a de-risking plan as well as risk mitigation of the application in our 3D-printing process.

Thanks to a new partner in the medical field, we will develop 3D-AIM also for this market.



Fig. 4
Printing with industrial printer C3600

CA: *Is innovation only concerning hardware or mix?*

RG: Innovations by 3DCERAM have always been thought to answer markets needs. As we saw, we have a wide portfolio of machines, such as the C100 Hybrid for universities and research centres or the C100 EASY FAB and C3600 ULTIMATE for industrial application.

We have many materials and last but not least, we are fine-tuning our services with BUILD-IT software which has been released in November 2020. In order to explain what brings BUILD-IT to our customers, we have to go deeper into the process. In 3D-printing, if the UV source is below the parts in construction, supports are strongly attached to the parts and thus are very difficult to be removed. The technician needs time to create the supports and time to remove them (if the parts get not damaged during removing). In our technology, supports are not mandatory and when some were needed, then we had to “cad” them. In order to save time to the customer, the new software BUILD-IT automatically creates the support.

This software is also interesting because it's integrated in the CERAMAKER software as an option. That means this software therefore precisely meets the exclusive technology of 3DCERAM consisting to polymerize following specific parameters. It also eases the step of scale factors to compensate the shrinkage during the firing, check the thickness of the part and other advanced features but it will be too long to describe here.

CA: *Are your printers equipped with tools to produce multi-material parts?*

RG: We have two printers which can print multi materials. A lab machine: the C100 Hybrid and mid-size machine able to print 5 material at a time: C900 Hybrid. This approach calls for comprehensive knowledge of pre- and post-processing, especially when metal and ceramics have to be co-sintered. For example, in the electronics industry, 3DCERAM's hybrid approach has a range of applications, including rapid prototyping of ceramic PCBs, LTCCs (Low Temperature Cofiring Ceramics) or HTCCs (Hot Temperature Cofired Ceramics). The hybrid technology has several advantages compared to conventional electronic prototyping methods, including lower costs and faster lead times. Moreover, the technique's free path capability can also increase electrification density within electronic devices, making them more efficient.

We have also created a hybrid process capable of embedding other materials into ceramic parts. The technology in



*Fig. 5
Satellite mirror produced using AM*

question is not being brought to market as a new machine. Instead, 3DCERAM has developed an update for its existing ceramic AM platform, which increases process flexibility and reduces the cost of hybrid applications. In this case the 3DCERAM's hybrid AM process is based on the company's existing laser stereolithography AM technology and adds a hybrid scraper tool. This device is equipped with a dispensing system, which makes it possible to integrate other materials into the ceramic part as it is built.

CA: *What is your vision for ceramic 3D-printing over the next few years?*

RG: Even if now it is rather complicated to have a clear view of the market, ie, which AM provider will survive after COVID-19, which geographic area will expand rapidly ...

What we know is that 3DCERAM and its strong shareholder Sinto will be a worldwide key player for next decades. For instance, we invest in a new building of 3000 m² near Limoges and the move into this new facility is scheduled for late January 2021. This will allow us to fulfil all our commitments to customers: increase production volume in terms of machine, materials and services! Let's imagine FULL DIGITAL CHALLENGE together!

CA: *Thank you for talking to us.*

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