# Manufacture, Redefined: 3D Printing Meets Digital Production

**With over a decade of experience in the field of ceramic 3D printing and manufacturing, Lithoz/AT has already seen just how rapidly new production techniques and technologies can grow within the industry. Ceramic 3D printing is fast becoming an established production technique in the manufacturing world thanks to the freedom it offers in design, as well as its rapid, sustainable and simplified production process. One major way in which this manufacturing technique is able to be so flexible is the integration of digital production into the manufacturing workflow. Defined as the integration of computers and online systems into the world of manufacturing, digital production is completely changing the way in which both suppliers and customers interact in the modern world.**


*Fig. 1*
*Digital production enabled by ceramic 3D printing*

While digital production is still seen as a rather futuristic topic, the truth is that this technology is actually becoming a key part of production today. As more and more machines and companies gain the ability of digital integration within their production workflows, they are becoming globally connected and therefore greatly developing their opportunities for creativity and innovation. Innovators are now able to effectively collaborate online, encouraging the customization and improvement of 3D-printed parts and designs and allowing for the advancement of this manufacturing technique in all kinds of different industries.

Here at Lithoz, we have recognized the importance of digital production and have thus developed our entire range of 3D printers to be ready for key elements of this manufacturing technology, such as Industry 4.0 and the Industrial Internet of Things.

But for companies not yet involved, it may not be clear just why this is such an industrial advantage. It is here that we must highlight the growing power of digital production - not only in 3D printing, but also the general manufacturing world – to ensure that as many companies as possible take advantage of these integrated systems to make their workflow more efficient than ever.

**Reduce your inventory – optimize your storage**

One of the clearest ways in which digital production can benefit manufacturers is the

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fact that inventory is moved online. When it comes to traditional methods of manufacturing, far more storage is required due to the tooling involved. Suppliers who produce many different parts for different customers via injection use molds, which must be physically stored in warehouses. The costs related to the production of the molds, as well as the price of storing them, have simply been an unavoidable aspect of ceramic manufacturing until now.

Using digital production, however, the problems of tooling are eliminated. 3D printing as a digital technology requires no molds, therefore removing the issue of physical storage and the related costs as the design files are digitally stored in an online inventory. By removing the extra step of mold production, the entire process is simplified and streamlined, now only needing the online design to produce the final part. In this way, 3D printing utilizes digital production to make manufacturing a more cost-effective and efficient process.

**Flexibility in digital production**

As we have already seen, the lack of tooling required during 3D printing is advantageous in terms of storage. The removal of molds in the production workflow, however, also eliminates other potential problems in terms of mold-induced defects. If a problem is found with the mold during traditional


*Fig. 2*
*Full documentation of production data such as material batch numbers*

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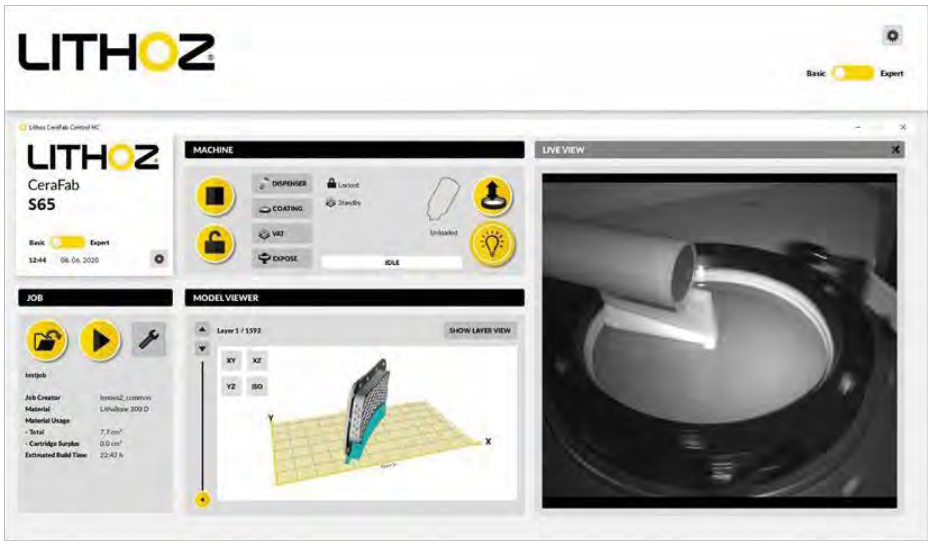


*Fig. 3*
*Real-time process monitoring and automatic control* *(Figs.: Lithoz)*

manufacturing processes, the entire workflow is disrupted – suppliers must wait for the mold to be repaired or for a new mold to be produced before they can start manufacturing the final product, greatly extending lead times for the customer and increasing costs. When using digital production, however, edits can be made quickly and easily to the digital or .stl file, allowing for a rapid fix or improvement to the product before printing the part.

In addition, by modifying the design instead of the mold, customizations can be made to produce components which are exactly suited to the customer's needs, lowering both the cost and time needed for design changes. The freedom in design offered by 3D printing is simply unparalleled; complex designs are entirely achievable thanks to digital software.

Using digital production, the turnaround between design and produced part is greatly reduced as products can be tested and finalized rapidly, giving companies a faster time-to-market. In this way, digital production allows for more flexibility in manufacturing than ever before, while also allowing for more trust in complex designs than can be offered by conventional manufacturing.

**Automate your production workflow**

Production therefore allows for rapid design changes as molds do not need to be physically edited. However, another way in which digital production simplifies and speeds up manufacturing is that process and quality control become fully automated processes.

By integrating intelligent software into the manufacturing process, potential defects are marked up to be solved before the part is produced. Digital production eliminates the natural obstacle of human error and thus makes the entire process more reliable and economical, saving time, money and stress by removing faults in the early stages of production. The integration of such software allows companies to benefit from automated quality checks, as well as providing complete traceability along every step of the production workflow to make the series production of a reliable and high-quality product more attainable than ever before.

Lithoz have already successfully implemented digital solutions to give users more control over their product's creation. Intelligent CeraVision software allows for remote control of the print job, as well as offering specific analysis and production monitoring every step of the way. In order to help companies manage their increasing production volumes, Lithoz has also developed their CeraDoc software to guarantee the highest levels of quality assurance and traceability throughout, allowing innovators to more efficiently scale their 3D printing operations. Quality assurance management functions are seamlessly integrated and users are able to easily export documentation, such as reports or datasheets, to ensure all quality assurance requirements are met.

**Lithoz's digital vision: your partner for Industry 4.0**

As a pioneer in ceramic 3D printing, Lithoz has a vision for advancing this technique through the integration of digital production. As we have already seen, this technology has the power to completely transform the world of 3D printing and, as your partner in digital production, our technology will enable you to completely redefine the limits of traditional manufacturing.

By opening the door to digital production in manufacturing, companies have the tools to customize their designs quickly and easily, making the every step of the process more accessible and simplifying the procedure along the whole process chain. This new level of ease also means that innovators can look into new applications for 3D printing, broadening the range of possibilities for this powerful technology.

With the range of Lithoz printers available, companies are supported throughout their production growth. Starting with the CeraFab Lab L30, innovators can fine-tune and perfect designs before moving onto large-scale production with the CeraFab System industrial 3D printer. By enabling simple and connected scalability in this way, the entire manufacturing process is covered no matter the volume of production.

Every Lithoz printer also has the advantage of powerful CeraDoc and CeraVision analysis software, which give full digital control over the entire production process. The creation of the CeraData Server, a singular data storage platform connecting multiple machines to one software, also greatly simplifies the process of transferring data. The single platform enables a seamless data flow between machines, providing unmatched traceability and scalability to further drive 3D printing towards industrialization. By networking machines and machine data together in this way, the process matches the pace of companies as they increasingly digitize their operations.

"Through the advancement of digital production in 3D printing, we will establish this technology even more firmly as a manufacturing technique and will drive the growth of ceramic 3D printing globally and across many fields", stated Lithoz CEO Dr Johannes Homa.