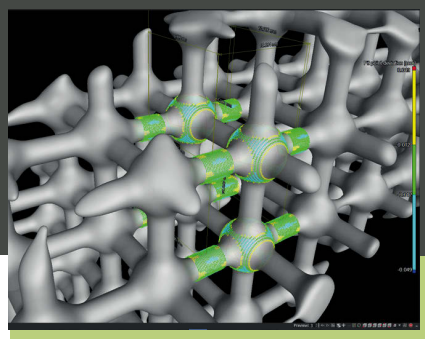
Quality Control in Additive Manufacturing

WORDS : CHRISTIAN LOHMÜLLER



DESPITE ALL ITS ADVANTAGES, ADDITIVE MANUFACTURING (AM) NEEDS TO WIN THE TRUST OF MANUFACTURERS AND CONSUMERS IF IT IS TO BECOME A SERIOUS ALTERNATIVE TO ESTABLISHED MANUFACTURING METHODS. DELIVERING QUALITY IS THE ONLY WAY TO ACHIEVE THIS. HOWEVER, AM POSES SPECIAL CHALLENGES TO QUALITY CONTROL - CHALLENGES TRADITIONAL TACTILE AND OPTICAL NON-DESTRUCTIVE TESTING METHODS CANNOT OVERCOME. ONLY CT (IN COMBINATION WITH THE RIGHT SOFTWARE) IS CAPABLE OF CAPTURING ALL FEATURES OF AN OBJECT, BOTH INSIDE AND OUTSIDE – AND ALL WHILE PRESERVING THE PRODUCT.

ADDITIVE MANUFACTURING: SIMPLER YET MORE COMPLEX

On the one hand, AM makes designing and manufacturing much simpler as it no longer requires a factory in the conventional sense. On the other hand, the ability to manufacture virtually any form makes products much more complex. For example, a part could mimic the structure of a bone to be lightweight, strong, and save on material. Just as with a real bone, that part would greatly depend on its inner structure. If this inner structure is flawed, the whole part is.

ONLY ONE VIABLE INSPECTION METHOD

Using traditional, destructive inspection methods in AM simply is not sensible. The most obvious reason is that destructive inspection would destroy what are often one-of-a-kind pieces.

However, traditional non-destructive inspection methods also do not fit the bill because they are superficial. In contrast to tactile and optical methods, industrial CT holistically scans all surfaces of an object, even if they are inside a part or difficult to capture. While tactile coordinate measurement methods are also non-destructive, CT has the added benefit of being non-intrusive. This means measuring using CT does not deform the part. And unlike optical methods, CT still works accurately even if the part is translucent or reflects.

To confirm shape and size, a CT scan can easily be compared against a CAD file or GD&T blueprint. But CT goes way beyond measuring: It can also be used to analyse porosity, wall thickness, fibre orientation, and even serve as basis for simulations.

REVERSE ENGINEERING

A CT scan can also be used to generate the blueprint of a part from scratch. This may come in handy when a spare part is no longer available. With the right software, the reconstructed volume dataset can be translated into a .stl file. This file can then be used to print the scanned part or be edited further in a CAD application. Specialized software for reverse engineering is able to convert the .stl file into a CAD representation.

FULLY DIGITISED PRODUCTION

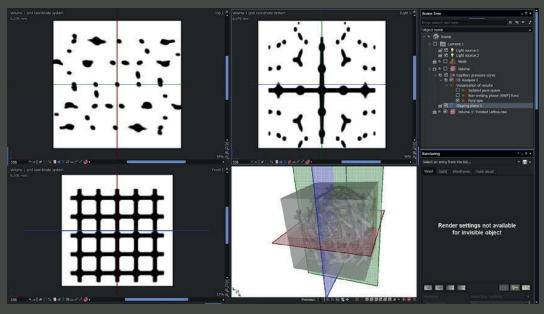
The building blocks needed to fully digitise the entire process from development to inspection are already in place. They just need to be put together by using the right inspection method and the right software. In the end, the same file can be used as a blueprint for manufacturing and for inspection. To make this possible, Volume Graphics software is fully compatible with .stl files, which are most commonly used in Additive Manufacturing, and CAD files. Furthermore, VGStudio MAX 3.0 and VGMetrology 3.0 automatically translate and intelligently evaluate Product and Manufacturing Information (PMI) in CAD files and use this information for quality control. PMI data provides additional part information, e.g., dimensioning, GD & T, layers, annotations or captions.

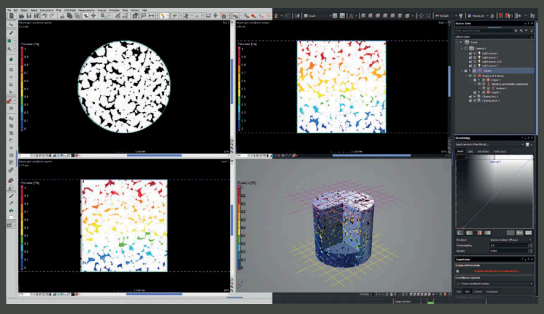
The result is a fully digitized production process: The product is first designed in CAD, then translated into a .stl file that is then handed over to the Additive Manufacturing system. After the product has been printed, the same CAD file that served as the basis for the .stl used for printing is used as reference for inspection. It is obvious how seamless manufacturing becomes when using the right technologies.

DIGITAL EQUALS QUALITY EQUALS TRUST

The more seamless the whole manufacturing process becomes, the less room there is for error. This seamlessness can easily be achieved because Additive Manufacturing is an inherently digital production method.

But trust can only be created if complex, additively manufactured parts are being inspected with a method that holistically scans all surfaces, even if they are inside the part or difficult to capture. This method is industrial CT – and the software to analyse the results is Volume Graphics. ■





FAR LEFT: Latticed Cube in GUI

LEFT: VGSM gui