Located in a high technology industrial center in Nogent, France, 3A was formed in 2011 as a subcontract manufacturer of titanium alloy and cobalt chrome parts using electron beam melting (EBM) technology. The firm mainly services the medical sector, which presently accounts for 75% of turnover, producing standard and patient-specific implants and prostheses as well as medical instruments. However, contracts are also carried out for the aerospace and motorsport sectors, as EBM is ideal for producing turbine blades, for example, and lightweight, multi-piece assemblies as single components.

To provide quality assurance support for these activities, specifically to ISO13485 for medical devices, 3A has purchased a Nikon Metrology bridge-type coordinate measuring machine (CMM) with an 800 x 700 x 600 mm inspection volume. It was supplied with a Nikon Metrology LC15Dx laser scanning head capable of measuring regular and freeform 3D shapes to an accuracy of under ten microns, an order of magnitude less than the required accuracies of the parts being produced.

Pascale Marié, Sales and Marketing Manager at 3A, commented, “We are very happy with the scanner, which we believe is the most accurate on the market. It is the latest version from Nikon Metrology and the first to be installed in France.”
intervals of 22 microns. There are hundreds of dies that need to be
digitised so that CAD files are available as tools wear out, ensuring
continuity of implant production.

The digital CAD models enable the customer to prepare metalcutting
cycles so that the forging dies can be machined on modern, high speed
cutting equipment in a process route that costs 35 per cent less and is
considerably faster than when dies were spark eroded using expensive
electrodes. The resulting financial advantage is significant, as the costs
associated with forging die production are the single most important
variable affecting the cost of forged products.
A second scanning application is the repair of existing tools. Once CAD models are available for a die set, it is possible to scan a used forging tool in order to accurately rebuild the two halves by repairing the metal in the places where they are worn. Those areas are machined and polished, after which further laser scanning allows the new profile to be referenced against the digital model. Any areas of concern can be highlighted using interactive or automatic deviation analysis with color mapping and reporting within the Nikon Metrology Focus Inspection software package.

Low scan data noise results in smooth, high quality surfaces

Irrespective of whether the scanner is employed for reverse engineering, or is used to inspect parts against design intent in CAD models to control the dimensional conformity of EBM manufactured components or help optimize die refurbishment, the capture of accurate point cloud data is essential. This is where the LC15Dx scores, as the accuracy of measured results is comparable with those of tactile inspection.

Pascale Marié continued, “The point clouds resulting from scanning the freeform profile of a component are filtered and meshed into NURBS (non-uniform rational basis spline) surfaces that are grouped to create the CAD model.

The smoothness and accuracy of the surfaces generated by the Nikon Metrology CMM, scanner and software is so good that the 0.1 mm tolerance required for subsequent forging die manufacture is easily maintained by our customer. Quality control over our own 3D additive manufactured components is similarly reliable.”

Reflective surfaces are prevalent throughout 3A’s operations in Nogent, as forging dies are hand polished to achieve high accuracy, while some implant surfaces, notably for knees and hips, are honed mainly to optimize the friction coefficient. Laser scanning is usually susceptible to errors when inspecting such reflective surfaces, but the LC15Dx with its high quality Nikon lens handles the conditions well. Unwanted reflections are neutralized by an advanced software filter while changes in ambient light are absorbed by an optical daylight filter.

About 3A

Advanced Additive Applications (3A) is specialized in rapid manufacturing of metal parts with the ARCAM Electron Beam Melting Technology (EBM®), from custom-made products up to type series. Contact:

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