AFPR (French Rapid Prototyping Association)

TROPHEES 2008

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Trophee of the Best part

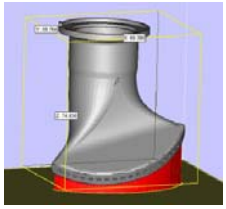
BV Proto - France

Direct Fabrication by selective laser fusion of a bronze complex part

Photo credit: Ecole Centrale Paris

Dassault Aviation entrusted to BV Proto, young company specialized in the direct manufacture of metal parts, the feasibility study by additive manufacture of a tube of demisting for the pilot station of the two-seat Rafale, called “tail of carp”. Manufactured with 30 specimens per annum, this part of class 3, was previously carried out in two parts: upper part in Kevlar, lower part (rings) machined out of aluminum, then the unit was stuck and protected by chromic and painted anodic oxidation. With its customer, BV Proto chose to manufacture the carp tail in bronze alloy, in layers of 20µm, on its machine of selective laser metal powder fusion EOSINT M270. The choice of the positioning of the piece to optimize the supports of construction by successive layers and the number of parts carried out by manufacture, as well as the realization of supports in honeycomb to ensure a good support of the part during its manufacture but also to ensure the heat transfer towards the plate of manufacture, was the key of the success of this manufacture. Indeed, the work of BV Proto to consist in finding the good compromise to optimize at the same time manufacturing time and completion of the parts in order to guarantee good functional surfaces, while amalgamating a maximum of parts in the same manufacture, in short: to define a strategy of manufacture aiming at reducing to the maximum the number of supported functional surfaces. Result: manufacture of 30 specimens in 10 days compared with 4 months with the preceding process, at a cost reduced by two and with a better dimensional accuracy, refering to the opinion of the customer.

Photo credit: Dassault Aviation et BV Proto.



Study of the positioning of the part in order to optimize the manufacturing supports and the number of parts manufactured at the same time

Photo credit: BV Proto.

Trophee of the Best study

Auckland University of Technology - New Zealand

The Spengler Cardiovascular Lab: a case study in Rapid Prototype as Design

Photo credit: Ecole Centrale Paris

Time to market is rapidly becoming the most critical factor to the development of hi-tech products. The majority of high tech products include mechanical, software and electronic sub-systems. Though many new rapid prototyping technologies are now available for the prototyping of these various sub-systems, it is the integration and management of the different prototyping areas that is often the key to project success. Design teams are expected to produce physical prototypes that demonstrate the working principles of the products they are designing within tight time-frames. The use of true concurrent engineering and the 'rapid prototype as design' (RPaD) methodology, combined with the ability to effectively integrate the many existing and emerging virtual and physical rapid prototyping technologies into the development process increases the potential of producing new high technology products in shorter timeframes. The case study of the Spengler Cardiovascular Lab presents a technologically complex project involving a variety of technologies, including electronic, physical, mechanical, and software prototyping. This product was developed for the French medical instruments manufacturer, Spengler, by a collaborative team working concurrently in three countries. The product was developed to a production ready stage in less than five months through the tightly integrated use of RPaD, concurrent engineering and virtual and physical rapid prototyping that allowed for a fast reiterative design approach and a short product development cycle.

The study about about the integration of the additive fabrication into the simultaneous engineering of new products enabled the Auckland University of Technology to demonstrate to its customer Spengler that it is possible to significantly reduce the time to market of their products by the use of additive technologies for the manufacturing of the envelop of the products.

Photo credit: Auckland University of Technology and Spengler.

Trophee of the best application of direct fabrication

AGTX Rapid Prototyping - France

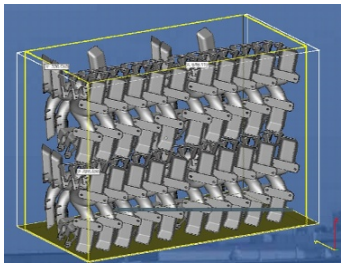
Qualification of the technology of direct fabrication by powder sintering for the aeronautic sector

Photo credit: Ecole Centrale Paris

The Adventure for AGTX Company began almost 4 years ago with the acquisition of a machine of powder sintering EOSINT P700. Today, the company machines are composed of three EOSINT P700 of which P730, as well as one P350 of EOS and a Vantage SE machine of Stratasys. Indeed, for a certain type of parts carried out in composite and which call upon tools, a draping, a completion and steam curing cycle, why not obtain these direct work pieces? Such was the question at the beginning. First tests on protectors then on pipes, out of fireproofed powder, made it possible to show the veracity of the process. After one year of tests and development in collaboration with Dassault Aviation and EOS companies, AGTX comes to obtain the qualification of the direct manufacturing process for the civil and military aviation. From the Catia numerical definitions provided by Dassault Aviation, AGTX manufactures series of parts. One passes here from the manufacture of prototype to the production of batch of parts with the right material. That required a quality and traceability step on behalf of AGTX, i.e. the passage of prototype manufacture to that of subcontractor in production. One has to notice that technology makes it possible to obtain parts in very short time, to evolve according to the request, to avoid the tools and the realization by traditional method and to thus gain in cost part without degrading the requirement of the customer. Admittedly, that requires a new design method of the parts but makes it possible to bring technicality and complicity up to now incompatible with other manufacturing methods.

For Class 3 parts, the replacement of composite parts with fireproofed polyamide parts will enable Dassault Aviation in collaboration with AGTX to reduce delivery time and manufacturing cost of some parts of the Falcon 7X, as this tube, when adding functionalities to the parts.

Photo credit: Dassault Aviation et AGTX Rapid Prototyping.



Placement of the parts in the manufacturing chamber of the EOSINT P machine for the production of the batch of the fireproofed polyamide parts
Photo credit: Dassault Aviation et AGTX Rapid Prototyping.

Special Award of the jury

Irepa Laser – France

Fabrication of mechanical components by Direct additive laser manufacturing

Photo credit: Ecole Centrale Paris

Laser micro-rebuilding is a process of surface treatment obtained by laser metal powder projection which allows the development of dense and low-size deposits. The deposits carried out offering of excellent mechanical characteristics, this technique can be employed for the realization of low-size 3D objects by superposition of layers. A coaxial tube of micro-rebuilding was developed in order to carry out fine walls (500-600µm) or thicker (1500µm) in an omni directional way, with low power (≈100W) using a laser with fiber. From test results and for digital simulation tools, the process was optimized and allows today the construction of small machine elements with an output of deposition reaching 55%. Parallel to these developments, some work implementing a tube based on the same principle, but adapted to the strong power made it possible to validate the feasibility of the process for the realization of parts of greater dimensions, in particular from a technico-economic point of view. These means of direct manufacture of parts with laser were presented during the AEPR' 2008 under the CLAD™ denomination for Direct Additive Laser Construction (CLAD: Construction Laser Additive Directe, in French). The jury decided to give a special Award to Irepa Laser because of their very promising progresses in these techniques of additive manufacture for industry. Indeed, the management of various capacities of powder flow associated with the possibility of using various metal powders during the same production cycle opens the way towards multi-materials manufacture under conditions of manufacturing productivity.

The new coaxial tube developed by Irepa Laser enables to deliver between 0,4 and 1mm metallic powder jets, depending on the gas parameters, for an increased productivity of additive layered-based rapid fabrication of parts.

Photo credit: Irepa Laser.

Integrated on a 5-axis machine, the coaxial tube of Irepa Laser enables the powder jet rapid fabrication of very complex parts, as this titanium part.

Photo credit: Irepa Laser.