

When 3D printing meets sustainability

interview



NICOLAS GAY,
CHIEF TECHNICAL PRINTER AND CO-FOUNDER
4D PIONEERS

4D Pioneers is a growing start-up that uses additive manufacturing of high-performance materials to create a more sustainable future for the industry. With its team of experts, the start-up offers a tailored process to its clients, from diagnosis to accompanying them in their sustainable journey.

JEC Composites Magazine:
Could you please explain where the idea of 4D Pioneers came from and your relationship with composites?

NICOLAS GAY: I have always dreamed of a world where 3D printing becomes the norm and contributes to a better future. Additive manufacturing is much more than just an aesthetic tool. I am convinced that it can solve complex industrial problems. Thanks to my work as a research engineer and my various collaborations, I was able to identify industrial obsolescence as a major industrial issue that can be resolved very effectively by 3D printing of

high-performance materials. Creating a company dedicated to solving this problem seemed obvious to me.

Beyond that, participating in the reduction of industrial waste is a great source of satisfaction to me as it gives an environmental objective to 4D Pioneers. This is our fourth dimension!

Additive manufacturing is obviously a perfect solution to obsolescence, not only by implementing an agile production tool but also by offering the possibility of reconsidering the material or the design of spare parts to make them more resistant over time.

While steel is a fundamental part of the industry, the search for other materials is

accelerating, whether other metals, ceramics, polymers, or composites.

The cultural shift from metal to composites constitutes a profound change in mechanics, which is necessary to provide weight saving solutions, in particular, in response to energy consumption or environmental requirements – production with less materials, less waste, and a lower consumption, without compromising performance.

Due to their exceptional properties, composites are an ideal material for many spare parts, and the objective of 4D Pioneers, through its expertise in materials, will be to convert manufacturers to these high-performance materials.

What is the service you offer and how is it different from other 3D printing services?

N.G.: 4D Pioneers is a service company that designs 3D industrial parts made of high-performance materials to repair or improve the life of industrial machines through a tailor-made, end-to-end service. We help our customers fight industrial obsolescence and create a sustainable environment.

Through our expertise and advice, we hope that each project will be a source of success and satisfaction for our customers. We want to democratize 3D printing of high-performance materials in the industrial world, help our customers understand the possibilities it offers and reassure them about the performance of the parts they produce by quantifying their durability.

Our international board of nine scientific experts offers a certifiable in-depth knowledge of the different materials (physical, mechanical, porosity and ageing properties) and an expertise in 3D printing strategies that is essential for the development of functional parts.



High performance thermoplastic and composite printing (FDM)

We support our customers through a four-step process including: 1) analysis of the part's environment and development of specifications, 2) part design, recommendations on the most suitable materials and selection of a 3D printing process, 3) production of the part via its technological hub (composites, polymers, alloys or ceramics), and 4) quantification of durability under in-situ conditions. We differentiate ourselves from other players with our scientific knowledge and our ability to offer tailor-made services depending on our customer's needs.

We are a spin-off of Centrale Lille and we collaborate with three cutting-edge laboratories (Mechanics, Multi-physics, Multi-scale Laboratory/LaMcube – Centrale Lille, Engineering Mechanics in Materials Mechanics Laboratory/PIMM – ENSAM Paris, Industry Research Centre Belgian Ceramics – BCRC Mons, Belgium).

Through this service offer, 4D Pioneers wants to revolutionize industrial practices in the field of obsolescence, to demonstrate that 3D printing is a particularly effective solution both for replacing obsolete parts and for extending the life of machines by replacing existing parts with parts combining optimized design with more efficient materials.

In which sector(s) do you work the most?

N.G.: The automotive, civil engineering, sporting goods, energy and medical industries are particularly interested in our services and additive manufacturing technology.

What are your mid-term goals and how are you planning to achieve them?

N.G.: Our services have attracted attention from the largest players across industries. We are currently focused on delivering the best service and customer experience. We want to focus on key customers and develop a catalogue of technical spare parts together with them.

But we are also engaged in advancing science with two main areas of research: sustainability, i.e. evaluating the longevity of the parts produced under real conditions of use, and process innovation for neo-materials. The purpose of this holistic approach is to use additive manufacturing processes to produce components with an extended lifetime, whatever the materials.

To really change the paradigm for the industrial use of 3D printing, we need to improve additive manufacturing technology and its application to high-performance materials: PEEK, PEKK, PEI... Many printers can do the job, but the



Ceramic printing

process is not efficient enough and must be improved for high-tech industries.

Considering the strong potential of additive manufacturing and the problems encountered by the industry, we are working on a new process. We want Industry 4.0 to become a reality. Therefore, our objective is to develop new printers capable of printing composites with high-performance matrix materials and continuous carbon fibre.

In addition, our discussions with our industrial partners have shown that there is a real interest in elastomers. Therefore, the next step is to develop the printing technology for elastomers and composite elastomers.

Our last line of development is the search for new materials

compatible with additive manufacturing technology. The family of polymers and composites available is very wide and we really need to focus on how to print them while taking into account their functional requirements or, ideally, improving their performance. Qualifying the longevity of the parts produced will be a key focus in the development of printing solutions.

Our ambition is to accomplish these goals within the next 24 months. Our motivation is extremely strong. We want to be major players in the 3D revolution in the industrial world... right now. □

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