Case study: Precision manufacturing

TEKNA

RENISHAW
apply innovation™


# Renishaw and Tekna transform titanium additive manufacturing (AM) with large-cut powder

## Background:

Founded in 1990, Tekna (OSE: TEKNA) is a global leader in producing advanced material powders and plasma systems. With over 30 years of experience, Tekna is renowned for the design and manufacture of high-quality spherical powders, serving various industries.

## Challenge:

Titanium alloys, particularly Ti-6Al-4V (Ti64), are popular for their high strength-to-weight ratio, excellent corrosion resistance, and biocompatibility. However, the fine titanium powders traditionally used in Laser Powder Bed Fusion (LPBF) AM systems can create challenges in powder handling, health and safety, and material costs.

## Solution:

Renishaw collaborated with Tekna to adapt a large-cut Ti64 powder that enhances productivity and reduces costs. This makes it suitable for applications requiring high productivity printing across various industries, including defence, industrial, consumer electronics, motorsports and automotive.

> **“The coarser powder works seamlessly with Renishaw’s LPBF systems, enabling faster printing with thicker layers, while preserving essential material properties.”**
>
> Amir Nobari
> Sales Manager
> Tekna (USA)

Tekna is a world-leading provider of advanced materials and plasma systems, headquartered in Sherbrooke, Quebec, Canada.

It was founded in 1990 as a research and development company by Professors Maher Boulos and Jerzy Jurewicz from the Université de Sherbrooke, Canada.

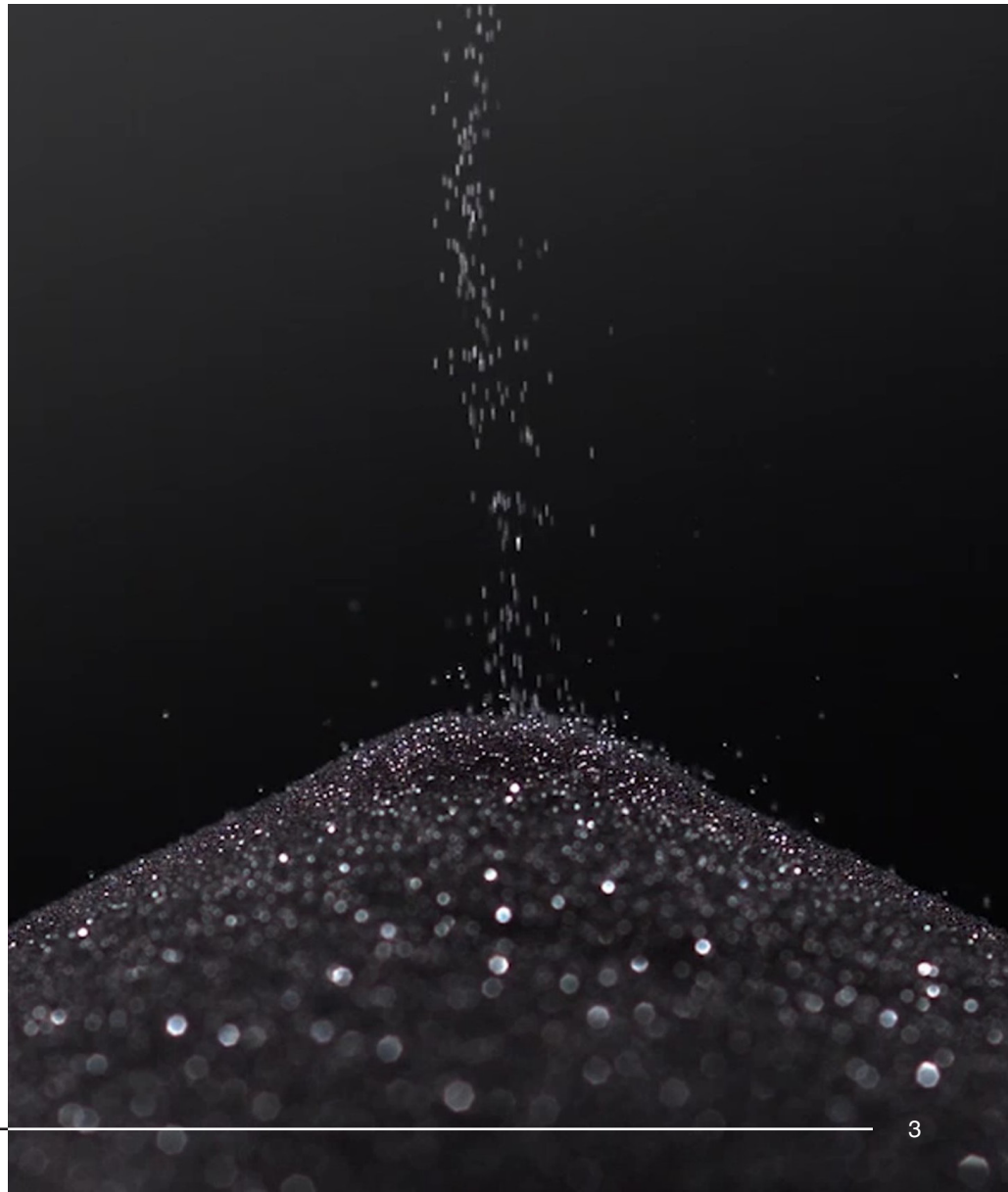
In addition to its headquarters and manufacturing centers in Sherbrooke, the company also has facilities in France and sales offices in Asia. Its parent company, Tekna Holding ASA, reported a total of 185 employees worldwide at the end of 2024.

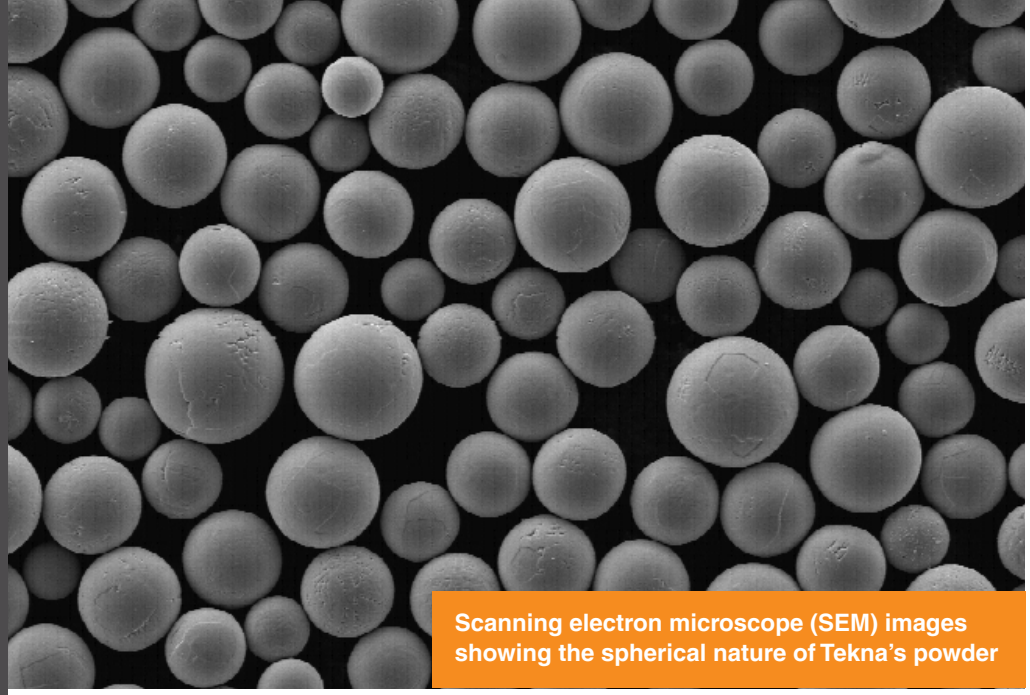
**As additive manufacturing (AM) evolves, manufacturers are under pressure to enhance process efficiency while maintaining high standards of quality. Titanium alloys, especially Ti64, are widely used in industries such as aerospace and medical for their exceptional strength-to-weight ratio, corrosion resistance, and biocompatibility. However, the fine titanium powders (such as 15 microns to 45 microns) used in Laser Powder Bed Fusion (LPBF) AM systems present some challenges.**

One important challenge is the cost of building with fine titanium AM powder. While fine Ti64 powders deliver excellent surface quality and precision, this comes with associated powder production costs. In large-scale AM production, both powder cost and printing time significantly contribute to the total production cost. Historically, in LPBF systems thin layer dosing such as 30 µm has been recommended, which extends build times. This leads to bottlenecks, reducing throughput, diminishing overall efficiency, and as a result making titanium AM less accessible for manufacturers in cost-sensitive markets. When considering total operational productivity, applying a low-cost powder that assists manufacturers with increasing LPBF manufacturing rates would be beneficial to the industry as a whole.

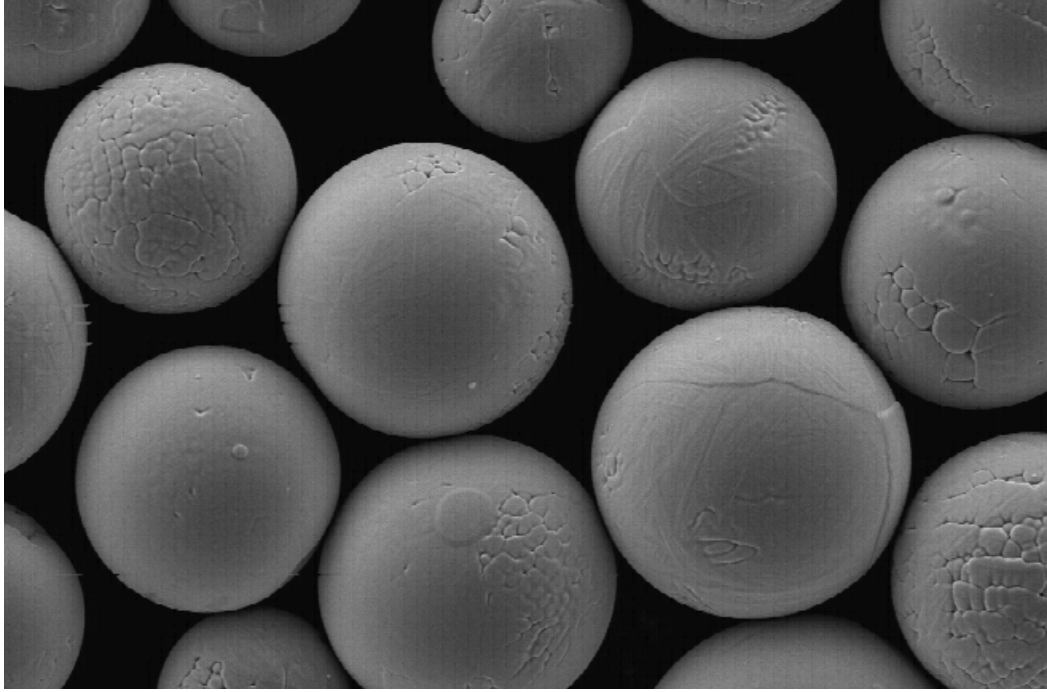
Handling and safety concerns further complicate the use of fine titanium powders, which are considered as dangerous goods. When airborne, these powders create health risks related to metal dust exposure. To mitigate these hazards, AM users must invest in extra safety measures and containment systems. Also, as titanium is a reactive material, there are some costs associated with storage and transport of powders having a fine-cut size.

To address these issues, Renishaw collaborated with Tekna to explore larger-cut variants of titanium alloys. This work built upon Tekna's expertise in producing spherical powders using radio frequency (RF) induction plasma atomisation technology.





Scanning electron microscope (SEM) images showing the spherical nature of Tekna's powder



**Tekna produces titanium powder using RF induction plasma atomisation, a process in which titanium wire is fed into a high-temperature plasma torch. The intense heat melts the wire, transforming it into fine droplets that solidify into spherical powder particles as they cool.**

This process offers significant advantages. It ensures superior sphericity, enhancing flowability and consistency in AM. The RF induction plasma process also maintains strict control over alloying elements, reducing contamination risks. Tekna's proprietary plasma atomisation process is continuous and does not require any consumables that may interrupt or contaminate the process. Without any external gas jets or electrodes in contact with the material, the powder remains free from contaminants, making it ideal for demanding applications in aerospace, medical and industrial sectors.

Using this methodology, Tekna developed and optimised a large-cut variant of Ti64 powder. Renishaw was instrumental in validating the new powder product, working closely with Tekna by reporting the results of extensive laser parameter optimisation and powder flow testing. This workflow ensured the product met the high performance and consistency standards to perform in advanced AM machines.

"Renishaw's material qualification expertise was critical in ensuring that Tekna's large-cut titanium powder performed optimally on our systems," said John Laureto, Renishaw's AM Business Manager, Americas, "Our collaboration allowed us to test rigorously and refine the material to meet the high standards required for reliable, high-quality AM."

Amir Nobari, Tekna's Technical Sales Manager, Americas, added: "By combining our expertise, Tekna has developed a large-cut titanium powder that supports Renishaw's objective of increasing overall process efficiency to their customers, while also reducing direct costs associated with the powder. The coarser powder works seamlessly with Renishaw's LPBF systems, enabling faster printing with thicker layers, while preserving essential material properties."

**Through Renishaw and Tekna's collaboration, customers can realise production cost-efficiencies that enhance the use of AM as a volume production process. This is an important step as metal LBPF technology experiences greater adoption in both existing and emerging use-cases.**

Tekna's large-cut titanium powder has immense potential for multiple applications and opens new opportunities where cost has been a barrier. The use of larger particles reduces material costs per part, making titanium AM more accessible. Additionally, coarser powders enhance overall process sustainability by increasing yield efficiency and reducing material waste. These powders also mitigate certain health and safety concerns associated with traditional AM powders, as they are not classified as dangerous goods. Fewer safety precautions during transportation lowers logistical costs and aids operational efficiency.

Additionally, by utilising a thicker 90 µm or greater layer setting, users can experience a substantial increase in printing speed compared to 30 µm or 60 µm layers. This enhancement allows for significantly improved productivity, enabling faster turnaround times. The open-architecture of Renishaw's AM systems allows for the development of bespoke parameters, including layer thickness, for specific application areas and material types.

"The benefits of this powder extend across a variety of industries," added Laureto. "In motorsport and automotive, it supports high mechanical strength, while making parts more lightweight. The powder is already being applied in the aerospace and defence sectors in various application areas."

**Powder flow analysis - shows the high flowability of Tekna's plasma atomised powders**

This collaboration between Renishaw and Tekna marks a significant step forward for large-cut titanium alloys, offering a solution to the challenges associated with traditional fine powders.

For manufacturers looking to enhance their AM capabilities, Renishaw's advanced systems combined with Tekna's cutting-edge titanium powders provide a powerful opportunity to drive innovation, improve output, and reduce costs.

For further information, visit www.renishaw.com/am

Case study: Precision manufacturing

TEKNA

RENISHAW
apply innovation™

**www.renishaw.com/am**

**#renishaw**

+44 (0) 1453 524524 uk@renishaw.com



Part no.: H-5800-6915-01-A