



INNOVATIVE 3D PRINTED TPU HELMET FOR 2022 WINTER OLYMPIC BOBSLED TEAM



Figure 1: A line-up of 3D printed bobsled helmet linings produced on Farsoon's Flight® Technology.
Image Courtesy: Farsoon Technologies



Project Overview

CHALLENGES

Safety and Comfort for Athletes
Challenging Speed and Temperature Conditions

SOLUTION

Farsoon Flight HT403P

KEY BENEFITS

Customizable Fit
Mechanical Strength
Weight Reduction

Production Efficiency & Optimal Performance - Achieved by Open Partnerships.

The Beijing 2022 Winter Olympic Games officially kicked off on February 4. Being one of the most iconic competitions, bobsled is a racing of gravity-powered sleigh down a narrow, downhill track covered in ice by steering through twists, turns, and straight-aways. Known as the "Formula One on Ice", the maximum racing speed can reach as fast as 160km/h, creating a few G-Forces in rapid acceleration or deceleration. In such high-speed situation, the safety of athletes is the top priority. As an important part of the protection accessories, the full-face bobsled helmets will require the safety, functionality, and of course comfort for the athletes under the challenging condition of speed and temperature.

Led by Assoc. Prof. Li Nan of Dongguan University of Technology, the bobsled helmet R&D team has been looking into additive manufacturing technology since the very beginning with Farsoon Technologies and Wanhua Chemical Group.

"Mechanical strength, weight-reduction and customizable-fit – these are the key factors to achieve the best performance of the helmet," says Li, "Compared to traditional manufacturing, 3D printing offers us more possibilities for design optimization and customization. We are proud to team up with the innovation leaders in the fields of 3D printing, material science and design prototyping, to create this brand-new bobsled helmet together."

↓ Open Partnerships

The bobsled helmet lining is fabricated with [Wanhua Chemical's](#) specialized TPU material developed for superb performance under extreme temperatures, and produced by Farsoon's dual-laser [Flight® Technology](#).

"In order to meet the requirement of excellent bearing capacity, impact resistance and shock absorption performance for the helmet lining, we specifically developed WF-PU95AB TPU material for Farsoon's fiber laser sintering process," says Dr. Yang Jie, Strategy R&D Manager of Wanhua Chemical.

"We solved the challenging technical issues such as laser absorption, powder re-coating for TPU material processing; and achieved good physical properties including elasticity and flexibility even at a temperature as low as -35°C."

Farsoon's latest [dual fiber laser](#) Flight® Technology offers industrial-scale manufacturing turn-over with the TPU material; taking advantage of two powerful 300-watt Fiber lasers and two dynamic optical systems, which creates two ultra-fine laser spots with fast scanning speed of up to 20m/s (66ft/s). With the Flight 403P's expanded cylinder size 400 × 400 × 450mm, two bobsled helmet linings can be produced in one build of only 7.5 hours.



Figure 2: 3D printed bobsled helmet lining produced by Farsoon's Flight® Technology (left) & the helmet used in racing (right). Image Courtesy: Farsoon Technologies



Figure 3: An array of 3D printed bobsled helmet lining produced by Farsoon's Flight@ Technology.
Image Courtesy: Farsoon Technologies

Also, thanks to the open parameter strategy offered with all Farsoon machines, Li worked closely with Wanhua and the Farsoon application team to conduct tests of various parameter combinations - integrating the laser power, scan spacing and layer thickness - to choose the best suited processing parameters balancing mechanical performance and weight requirement of the helmet lining lattice structure.

↓ Customized Lattice Design

Compared with the standard foam helmets available in limited sizes and fittings, the new generation of this helmet uses 3D scanning to collect the data for customizing the helmet lining lattice design to best fit each athlete's head. It offers great gravity self-adaptation, and improves wearing comfort and safety during the competition.

The lattice structure developed by the bobsled helmet R&D team is composed of multiple layers and buffer zones with different hardness levels. Areas with higher collision frequencies are equipped with structural distribution of different densities, which can accurately absorb the damage caused by head collisions. These impact zones were designed to resist the various impact

forces of the helmet in the event of a collision, providing athletes with unprecedented protection performance.

The 3D printed lattice lining, together with the carbon fiber shell, weigh only 1.1 kg – this achieves 500 grams of weight reduction compared to the traditional foam helmet.

"Thanks to Farsoon's high-speed dual-laser Flight@ Technology, we are able to achieve customized design and accelerated manufacturing process," says Li, "we are also impressed with the performance of the new generation of customized helmets, as the impact strength of the helmet lining is increased over 40% compared with the international standard. It is also inspiring for us, to use 3D printed lattice structures to produce other protective sports pieces, which brings new opportunities for the upgrading of helmets, armors and other protective equipment."

The new bobsled helmet has already passed GB and ECE certifications, and it meets the requirement of the FIS (Federation Internationale De Ski). As an innovator of the industrial 3D printing, Farsoon will continue to help pushing the limits in technology and help the athletes exploring their potential in the Olympic spirit.

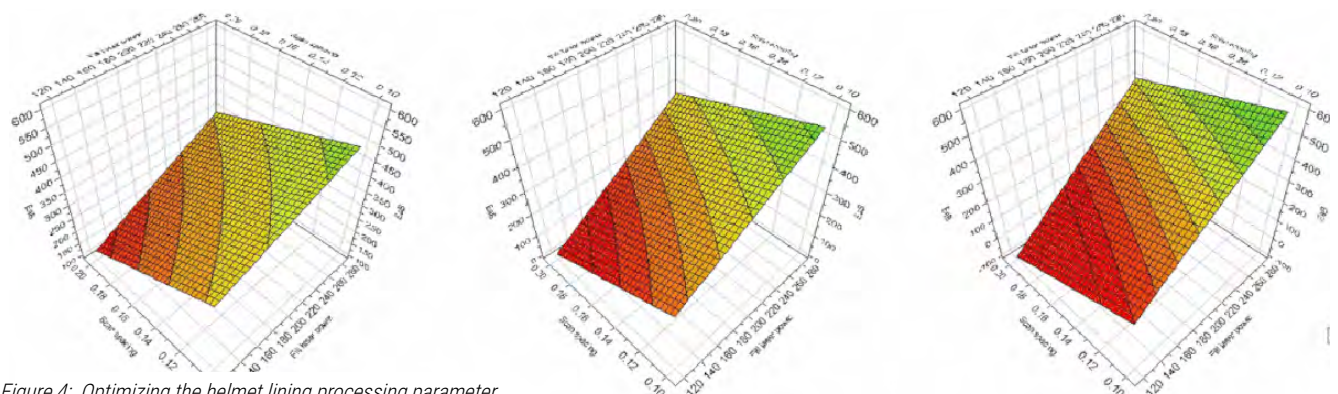


Figure 4: Optimizing the helmet lining processing parameter thanks to Farsoon's open platform.
Image Courtesy: Farsoon Technologies



Figure 5: The design of helmet lining is verified by Dongguan Keheng Prototype Co., Ltd.
Image Courtesy: Farsoon Technologies

↓ About Flight Technology

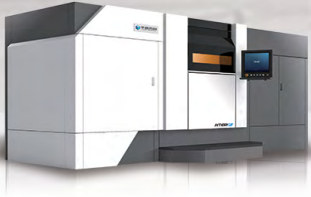
Farsoon's Flight® Technology or Fiber Light® Technology takes advantage of powerful fiber lasers in place of the standard CO2 lasers found in standard laser sintering systems. A fiber system is capable of delivering greatly increased power to the powder bed. Due to the more robust and stable nature of a fiber laser system as compared to a CO2 system, Flight® Technology also provides increased laser longevity which is key when considering ROI for manufacturing applications. In addition, with its increased power and energy absorption characteristics Flight® Technology will be capable of accessing a much different range of process-able materials and operational flexibility as compared to standard laser sintering systems, which allows for increased freedom for future AM material and application development.

↓ About Farsoon

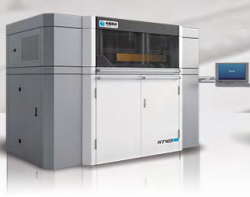
OPEN FOR INDUSTRY - Farsoon Technologies, founded in 2009, is a global manufacturer and supplier of industrial level polymer and metal laser sintering systems. Farsoon is the leading supplier of industrial AM technology in China with increasing growth in the international market. In 2017, Farsoon released the first of a new series of machines under the revolutionary Continuous Additive Manufacturing Solution (CAMS), and established Farsoon Technologies-Americas in Austin, Texas, USA. In 2018, Farsoon Europe GmbH was established in Stuttgart, Germany to expand direct operations to Europe. Farsoon is committed to developing AM towards its true manufacturing potential and providing customers with best-in-class systems, materials, software, applications and services. Learn more: www.farsoon.com

↓ Farsoon's Plastic Laser PBF Systems

▼ HT1001P



▼ 403P Series



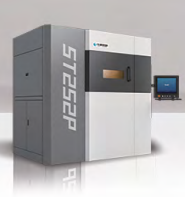
▼ FLIGHT 403P Series



▼ FLIGHT 252P Series



▼ 252P Series



▼ eForm



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