

Metal Additive manufacturing on the track of the Dakar 2021.

Official Porsche driver since 2004, Romain Dumas has multiplied his victories on the racetracks. But he is above all a passionate driver and a man of challenge. With this spirit, RD Limited was born, a multi-discipline racing team based at the Pôle Mécanique Alès-Cévennes (south of France). In 2017, Romain Dumas won the famous Pikes Peak race (USA) with a car equipped with a hub carrier printed in 3D by Poly-Shape, a French subsidiary of AddUp. Since then, this technological partnership has only grown stronger and it is logical that Romain Dumas has trusted AddUp to design and produce metal parts for his buggy DXX for the next Dakar 2021.

Men and mechanics put to the test

For the second consecutive year, the Dakar, a mythical rally-raid, will take its competitors in search of performance to Saudi Arabia. The highlight of this 43rd edition will be a marathon stage between dunes and desert landscapes that will put the mechanics and the crews to the test. Such a sporting adventure requires the vehicles to be faultlessly reliable and continuously performing. This is why Romain Dumas has renewed its confidence in additive manufacturing to produce strategic parts of great robustness.

The advantages of 3D metal printing

Two factors are essential in the search for performance in an off-road racing vehicle: lightness and robustness. The PBF (Powder bed fusion - laser) technology allows metal powder to be fused to create parts from successive layers. Thus, various strategic parts of the buggy were printed, including an ergonomic gear lever, whose knob is the exact representation of the driver's hand, for a better grip and to simplify the pilot's driving. The gear lever has been 3D printed all-in-one, in one of the strongest metals, Titanium. Moreover, its mass has been reduced thanks to the topology optimization technique, that consists in placing material only where it's needed. This technique enabled a 60% mass reduction compared to the original lever, made with conventional means. Finally, the topology optimization technique allowed savings in raw material, and therefore a lower production cost.

In addition to the aesthetic aspect of the part, which is not very common in rally-raid, additive manufacturing has made it possible to integrate more functions. A cable gland is now embedded in the gear lever, allowing the strain gauge installed on the gear lever to be fed without disturbing the race-driver.



Gear lever. Mass reduction of 60%



Pedals with grip..



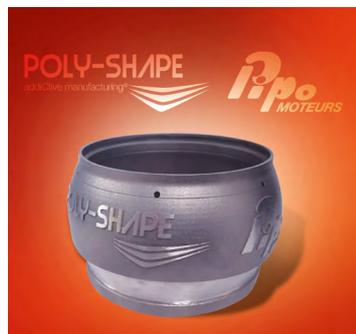
Romain Dumas and his buggy DXX
RD Limited

Other on-board additive parts...

In addition to the gear lever visible in the passenger compartment, experts from Poly-Shape have design the three pedals of the car according to the forces exerted by the driver during the race. The result is an average weight saving of 42% compared to the original pedals and a stronger sturdiness because they are printed in Titanium.

Finally, the last part installed on the buggy that will take to the starting line of the Dakar 2021 on January 3rd is an Inconel® exhaust ball joint. The same part that already equips some cars taking part in the WRX Rallycross Championship. Pipo Moteurs, a French engineering company and manufacturer of engines for cars that compete in the current World Rallycross Championship (WRX), has been looking for a solution to improve the exhaust line bellows that are too prone to break or even cause fires during races. Pipo Moteurs contacted Poly-Shape, with whom they have been collaborating for many years, to optimize the design of a ball joint manufactured exclusively in 3D metal printing.

The spherical ball joints named «PSPM» are designed in collaboration between the Pipo Moteurs and Poly-Shape design offices, in order to meet, on the one hand, the geometrical, mechanical and thermal constraints imposed by the engines, and on the other hand, the manufacturing constraints of metal 3D printing. The mastery of expansion phenomena and stripping techniques by AddUp have made it possible to achieve a precise adjustment between the two sections of the ball joint which is printed all-at-once, with a very good surface finish.



The «PSPM» ball-joint, a long life part.

Contact Poly-Shape:

Luc Debenoit

l.debenoit@poly-shape.com

+33 (0)4 13 22 14 09

Contact AddUp:

Manon Delarbre (Communication)

manon.delarbre@addupsolutions.com

+33 (0)6 43 11 01 52

Poly-Shape

With an expertise developed in several high tech sectors such as aerospace, mechanical sports, medical devices and energy, POLY-SHAPE positions as the French Leader of Metal Additive Manufacturing. With a wide and diverse pool of machines, and a metallurgy laboratory, the company masters all additive manufacturing technologies using metal powders or wires. From design to delivery, including machining and finishing, POLY-SHAPE keeps control over the whole value chain, supported by an exclusive training team and a substantial research and development department. Solving future industrial challenges is the core focus of this innovative company's strategy. Since 2018, Poly-Shape is a subsidiary of AddUp.

<http://www.poly-shape.com/>

AddUp

AddUp was born on April 1, 2015 following the decision of the two industrial groups Fives and Michelin to create a major player in metal 3D printing. This joint venture aims to bring its unique experience and know-how to its customers by developing and marketing industrial machinery and production workshops using the technology of its customers, Additive metal manufacturing, commonly known as 3D Metal printing. The AddUp offer incorporates Powder Bed Fusion Technology (PBF Powder Bed Fusion) and Directed Energy Deposition DED technology since the acquisition of BeAM in June 2018. AddUp also offers services, consulting and training to support its clients in the adoption of technology. Since 2018 Poly-Shape is an AddUp company.

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