

CASE STUDY



A 2021 Grand Prize Winner in the Hand Tools/Recreation category for metal additive manufactured components

Putter Head and Hosel

Process:

Metal additive manufacturing (AM)

Material:

316L stainless steel

Density:

Greater than 99% of theoretical

End Use and Function

The use of metal AM technology allowed designers to place or remove material strategically to optimize mass distribution, stiffness, and flexibility to achieve optimum performance. The process allowed the rapid design, review, and testing of 57 design iterations, permitting the customer to test the characteristics of sound and feel, important to golfers when striking a ball, but not easily simulated in design software.

Fabrication

The design freedom of metal AM, the ability for rapid design iteration, and high-volume manufacturing capability were critical to the success of this program. The flexibility of metal AM processing allowed collaboration between producer and customer to develop a unique lattice structure that eliminated the need for supports during the sintering process. The

flexibility also allowed production of both right- and left-hand versions of the putter head and hosel without the need for tooling changes. The parts are made using 316L stainless steel. The strict cosmetic polishing, PVD coating, and milling requirements could only be met by achieving a relative density of greater than 99 percent.

Results

The putter head and hosel are the first metal AM golf clubs to be commercialized by a major manufacturer, continuing a tradition of high-performance, high-quality clubs that are also the most aesthetically pleasing on the market. Metal AM provided designers the ability to manipulate metal in ways not possible in casting, machining, or metal injection molding (MIM).



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