

Harley-Davidson Factory Racing 3D-printed Exhaust

Harley-Davidson Factory Racing (HDFR) competes in the King of the Baggers series, a one-of-a-kind competition bringing together the best riders in the world to race 620-pound, souped-up Road Glide motorcycles.

Challenge

In addition to building speed, the ability to take tighter turns on the track is a primary focus for the HDFR engineering team. Increasing the lean angle is critical, but also complex due to the size of the Road Glide motorcycles. However, the benefit is clear:

½ degree extra lean angle in turns = ¼ second faster

HDFR annually reevaluates the exhaust tubing on the bike as the primary barrier to increasing lean angle. Most recently, they turned to 3D printing to create an organic exhaust design that brings the components closer to the bike.

Solution

The exhaust components on the bike were historically tube welded. The process limited the team's efforts to maximize lean angle—the exhaust was already dangerously close to the bike's lean plane while adjustments were limited due to the position of the rider's foot.

HDFR pivoted to 3D printing and leveraged its design freedom to create exhaust components that maintained the foot pedal position most comfortable to the rider. The team instead turned to Protolabs' CNC machining to modify the cam cover, rear break pedal, and rear break caliper to accommodate the new exhaust design.



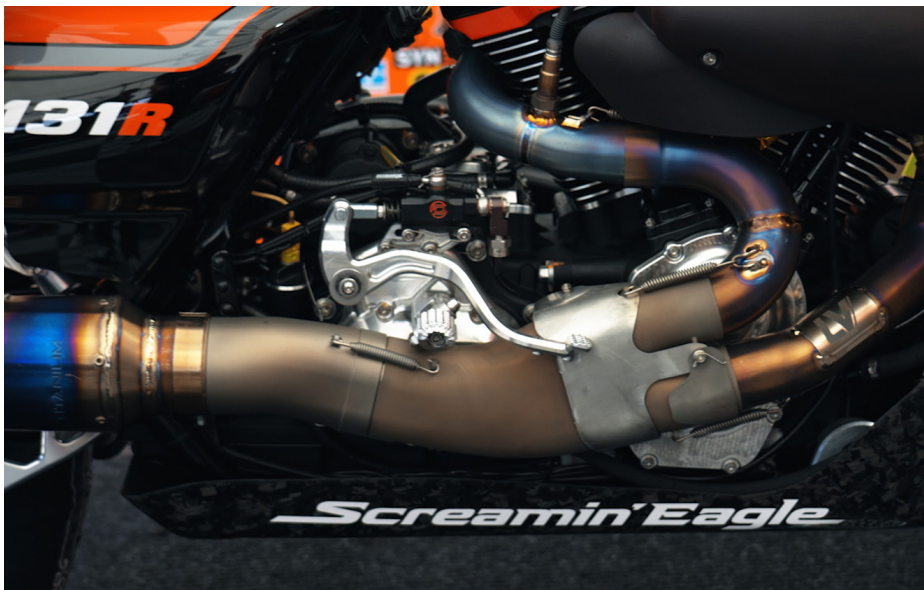
3DP Technology
Direct Metal
Laser Sintering
(DMLS)



Prototype Material
HDFR iterated in **Stainless Steel 316L**, a lower-cost material for testing the design on an engine dynamometer to ensure the new design did not impact performance.



Final Material
The team printed the final part in **titanium** for installation on the race bike to reduce weight while maintaining durability (see bottom left).



Outcome

HDFR Riders James Rispoli and Kyle Wyman can now increase their lean angle on turns without scraping the exhaust on the asphalt due to the 3D-printed exhaust component's more compact, organic design.

The modification helped them win multiple races and achieve more podium finishes throughout the current King of the Baggers 18-race season.