



PRESS RELEASE

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Two Become One - Monoblock Input Shaft with Ready-for-assembly Lamellae Splines Saves Development and Production Costs

As system complexity in hybrid powertrains increases, so does the number of components required, thereby causing the costs for these systems to rise. This applies to the costs per unit, logistics costs as well as to investments in development and tools.

An effective way of countering these cost increases is to reduce the number of components and suppliers and to eliminate manufacturing steps. The success of this approach can be illustrated by means of an input shaft for a double-clutch transmission.

The customer required a shaft that would allow the electric motor to be coupled and decoupled in a P2 hybrid layout in the powertrain between the engine and the transmission. The first component design comprised a simple shaft with a flange. The intention was to weld a sheet metal component with lamellae splines onto the flange.

Hirschvogel's range of components includes numerous shafts with forged and ready-for-assembly splines. Examples include disk carriers for on-demand four-wheel drive or a parking gear on a variator shaft for a CVT. Based on this expertise, the engineers at Hirschvogel also proposed a monoblock solution for the application in question.



Intensive cooperation with the customer resulted in a warm forged shaft which is made of 1045 and which has a large flange with integrated lamellae splines on the outer circumference. Thanks to a concluding cold forging step, the splines demonstrate ready-for-assembly tolerances. The splines on the shaft as well as the bearing and sealing seats achieve their hardness through induction hardening.

The component developed in this way has a weight of approx. 1.1 kg and brings together a number of advantages: The tool costs for the development of the monoblock component amount to around only 20 % of the investment that would have been necessary for the two-part solution. Above all, the tools required for the initially planned sheet-metal solution would have been very capital-intensive. The costs for joining the sheet metal components to the central shaft (e.g. by means of laser welding) were completely eliminated, as were the inspection costs for the joint.

The strain hardening that takes place during calibration renders heat treatment of the lamellae tooth flanks unnecessary. The combination of warm and cold forging generates a connection between the teeth on one side of the splines. This connection holds the attached clutch lamellae in place during assembly. These geometries would not be possible with a deep-drawn part made of sheet metal. In addition, the fact that the number of suppliers is minimized should also lead to a reduction in expenditure during development and production.

This example clearly shows how a highly developed manufacturing technology can significantly contribute to reducing investments and development costs. The production costs of this monoblock variant are also very attractive at the current annual volume, which is in the medium range.

Picture: Monoblock input shaft with lamellae splines



The Hirschvogel Automotive Group

The Hirschvogel Automotive Group is among the most successful manufacturers of forged parts made of steel and aluminum. As a development partner to the automotive industry and a production specialist in forging and machining, the core competencies of Hirschvogel lie in the application areas of gas and diesel injection, the engine, electric drives as well as the transmission, powertrain and chassis in passenger cars and commercial vehicles. Another key focus is on parts for off-highway applications.

Hirschvogel is an independent family company and has approx. 6,000 employees worldwide. Total sales in 2019 amounted to 1.23 billion euros. The headquarters of the Group are located in Denklingen, Upper Bavaria. Likewise located there are Hirschvogel Umformtechnik GmbH and its parent company Hirschvogel Holding GmbH. The Group is also represented in Germany with three other plants based in Schongau and in Marksuhl, near Eisenach. Internationally, the Hirschvogel Automotive Group is present on three continents: in Pinghu near Shanghai (China), in Columbus/Ohio (USA), in San Juan del Río/Querétaro (Mexico), in Gliwice (Poland) and in Sanaswadi (India).

More information on the company, products, service spectrum and career at Hirschvogel may be found at www.hirschvogel.com.