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Impact of superfinishing and coating on the degree of efficiency of a rear axle drive.

Andrea Procopio[1], Florian Gangauf[1], Johann Schnagl[1], Holger Ziegele[1]

[1]BMW Group, München, Germany

andrea.procopio@bmw.de

Nowadays the automotive industry has to deal with a dramatically increasing demand on fuel efficiency and thus lower CO_2 emissions. In this context the reduction of friction of rear axles drives has been examined. In this article the results of superfinished and coated gears will be presented. The rear axle drive is an important part of the BMW powertrain. As the complete driving power passes this component, an efficiency improvement results directly in a better CO_2 value. Splashing and gearing losses are the dominant influence factors. Hence a major impact can be obtained by improving the oil flow inside the system and the gearing characteristics. The first can be achieved by reducing the viscosity of the axle oil, the latter by producing smooth contact surfaces prior to coating them with an amorphous carbon functional layer (DLC). Thus a number of superfinishing technologies are tested. A Goal is an R_z lower than 2µm. Further requirements are very low shape deviations due to the sensitive gearing system. To ensure that all requirements are met, the components are analyzed prior and after superfinishing with a 3D coordinate measuring machine and a surface roughness tester. The coating is deposited by a combined PVD and PECVD process. It has a maximum thickness of 2-3µm and a hardness of 2000HV. These additional production technologies can have an influence on the life time of the rear axle. Thus the components have to stand a severe test on a FZG-torque change device. The benefits on the degree of efficiency are analyzed on an efficiency test bench.

Keywords
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