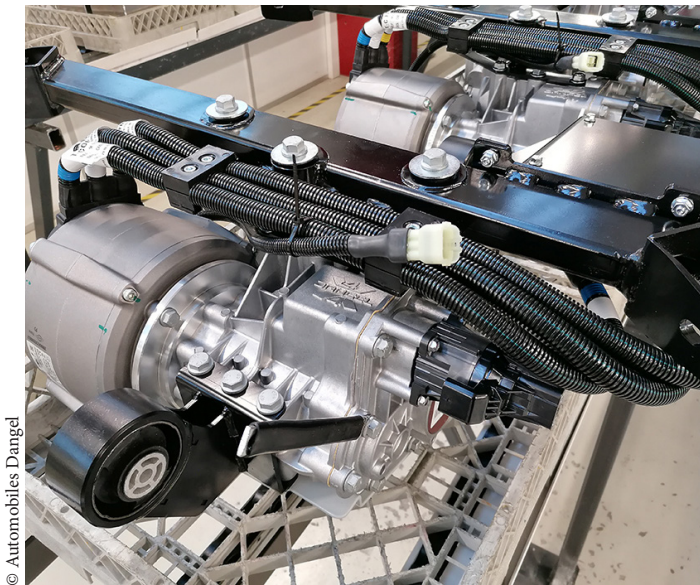


Automobiles Dangel

Acoustic challenge overcome in a mechanical transmission

In order to perfect the acoustics of its new electromechanical gearbox system, Dangel called on Cetim.



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OUR CUSTOMER

Corporate name
Automobiles Dangel

Workforce

100 employees in Sentheim, Guewenheim (France) and Bouzas (Spain)

Turnover

25 million euros

Business activity

Since 1979, Automobiles Dangel has been improving the mobility of commercial vehicles. Its expertise covers the development, validation, type-approval, production, marketing and after-sales service of electromechanical systems, including four-wheel drive systems. It pays particular attention to the performance of its vehicles, of which acoustic performance is a key aspect.

In the automotive world, acoustic comfort has become a key marketing asset for standing out from the competition. Consisting of a gearbox driven by a rear-mounted electric motor, the new electromechanical system developed by Dangel was causing a noticeable whistling noise in the passenger compartment. The bodywork manufacturer had linked this to the gear train but was unable to determine the necessary corrective measures. *“We went to see Cetim, with our measurements and analyses, to find out what options could improve the system’s acoustics,”* explains

Christian Mazeau, then a design office engineer in charge of acoustics at Dangel.

From acoustic measurements to pinion tooth modification

A road test in an instrumented vehicle made it possible to pinpoint the noise to the pinions in the second stage of the gearbox and to understand when it occurred. The first stage of the investigation involved identifying any signs of wear or fatigue on the components. A metrological analysis of the tooth profiles was then carried out. As the deviations on the order of one micron observed in the tooth profiles were insufficient to explain the phenomenon, the study was extended to include a check of the center distances between the casings. Based on all these measurements, the specialists at Cetim reproduced the gear tooth geo-

metry as faithfully as possible, carried out a contact analysis using KISSsoft software, and then compared the results with those obtained from the other pinions and with the contact area checks carried out by Dangel, thereby identifying the source of the noise.

Given the constraint that modifications could only be made to the pinion, new microgeometry corrections were defined for the tooth profile, in order to optimize contact and ensure the smoothest possible meshing, thereby reducing dynamic vibrations. Dangel incorporated this data into the specifications sent to its gear manufacturer. The result: at 70 km/h, the noise level in the passenger compartment was halved. *“We applied the same approach to the first stage of the gearbox with excellent results,”* says Christian Mazeau.

Cetim's asset



The ability to bring together, within a single project, expertise in NVH relating to gear teeth, gear metrology and contact analysis, in order to address the issue from noise localization through to the definition of a targeted micro-geometric correction.

