



REDUCTION OF CO2 EMISSIONS NTN-SNR DEVELOPS A NEW CRANKSHAFT BEARING LABELLED BY THE SOLAR IMPLUSE FOUNDATION

With all environmental issues, car manufacturers are under great pressure to reduce the CO2 emissions for new vehicles. While many advances have already been made, we must go further to find solutions combining mechanical performance and economic growth.

In this perspective, NTN-SNR, world leader of bearings has designed a new roller bearing to reduce friction losses of the crankshaft. Compared to the alternatives available on the market, this highly competitive innovation has recently been awarded the prestigious "Solar Impulse Efficient Solution" Label.

A PROJECT INITIATED INTERNALLY AND DEVELOPED IN CLOSE RELATIONSHIP WITH A GREAT FRENCH MANUFACTURER

In 2014, a pre-study carried out by NTN-SNR demonstrated that the friction at the level of the crankshaft bearings, generated significant drags. Contributing to CO2 emissions and with a potential of being considerably reduced, the equipment manufacturer sets about to design a new bearing to replace the bearing shell of the first and fifth bearings.

Consequently, between 2015 and 2017, NTN-SNR put its know-how at the service of the Research and Development department of the French car manufacturer in order to offer a new product. Different designs, calculations, prototypes, functional validations and reliability tests have been carried out for this bearing capable of reducing the coefficient of friction.

A SOLUTION FROM A UNIQUE KNOW-HOW

A design and technicality very specific for an optimal performance

NTN-SNR has built on its expertise acquired over a century to develop a bearing that guarantees optimal performance in a pressurized environment. Several significant improvements, coupled with a change in the course of the crankshaft oil, have been made.

First, the equipment manufacturer gave the rollers a rounded shape. The constraints related to the dynamics

of the crankshaft, namely, the radial forces, the operating temperatures and the bending modes are thus perfectly integrated and the friction reduced. The cage design and the material used have also been revised and designed to resist the engine acyclism generated by the movement of the mobile coupling. The internal and external rings have received a nitrocarburizing treatment, to obtain a hard and wear-resistant contact surface. It ensures optimum operation with oil polluted by combustion. Finally, a cap was added to the bearing to limit the modifications to be made to the production chain and thus facilitate its integration.

Desirous to obtain better results on CO2 emissions, NTN-SNR looked into the integration of a second one on the fifth bearing, on the flywheel side. This installation, which requires specific know-how, has been patented by the equipment supplier, making its intervention essential.

Up to 1.2g/km of CO2 saved

Although the addition of the two bearings slightly affects the weight of the engine with a negative impact of around 0.05g / km of CO2 emitted, the gains achieved are much more significant. The reduction in friction and the reduction in oil flow allow a reduction of 0.6 g / km of CO2 measured per installed bearing, up to 1.2 g / km for two bearings fitted. From a global point of view, this represents a gain in CO2 emissions

of around 1% per kilometer driven depending on the car model. Given the strong pressure exerted by the public authorities on manufacturers, this gain remains significant.

Beyond reducing CO2 emissions, the crankshaft bearings designed by NTN-SNR offer an excellent cost/added value ratio. Thanks to a very low cost per part and an integration facilitated by its design, the modifications to be made to the production chain are limited.

PROMISING RESULTS AT THE TEST BENCH

During this collaboration, complete bench tests were carried out to validate the reliability of the product for the purpose of marketing. To do this, a prototype engine was tested for 600 hours under severe conditions. After dismounting, a precise and detailed analysis revealed more than promising results because they perfectly met expectations.

In parallel, a study to assess the risk of noise and vibrations induced by this new system was carried out by an independent engineering company. The results were also very positive, demonstrating that the bearings did not generate any noise or vibration.

SOLAR IMPULSE FOUNDATION: AN ENVIRONMENTAL AND PROFITABILITY LABEL

Looking for effective solutions for a clean economic growth, the Solar Impulse Foundation is one of the first foundations to distinguish projects combining both environmental protection and financial sustainability. Each initiative is carefully analyzed in advance by a pool of independent experts. The aim is to show world leaders that investing in clean technology is both an economic and industrial opportunity, but also a necessity to limit climate change.

Supported by Bertrand Piccard, spokesperson for this innovative vision, NTN-SNR submitted its research work on crankshaft bearings. The equipment supplier was honored with the prestigious Solar Impulse Efficient Solutions Label last November in the Industry, Innovation and Infrastructure category.

This distinction gives NTN-SNR a great visibility and an undeniable advantage for the equipment manufacturer looking for a partner to continue the development of the bearing and start mass production.

KEY NUMBERS

- 1% less CO2 emission per kilometer driven
- 600 hours of endurance test on test bench
- No additional noise or vibration
- Limited impact on the engine production line
- November 2019 :
Solar Impulse Efficient Solutions Label

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