



Research Fund for Coal and Steel



**Gears with top in-service performance
developed for
hybrid and electric vehicles**

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Metallurgical assessment of the manufactured
steels

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PUBLISHABLE SUMMARY

In the TOPGEAR project, four steel grades have been chosen to test the different alternative surface treatments. As a reference, it has been selected the grade 27MnCr5 with conventional carburizing (LPC+HPGQ). For a new carburizing and quenching process, 20NiCrMo2 steel has been chosen, aiming to achieve an increase in the compressive residual stresses introduced in the gear during the surface hardening. For the nitriding and nitrocarburizing processes, a quenched and tempered steel (40CrMoBi4) and a microalloyed steel (36MnSiV4) were selected to evaluate the influence of microstructure on machining costs and surface properties.

Industrial material of the four steel grades has been manufactured at SIDENOR through the route melting in an electric arc furnace, secondary metallurgy in a ladle furnace with a stage of vacuum degassing, continuous casting into billets of 240x240 mm² square section, hot rolling in a continuous rolling mill into the required dimensions. A detailed metallurgical characterization has been done to assess its possible impact in further analysis and tests.