

Title: Investigations on the Material Efficacy of Failed Helical Gears in a Gear Train

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Abstract: An investigation on the material efficacy of failed helical gears in the gearbox of an automobile has been carried out. Two helical gear samples taken as representatives of the whole of six in the gearbox were denoted as samples A and B. Methods employed in the failure investigation include visual examination with the unaided eye and fractography; compositional analysis; hardness measurements and microstructural analysis. The results obtained showed that Gear sample A failed by oxidative wear essentially caused by insufficient lubrication. On the other hand, Sample B exhibited no outward sign of failure. Processes culminating in the formation of a wear particle were however noticed few micrometers below the surface of Gear Sample B. Furthermore, in the absence of sufficient lubrication, numerous carbide precipitates formed in both samples contributed to wear of the gear material. It was concluded that the premature service failures of the gears was caused by inadequate lubrication and not inadequate material selection.