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Tribology and Wear Protection

Surface roughness of sintered components – review and typical examples dealing with wear and high stress gradients.

Senad Dizdar
Höganäs AB; Sweden

Sintered components have often been considered as low–cost low–performance structural components in automotive, agricultural, construction and power tools industry. However, by increasing sintered components' overall sintered density or/and by selective surface densification, these components are coming close to performance levels of components made of machined wrought steels.
Increased overall density and full densified surface lead to a new type of surface topography of sintered components. High overall density components have the top surface layer, ("the very surface") which is very smooth but has 15 to 25 µm deep but closed surface pores. The surface pores are no longer interconnected through the components as for densities below approximately 7.1-7.2 g/cm3. On the other side, fully densified surface produced by techniques such as rolling or burnishing have very smooth surface finish with normally no surface pores, and closed round pores are appearing first after a depth. A variant of surface densification is shot-peening which gives an orange-peel like surface finish which can be smoothened by machining/rolling or left unchanged depending on application.
Such new type of surface topography of sintered components provides new opportunities in design of structural components. Since before it is known that powder metallurgy offer a wide range of possibilities tailor alloying to achieve high, moderate or low strength and hardness of the sintered components. The full density surface layer allows capturing of high contact respective bending stress gradients. The deep surface pores of a high density and high hardness component put new opportunities for wear control.