Effect of Heat Treatment on Tribological Behavior of Forged Steel Balls

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Abstract: The grinding balls work under severe wear conditions. Different stresses taking place during the grinding operation may cause material wear whose rate differs from material type or manufacturing process. As a result, these numerous stresses can alter the life cycle of the material. In the grinding field, there are grinding bodies made of chromium cast iron and forged steel. In several aspects, chromium cast iron balls differ widely from the forged steel balls. Heat treatment is a recommended solution to improve the wear behavior of grinding balls. It promotes the precipitation of preferred microstructural phases and consequently better mechanical properties. The scope of this work is to study the effect of the austenitization temperature on the tribological behavior of forged steel balls intended for raw material grinding in cement industry. Three austenitization temperatures are used: 870°C, 950°C and 1150°C. A normal load of 10 N is applied to estimate the wear mechanism induced during a travel of 20 meter. Microhardness measurements, optical and SEM macrographs and 3D roughness views measurements are carried out on the generated wear grooves for each heat treatment test. The obtained results relate the effect of the heat treatment temperature and the applied force on the tribological behavior of the studied samples.

Keywords: steel, forging, grinding balls