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ABRASION WEAR RESISTANT ALLOYED WHITE CAST IRON FOR ROLLING AND PULVERIZING MILLS
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Wear Resistance Characteristics of High-Cr White Cast Irons of Various Alloying Compositions

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Abstract. The wear resistance properties (both erosion and abrasion) related to heat treatment conditions of high-Cr white cast irons with various C, Cr, and Mo contents were evaluated in this study. The results indicate that for as-hardened (as-quenched) specimens, both the peak erosion rate (R_E) and the maximum erosion depth ($D_{E(max)}$) occurred near 45° impact angle. For specimens tempered to peak hardness, however, both the peak R_E and $D_{E(max)}$ appeared at 60° impact angle. A combined ductile and brittle type of erosion mechanism accounts for the wear of alloys studied, but with a tendency towards ductile nature for alloys in as-hardened state due to the presence of abundant retained austenite (up to 35%), a relatively soft constituent, in the microstructure, while, more or less brittle type is registered for alloys tempered to peak hardness owing to the substantial diminishing of retained austenite (less than 10%) which was replaced by harder phases of martensite and/or tempered martensite. Both the extrusion-forging action of the matrix and micro-cracking of carbides produced by the impact of the eroding Al_2O_3 particles are involved in the material removal during the erosion wear. Accordingly, high-Cr white cast iron with a predominant austenitic/martensitic matrix may be a better choice in the case of blasting erosion wear. In addition, the increase of C content and Cr/C ratio did not assist in improving the erosion wear resistance. Moreover, the addition of Mo (1~3%) tends to reduce the resistance to blasting erosion. On the other hand, material removal by plowing and/or micro-cutting actions produced by the counter Al_2O_3 particles is responsible for the mass loss in the pin-on-disc wear tests, and therefore, a good combination of hard carbides and high matrix hardness is required for excellent wear resistance. Lastly, for tempered specimens a better resistance to blasting erosion wear was obtained for lower hardness, but reversal for the case of sliding abrasion wear.

Keywords*: High-Cr white cast iron, Heat treatment, Erosion, Abrasion*