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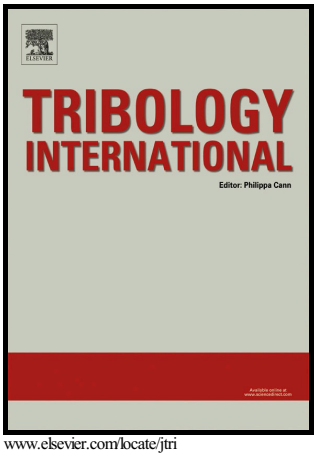

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ACCEPTED MANUSCRIPT

A study of abrasive wear on high speed steel surface in hot rolling by Discrete Element Method

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Abstract:

In hot rolling, the asperities of oxidised strip and wear debris slide over High Speed Steel (HSS) work roll. Hence, abrasive wear occurs, and wear particles will be removed from the work roll surface. This work introduces a Discrete Element Method (DEM) model which has demonstrated successfully that it can be used to study abrasive roll wear of HSS work roll with MC carbides embedded within the oxide layers at 650C. From this research, it has been found that the carbide orientation, distribution in the HSS roll, different scratching tip size and scratching depth affect the wear significantly.

Keywords:
Discrete Element Method (DEM), High Speed Steel, Hot rolling, Carbides

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1. Introduction

In hot strip rolling, the cost of roll wear was estimated to be as much as 10% of the total cost of steel production [1]; the longer roll life will extend the rolling campaign, increase productivity and reduce costs. Numerous empirical wear models have been used in the steel rolling industry on a trial and error basis but they are limited specifically to a particular plant. The ability to predict roll wear will significantly improve the product quality.

High speed steel rolls are preferred in hot strip mills due to their superior mechanical properties such as strong wear resistance, high hardness, and high temperature properties. In a hot rolling process, the roll surface is initially heated up to approximately 650^{o}C while in contact with the hot strip (850-1000^{o}C) for short periods, and subsequently cooled by water to around 70^{o}C in the same

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