

Fractographic and metallurgical analysis of heavy plate mill work roll failure during hot rolling

E. Pourbandari^{1*}, N. A Razani²

1- Khuzestan Oxin Steel Co, Ahvaz, Iran

2- Department of Mechanical Engineering, Amirkabir University of Technology, Tehran, Iran

Abstract

In the hot rolling process the root cause analysis of work roll failure is necessary for improvement of service life of work roll. In the current paper, two failed Indefinite Chilled Double Poured (ICDP) cast iron work roll with a diameter of 1200 mm and barrel length of 4900 mm are studied in fractography and metallography aspects. The hot plate mill referred this study consists of one 4Hi reverse mill stand wherein wide plate produces in the thickness and width range of 5-150 mm and 1100-4650 mm consequently. In order to fracture cause analysis of work rolls, first the rolling parameters recording in the advanced automation system (level 2) during the hot plate rolling process were investigated. Automation dataflow analysis indicated that there is no any additional mechanical force exerting on the work roll neck. Hence, the influence of chemical composition, microstructure and mechanical property of work rolls on fracture analysis were studied individually. The required sampling was performed on the surface and core of work rolls fracture cross section. Microstructural and fractographic observations revealed the large amounts of no spherical graphite with amorphous shape. Carbide aggregation and a large deal of magnesium oxide in the work rolls fracture surface illustrated the unsuitable magnesium insemination. Experimental investigation and the low range of elongation percent of samples confirmed the effect of mentioned microstructural defects on mechanical properties of the work roll.

Keywords: wide plate rolling, ICDP work roll, failure analysis, mechanical force, insemination

* Corresponding author: Khuzestan Oxin Steel Co, Ahvaz, Iran. Email: e.pourbandari@oxinsteel.ir