

Premature failure analysis of forged cold back-up roll in a continuous tandem mill

Abstract

In this paper, premature failure of a forged back-up roll from a continuous tandem mill was investigated. Microstructural evolutions of the spalled specimen and surface of the roll were characterized by optical microscopy, X-ray diffraction, scanning electron microscopy and ferritscopy, while hardness value of the specimen was measured by Vickers hardness testing. The results revealed that the presence of pore and MnS inclusion with spherical and oval morphologies were the main contributing factors responsible for the poor life of the back-up roll. In addition, metal pick up and subsequently strip welding on the surface of the work roll were found as the major causes of failure in work roll which led to spalling occurrence in the back-up roll. Furthermore, relatively high percentage of retained austenite, say 9%, in outer surface of the back-up roll contributed spalling due to conversion of this meta-stable phase to martensite and creation of volume expansion on the outer surface through work hardening during mill campaign.