

New Stress Instability Workability Criteria for Internal Ductile Failure in Steel Cold Heading

Authors : Amar Sabih, James Nemes

Abstract : The occurrence of internal ductile failure within the Adiabatic Shear Band (ASB) in cold-headed products presents a significant barrier in the fast-expanding cold-heading (CH) industry. The presence of internal ductile failure in cold-headed products may lead to catastrophic fracture under tensile loads despite the ductile nature of the material causing expensive industrial recalls. Therefore, this paper presents a new workability criterion that uses stress instability as an indicator to accurately reveal the locus of initiation of internal ductile failures. The concept of the instability criterion is to use the stress ratio at failure as a weighting function to indicate the initiation of ductile failure inside the ASBs. This paper presents a comprehensive experimental, metallurgical, and finite element simulation study to calculate the material constants used in this criterion.

Keywords : adiabatic shear band, ductile failure, stress instability, workability criterion

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