Numerical modelling of micro-plasto-hydrodynamic lubrication in plane strip drawing

This paper presents a new finite element model capable of predicting the onset of micro-plasto-hydrodynamic (MPH) lubrication and the amount of lubricant escaping from surface pockets in metal forming. The present approach is divided in two steps. First, a simulation at the macroscopic level is conducted. Then, a second simulation highlighting microscopic liquid lubrication mechanisms is achieved using boundary conditions provided by the first model. These fluid-structure interaction computations are made possible through the use of the Arbitrary Lagrangian Eulerian (ALE) formalism. The developed methodology is validated by comparison to experimental measurements conducted in plane strip drawing. The effect of physical parameters like the drawing speed, the die angle and the strip thickness reduction is investigated. The numerical results show good agreement with experiments.

General information
Publication status: Published
Organisations: Department of Wind Energy, Composites Mechanics and Materials Mechanics, University of Liege, ArcelorMittal Global R&D
Pages: 378-391
Publication date: 2017
Peer-reviewed: Yes

Publication information
Journal: Tribology International
Volume: 110
ISSN (Print): 0301-679X
Ratings:
BFI (2017): BFI-level 1
Scopus rating (2017): CiteScore 3.55 SJR 1.52 SNIP 2.043
Web of Science (2017): Impact factor 3.246
Web of Science (2017): Indexed yes
Original language: English
Keywords: Finite element method, Metal forming, Micro-plasto-hydrodynamic (MPH) lubrication, Arbitrary Lagrangian Eulerian
Electronic versions:
Numerical_modelling.pdf, Embargo ended: 04/11/2018
DOI:
10.1016/j.triboint.2016.10.046
Source: FindIt
Source ID: 2348708648
Research output: Contribution to journal › Journal article – Annual report year: 2016 › Research › peer-review