A FRICTION MODEL FOR IRON POWDER PRESSING BASED ON A TRIBOLOGICAL APPROACH

Mats Oldenburg, Hans-Åke Häggblad and Bengt Wikman

Department of Mechanical Engineering
Luleå University of Technology
S-971 87 Luleå, Sweden
Telephone +46 920 91000, Telex 80447, Telefax +46 920 91047

ABSTRACT

The global behaviour of the cold pressing process of iron powder is dependent on the material response in the powder as well as the friction between the powder and the tool walls. Both the behaviour with respect to the material response and the friction effects are dependent on the lubricant used in the powder mixture. Normally, solid phase lubricants are mixed into the iron powder. It is assumed that the local heat generated in the microscopic contact areas between the powder and the tool walls is partly responsible for the functionality of the lubricant. The microscopic interaction between powder, lubricant and tool wall at the point of contact is described by relations between the friction coefficient and a combination of state variables, e.g. relative velocity, pressure and powder density. The relations are established by use of tribological classifications of the lubricant as well as the mixture of lubricant and iron powder. Finite element simulations of pressing experiments are used for studying the influence of the frictional relations on the global pressing behaviour.

INTRODUCTION

The understanding of the frictional effects during the pressing of metal powder is very important for the product development and the manufacturing of products based on die compaction of iron powder. The final density, the density distribution, pressing forces and the ejection forces are directly connected to the friction within the powder and the friction between the powder and the walls of the tool. With a good model of the frictional behaviour and use of corresponding test methods of lubricants and powder mixes, the pressing behaviour of new products can be predicted.

The internal friction is affected by the powder type and the type and amount of lubricants in the powder mixture. This type of frictional effect influences the internal powder flow during com-