A NEW ANALYSIS OF COMPRESSIBILITY AND GREEN STRENGTH OF METAL POWDERS

G. W. Halldin*, K. T. Yung** and T. H. Tsai**

Department of Mechanical Engineering
University of Wisconsin-Madison
Madison, Wisconsin 53706

ABSTRACT

Compressibility and green strength data is given for a wide range of ferrous and non-ferrous metal powders for compaction pressures of up to 1200 MPa. Empirically determined theoretical densities are also given. Aluminum and lead powders are shown to achieve a sub-theoretical plateau density level above some characteristic critical pressure. This behavior is successfully modeled by a new compressibility equation which is shown to give significantly better correlation than previous models. This new model was used to estimate the plateau density level for powders which had a critical pressure greater than about 1000 MPa. The green strength is shown to be a function of the compaction densification parameter and a new green strength equation is presented.

INTRODUCTION

The processing of metal powders into components with useful engineering properties is ultimately dependent upon the compaction behavior of the powder. The two most important aspects of the compaction behavior is the powder's compressiblity and its green strength. The compressibility of a powder is its pressure densification response, and can be characterized by the compressibility curve which relates green density to compaction pressure. Compact green strenth can be expected to be primarily dependent upon the green density, so the green strength behavior of a powder can be characterized by the strength-density relationship.

The compressiblity curve has long been recognized as a knee-shaped curve, the density rising from the apparent density level with increasing pressure, at first steeply but then with decreasing slope (1). There have been several attempts at developing a mathematical model of this behavior

---

* Assistant Professor
**Graduate Student