Polynomial Modelling of Explosive Compaction Process of Metallic Powders Using GMDH-Type Neural Networks and Singular Value Decomposition

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Abstract: GMDH-type neural networks (Group Method of Data Handling) are used for the modelling of the explosive compaction process of metallic powders. The aim of such modelling is to show how two characteristics of the explosive compaction, namely, the compaction energy and the compact density percentage change with the variation of important parameters involved in the explosive compaction of metallic powders. It is also demonstrated that Singular Value Decomposition (SVD) can be effectively used to find the vector of coefficients of quadratic sub-expressions embodied in such GMDH-type networks. Such application of SVD will highly improve the performance of GMDH-type networks to model the very complex process of explosive compaction of metallic powders. Moreover, it is shown that the use of dimensionless input variables, rather than direct physical input variables, in such GMDH-type network modelling leads to simpler polynomial representation of the explosive compaction process which can be used for modelling and prediction purposes.

Key-Words: GMDH, Explosive Compaction, SVD.

1 Introduction

Shock consolidation is a technique that shows considerable promise for producing bulk material from powders. Rapid solidification technology is a rapidly advancing field by which unique