COMPUTER MODELLING OF COMPACTING OF POWDER PARTS HAVING SLANT TO A PRESSING DIRECTION SURFACES

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SUMMARY: The internal version of a finite element method is used at simulation of powder parts pressing processes. The modified relations of porous body plasticity theory are applied to exposition of powdered material properties. Rigid - plastic behaviour of material has been considered. The GID system was used as pre- and post- processing system for F.E.M. The study of the density distribution is of the main interest of the present paper. Effect of both contact friction forces direction and of the pressing scheme on the final properties of the compacts have been investigated. Two-layer parts compacting is also studied. The results of numerical simulation and experimental data are compared.

KEYWORDS: *powder compaction, metal forming, finite element analysis, numerical simulation*

INTRODUCTION

There are many details producing with a powder pressing method. Among them we cam allocate cumulative charges facing (Fig.1). It has slant to a direction of the pushing surface. Facing is a thin-wall cone is produced from composition heterogeneous powdered material like a cold pushing method. During the pressing process of the facing we have to decide various technological problems such as:

- to make a high prove thin - wall cone; the top of the cone must be 45°- 60°;
- to decide such problem as a random distribution properties on volume.

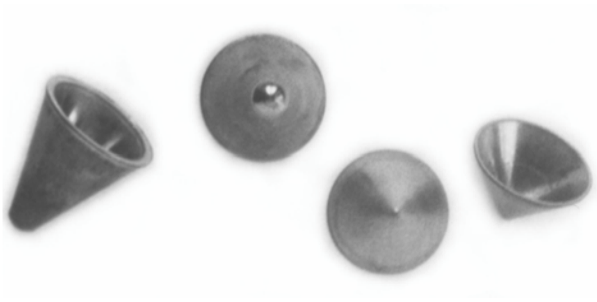


Fig. 1 : Powder cumulative charges facings

1.Methods of simulation

Only computer modelling give us possibility to make optimum scheme of a shaping. As defining relations we've used the theory toughness a porous body relations [1].

All solution we've made with finite element method. The GID system was used as pre- and post- processing system for F.E.M. [2].
An element simulation has allowed to define geometrical shape extruded workplace, it's intense- deformed condition, distribution porosity and accumulated plastic deformation of the material at the solid phase on the each stage of a stressing.

The obtained theoretical results compared to experimental data. We've considered as the simplified model problem, as the concrete workpieces pressing model.

2. **Obtained results**

As a result of simulation was established, that distribution properties on volume were nonuniformly. The migration of a dust in a direction, perpendicular to the pressing direction has also place. The initial height of the workpiece; the inclination angle of planes upper and lower male molds, the direction of there planes and the friction forces direction (Fig.2) about a wall of the lower die are influencing on the workplace [3].

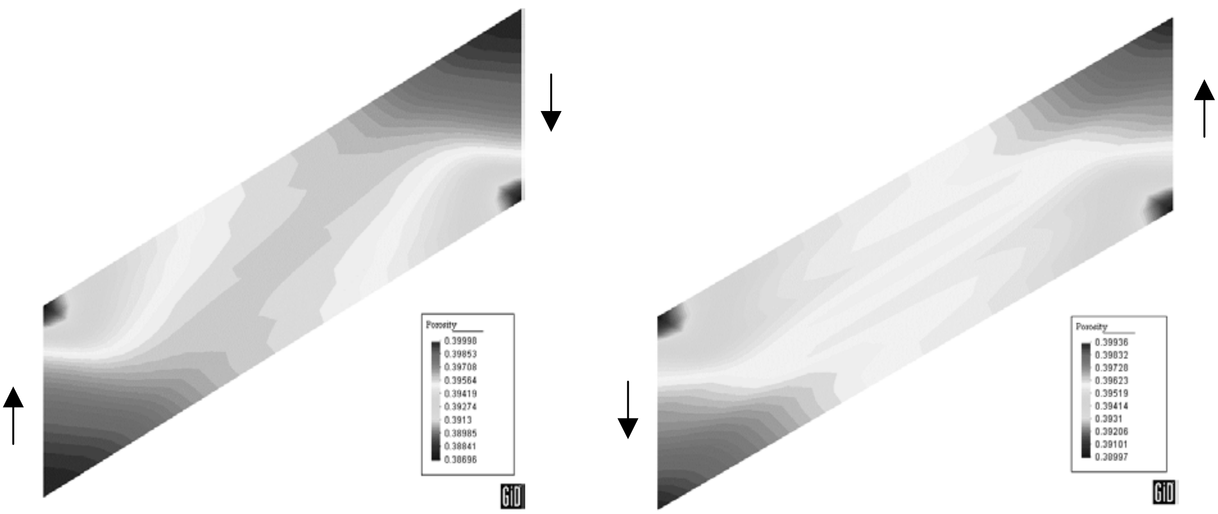
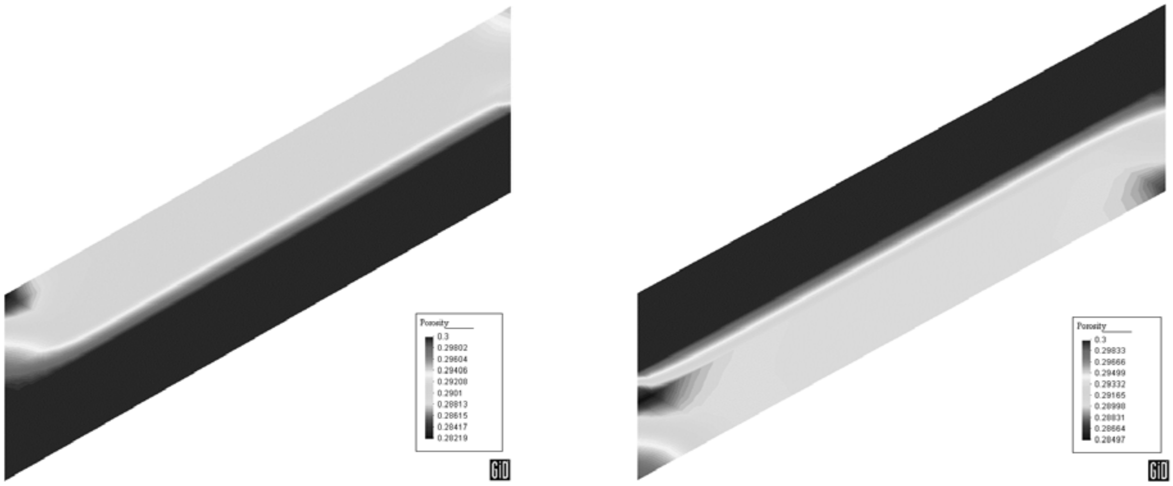


Fig. 2 : Influence of friction direction on porosity distribution

Also we can manage the workpieces final properties distribution therefor details, that initial properties we know. Besides this we need to receive details consisting from different materials. In this case we had learned the singularities of the two-layer workpieces seal (Fig.3). The stratums were differ as by physic-chemistry parameters, as the properties of the solid phase. The boundary between stratums was parallel as to the pressing direction as to the planes of the upper and lower male moulds. We have established, that less strong stratum was obtruded more intensively. Besides this, the more strong stratum parts were observed to the less strong.



a) b)

Fig. 3 : Pressing of two-layer parts, distribution of a porosity : a - Cu top layer, Fe lower layer, b - Fe top layer, Cu lower layer

The choosing a relation scheme of seal and optimum construction is very important. Computer simulation has allowed us to investigate current of materials, estimate energy force parameters and optimise technology.

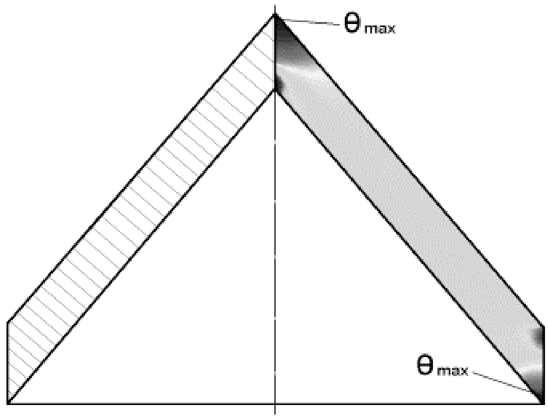


Fig. 4 : Powder facing, distribution of a porosity

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