11th World Congress on Computational Mechanics (WCCM XI)
5th European Conference on Computational Mechanics (ECCM V)
6th European Conference on Computational Fluid Dynamics (ECFD VI)
July 20 - 25, 2014, Barcelona, Spain

NUMERICAL SIMULATION OF FRACTURE: PROBABILISTIC APPROACH

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Key Words: *Numerical Simulation, Fracture, Probabilistic Approach.*

The natural heterogeneity of real materials structure influencing on distribution of material physicomechanical characteristics (PMC) is one of the factors determining character of destruction. The introduction of the given factor in the equations of mechanics of a deformable solid is possible at use probabilistic laws of distribution PMC on volume of a considered design [1].

There are problems where the fragmentation is mainly probabilistic process: for example, explosive destruction axisymmetric shells where character of blasting fragmentation are beforehand unknown. Determining influence of heterogeneity of material structure is shown as well in problems punching thin barrier, during so-called "petaling" barrier. In order that simulated process of a fragmentation reflected a real picture of behavior of the destroyed bodies, received in experiments, it is necessary to bring in casual distribution of initial deviations strength properties from rating value to PMC of a body (modeling of initial defective structures of a material).

In work the explosive fragmentation of the open and closed shells, punching a thick barrier by an shell with charge HE on a normal and under a angle, a fragmentation of a barrier and an shell after barrier piercing, punching thin barrier on a normal and under an angle, crushing of metal rings, process of high-speed impact of the laminated - spaced barrier with the steel spheres is considered.

For the description of processes of deformation and crushing of solids the model compressed ideally elastoplastic bodies is used. The basic equations describing movement of media, are base on laws of conservation of mass, impulse and energy, and are made by relations Prandtl - Reuses with the Mises flow condition. The equation of state was used in the forms of Tate and Mie – Gruneisen. As criterion of destruction at intensive shear deformations achievement by equivalent plastic deformation of the limiting value is used.

For calculation spatial elastoplastic flows and detonation products the technique realized on tetrahedral cells and basing joint application of Wilkins method for calculation of internal points of a body and Johnson method for calculation of contact interactions is used. Splitting of three-dimensional area into tetrahedrons occurs to the help of automatic construction of a grid.

The natural fragmentation thick-walled elastoplastic shells and barrier calculate with the help of introduction the probabilistic mechanism of distribution of initial defects of structure of a material for the description spall and shear cracks. The flaws in a material is modeled by variation of limiting value of the equivalent plastic deformation, which one was subjected to the normal distribution law with arithmetic mean, equal tabulated value and varied dispersion.

The received results show an opportunity offered the probabilistic approach and a numerical technique to model process of natural crushing of elements of machine-building designs at intensive dynamic loadings. The created technique of the decision of problems of a fragmentation allows in the most full, from the physical point of view, to three-dimensional statement adequately to reproduce processes of

crushing of solids at action of explosive and shock loadings.

REFERENCES

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