# NUMERICAL SIMULATION OF HIGH-SPEED LOADING OF AN UNDERWATER PIPELINE FILLED WITH LIQUID

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This paper considers a geometrically and physically nonlinear problem of impulse impact on a fragment of an underwater pipeline containing liquid in a three-dimensional formulation. A specially developed software package for solving three-dimensional dynamic problems of interaction of elastoplastic structures with compressible media, based on the unified Godunov scheme of increased accuracy for calculating the joint motion of fluid and elastoplastic media, is used for modeling. The package uses an Eulerian-Lagrangian approach with explicit separation of moving contact surfaces between different media. Three types of computational meshes for each medium are used. These are Lagrangian surface meshes in the form of a continuous set of triangles to specify the initial geometry of bodies and for their support in the calculation process, and two types of three-dimensional volumetric meshes automatically generated in the calculation process. Shock waves generated in the surrounding fluid interact with a fragment of subsea pipeline containing fluid and a rigid bottom. The underwater pipeline is assumed to be two-layered, the inner layer consists of a metallic elastoplastic shell, the outer layer is a concrete coating. Wave processes in both the steel pipe and the concrete shell are analyzed. The loads on the pipeline are estimated depending on the source of waves and on the position of the pipeline relative to the bottom, fig. 1. Possible failure of both steel and concrete weighting shell in the areas of tensile stress is shown.

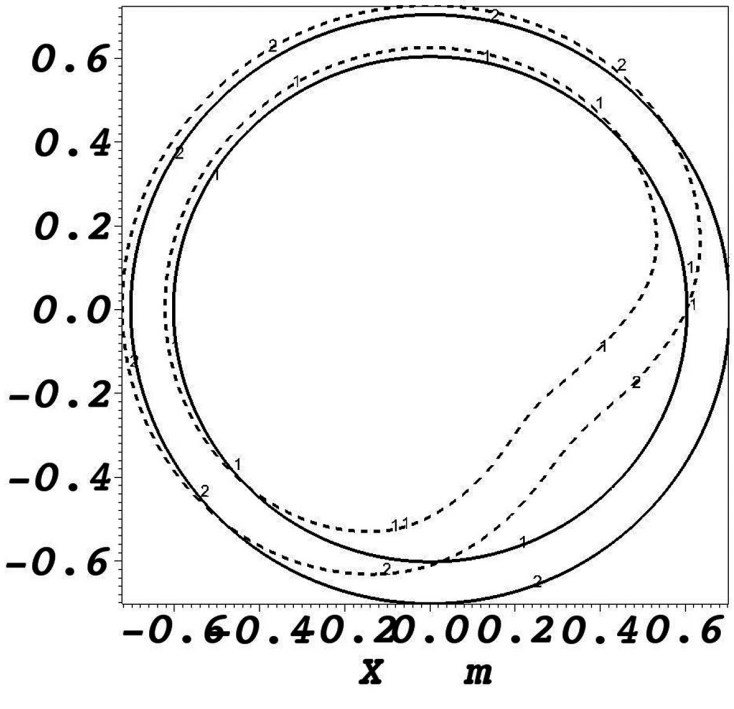


Fig. 1 Деформирование подводного трубопровода

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