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The modeling method of the impact of vibration loads on a charge with granulated powder elements

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Abstract

The porosity of the powder charge has a great importance in resolving the problem of the internal ballistic. Porosity is the volume of voids per unit volume occupied by the powder elements in a way that the granular powder elements are not evenly distributed throughout the space behind the projectile. The change occurs in the volume of the powder charge voids when the artillery shells is assembled. When filling the liner with granulated powder elements, in many cases, various devices are used to increase the density of filling the liner with gunpowder. Their principle of operation is based on the creation of vibrations with a certain amplitude and frequency, which are transmitted to the cartridge case and the powder elements in it. Oscillations cause movement of the powder elements, because of which the number of voids inside the volume filled with the powder decreases. The generated vibrations most often act in the longitudinal direction and lead to the movement of the powder elements in this direction. Movements in directions perpendicular to the liner axis are also possible, but they play a much smaller role in the process of redistribution of the powder elements inside the liner. The porosity of the powder changes due to storage, movement. The nature of the distribution of the porosity along the length of the charge impacts on the combustion process of the

powder charge and the value of the pressures of the powder gases observed in the firing process. This may lead to the conclusion that in taking the problem of internal ballistics, it is necessary to consider the effect of vibration loads on the formed powder charge, which consists of granulated powder elements. The objective of the work is to create a model that considers the compaction of the powder charge and the mixing of the powder elements under the influence of vibration loads.

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