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Numerical Simulation for cylindrical powder compaction using a high explosive

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Abstract

It is economically that we actually examine with the condition, which was chosen by numerical analysis. Therefore, the necessity for numerical analysis has been increasing and more realistic numerical analysis is called for.

In this paper, in order to perform more realistic numerical analysis for explosion in a pipe, sliding boundary condition developed by Mark. L. Wilkins was applied for treatment at the boundary between different materials, such as an explosive and its container. Applying this sliding boundary condition leads to prevent cell destructions. And this leads the successful simulation and more realistic numerical analysis.

The feature of the explosive applications is to obtain the high energy, super-high pressure and extreme temperature that are difficult to obtain by the static methods.

In this paper, the numerical simulation for powder compaction was carried out in order to evaluate the performance of a numerical analysis and the characteristic of the device. This device was so called cylindrical method, and the powder, which filled up into the cylindrical container, was compressed toward the central part from the outer wall side of a pipe by the super-high pressure generated by the detonation of the surrounding explosive. In this devise, water is set between the explosive part and powder part to change the pressure that acts on the powder part, and paraffin is set at the central part of this device in preventing the extreme pressure raise. Additionally, many boundaries were formed with the explosive, water, powder, and paraffin part and each container in this device. Therefore, sliding boundary condition was very important to apply for all boundaries.

From numerical analysis results, it was found that pressure which acts on the powder part does not change so much if the radial direction thickness of the explosive part is 20mm or more. Moreover, it was also confirmed that the pressure of the powder part was made high by setting the water part, and that the extreme pressure raise was prevented by setting the paraffin part.