An investigation on plastic deformation of rotating band for large caliber gun projectile during engraving process

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Abstract. The projectile engraving process of a large caliber gun is investigated by adiabatic process simulation based on smoothed particle hydrodynamics (SPH) and finite element method (FEM). The deformation process, equivalent stress, equivalent plastic strain, temperature and damage variable distribution of rotating band are obtained by numerical simulation. The frequency distribution of particles was get by particular variables. The field variable on a specified section was obtained by developing a program.

Keywords: Large caliber gun, Rotating band, Engraving process, Smoothed particle hydrodynamics, Plasticity deformation, Adiabatic process

1. Simulation model and boundary condition

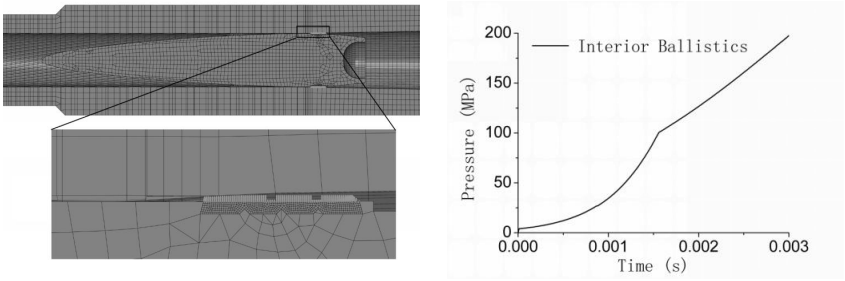

Figure 1. The Mesh details of the projectile-barrel system and pressure

2. Results and discussion

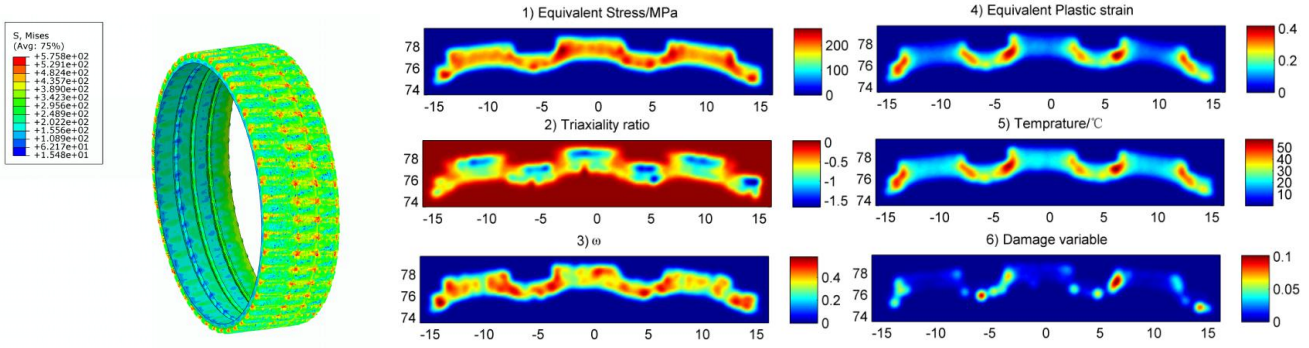

Figure 2 Equivalent stress distribution of the outer part of rotating bands (MPa)

3. Conclusions

The projectile engraving process of a 155mm gun at a given propellant pressure was investigated by numerical methods. The rotating band was modeled by FEM and SPH methods. The distributions of these variables in a specified cross section was also interpolated by shape function.The distribution of equivalent stress is almost uniform in this cross section, as large compress plastic deformation and flow under the engraving process. The value of stress triaxility minimizes at the rotating edge, while Lode parameter shows maximum value in the same area, as the shear stress dominates.