Exploding Container

Problem Description

In this simulation, a two-dimensional slice of a steel container that is filled with PBX-9501 has been "preheated" to above the ignition temperature of the explosive. At t=0, the explosive begins to burn, and the resulting product gas pressurizes the container which expands to the point of rupture.

Simulation Specifics

Component used: mpmice

Input file name: ExplodeContainer.ups

Command used to run input file: sus ExplodeContainer.ups

Simulation Domain: 0.09 x 0.09 x 0.002 m

Cell Spacing:
.001 x .001 x .002 m (Level 0)

Example Runtimes:
5 hours (1 processor, 3.0 GHz Xeon)
The run time can be reduced to less than one hour by halving the number of cells in the x and y direction.

Physical time simulated: 0.12 milliseconds

Associate scirun network: ExplodeContainer.srn

Results

Figure 1 shows the container and the explosive as represented by particles which are colored by mass. A cutting plane depicts the pressure field. Note that some dark blue particles have found their way through the container wall, which seems bad. However, a check of the colormap reveals that the mass of those particles is vanishingly small, approximately machine zero, at which point they become a bit hard to control.

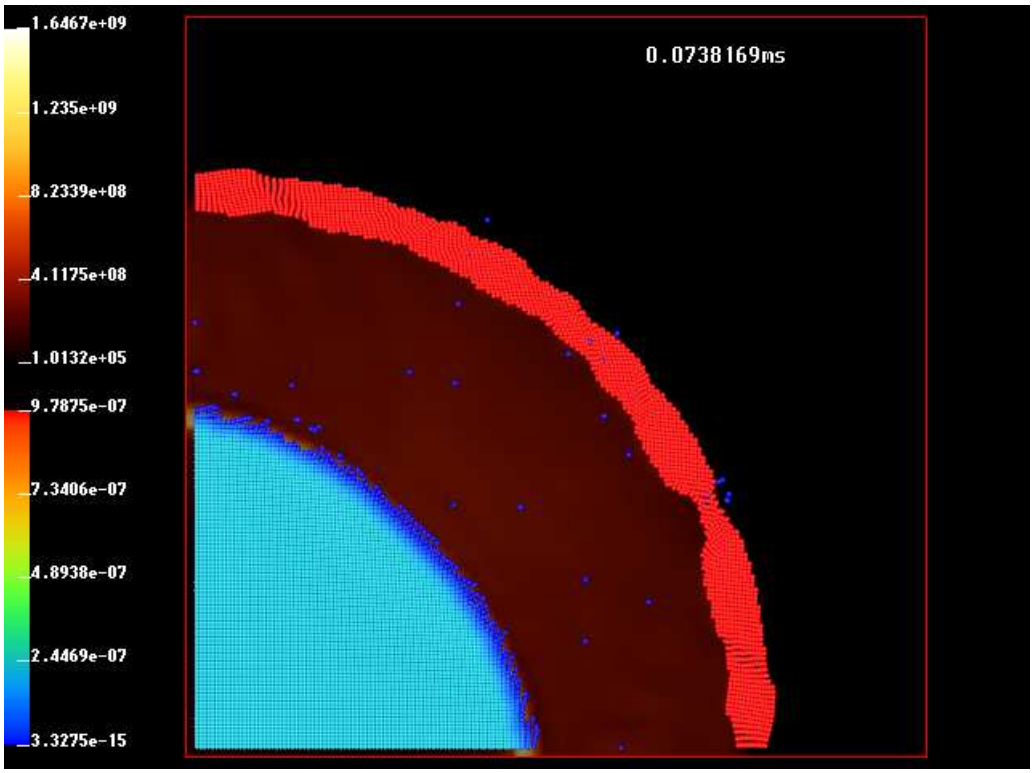

Figure 1: Steel container filled with burning PBX-9501.