

# Comparison of Dispersion Models for Spheres of Varying Geometry

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**INTRODUCTION:** 20L sphere is a standard instrument used for performing experiments on Nano dust explosion. An updated version of the conventional instrument is tested in CFD simulation. The effect of explosion is compared from a perfect spherical vessel to a vessel containing a straight section of the wall between two hemispheres.



Figure 1. Actual vessel of 20L sphere

**COMPUTATIONAL METHODS:** As there is no special algorithm for simulation of explosion in COMSOL Multiphysics®, we created a geometry and kept the pressure difference of 1000 atm in the centre and periphery of the vessel so that it can depict an explosion. The material is chosen as propane, and the meshing is done finer in size. The physical model is chosen as compressible and turbulent fluid flow model.

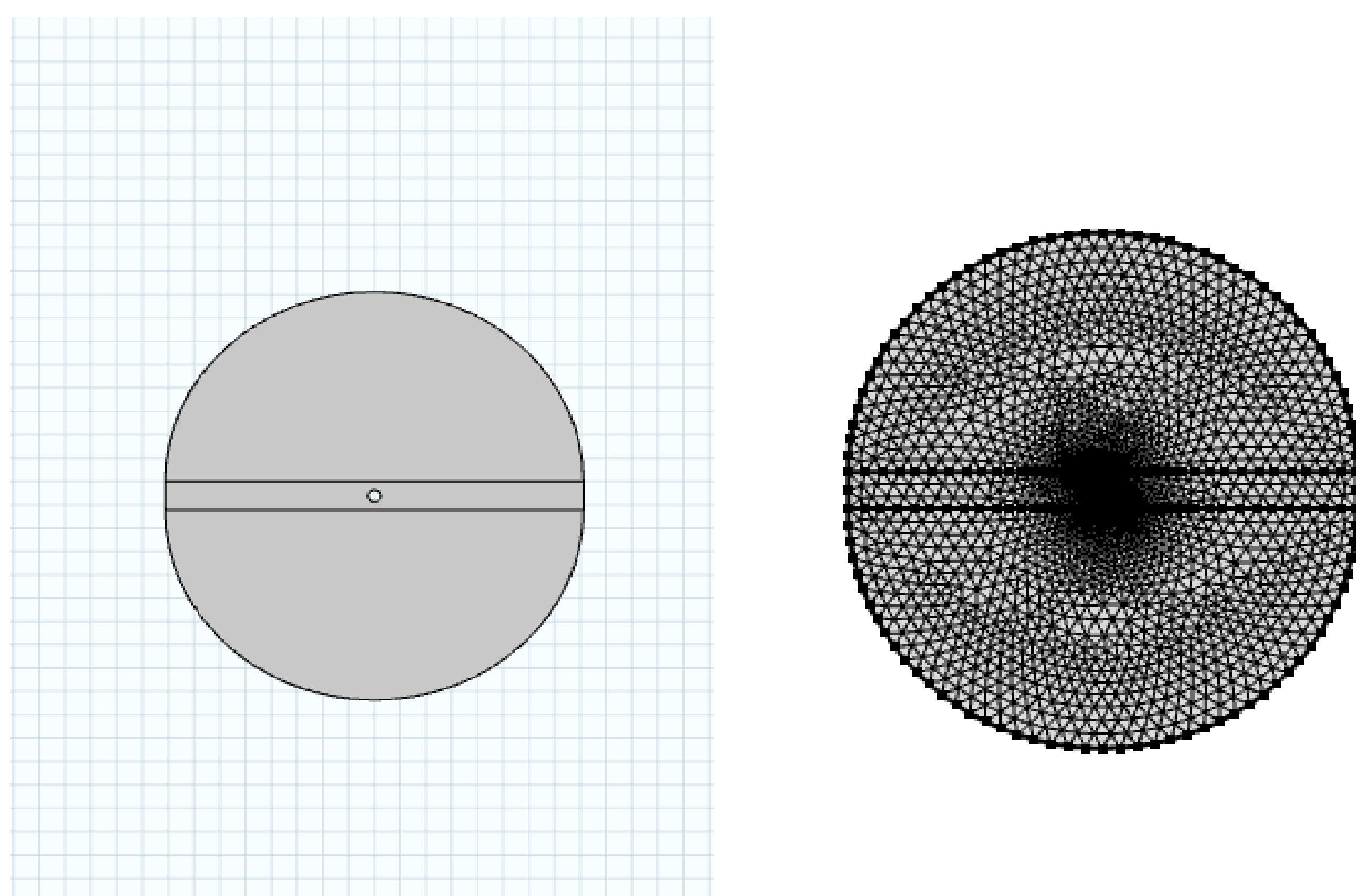


Figure 2. Geometry and meshing of the updated vessel

**RESULTS:** The time dependent study of pressure is studied in this case and compared with perfect spherical vessel. The results both on final and initial stage shows very minor change of about 15% pressure contour on the straight section of the vessel otherwise the entire vessel is containing homogeneous pressure contour.

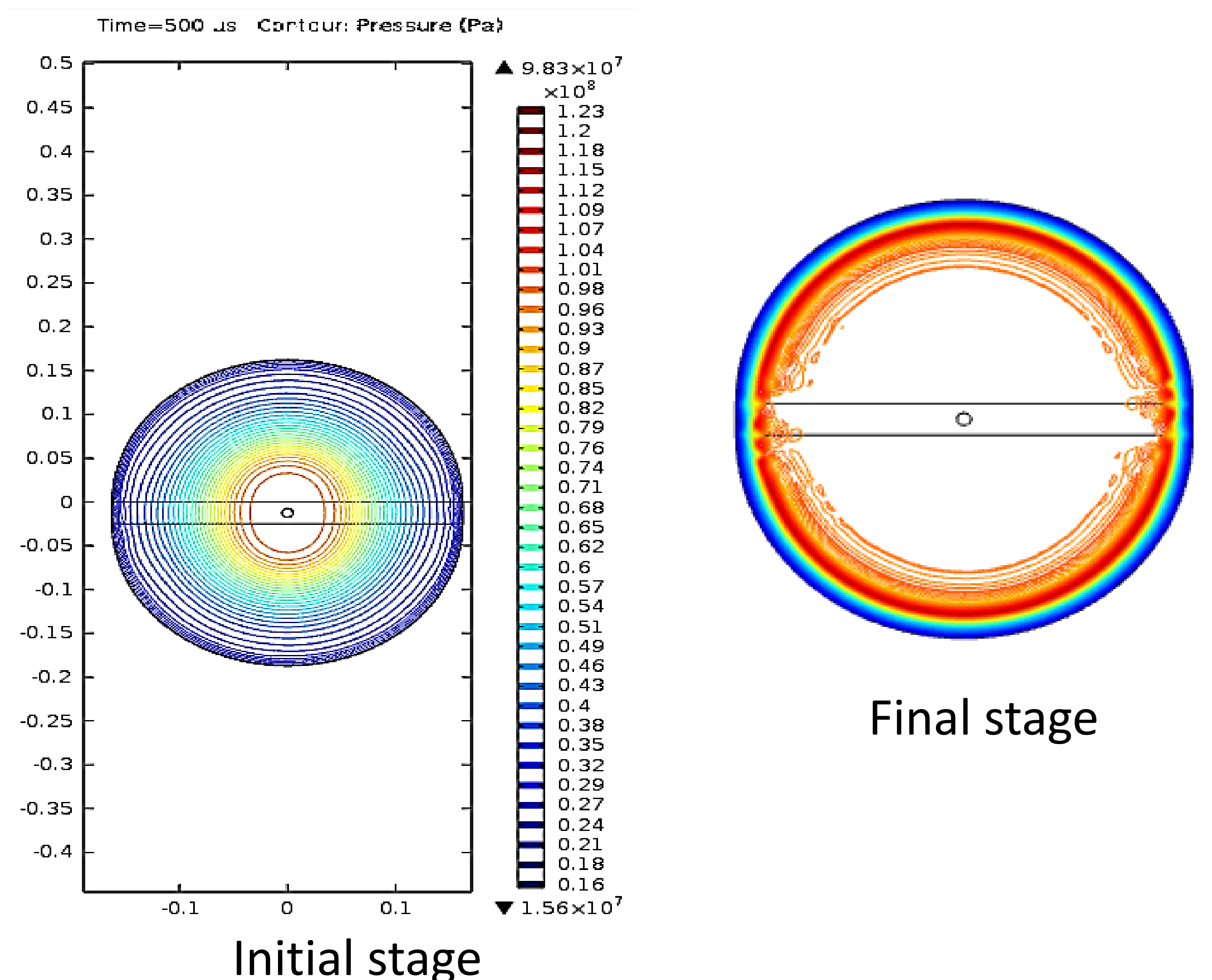


Figure 3. Pressure distribution inside the sphere at the starting and final stage of explosion

**CONCLUSIONS:** The study is interpreted as, there will not be any significant effect of explosion in the modified vessel, this modified vessel can be used for implementing the entry point of the dust particles or implementing more sensors for study. Ultimately, it can be concluded as the vessel can be successfully updated with no difficulties for further experiments related to dust explosion.

## REFERENCES:

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