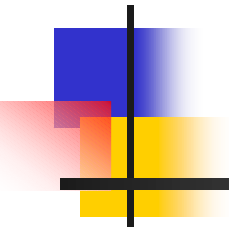


Tube Crush Analysis Using LS DYNA



Satish B. Dronavalli

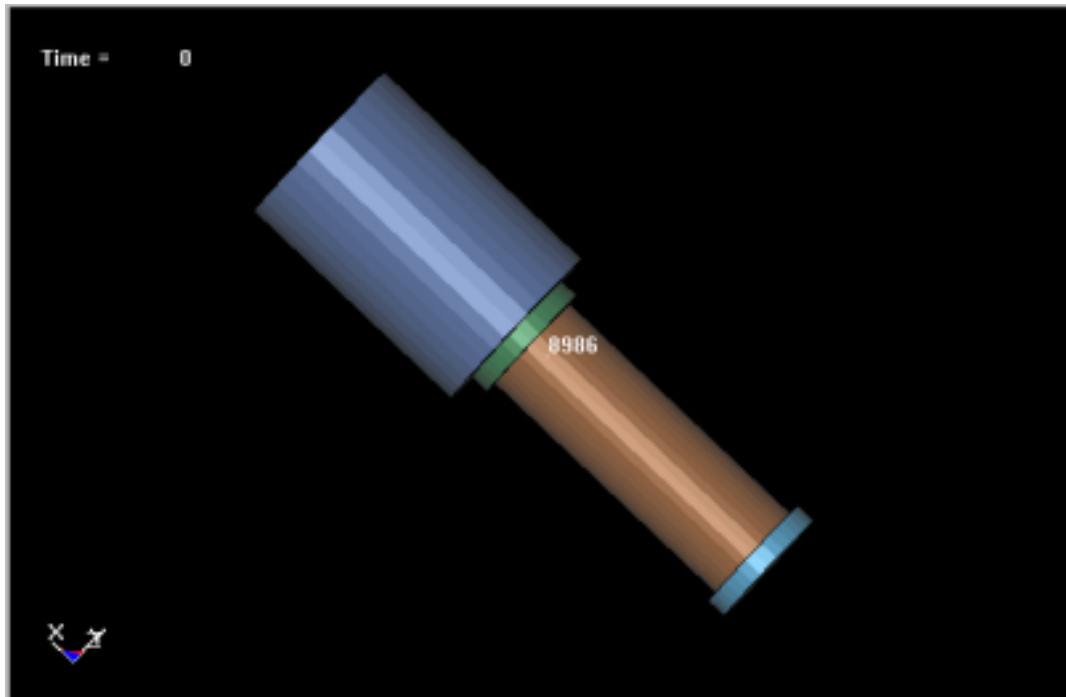


Contents

- Introduction
- Objective
- Modeling
- Results and Analysis
- Future Work

Introduction

- Crush analysis on thin Cylinder
- Impact of Titanium Striker on Al Cylinder





Objective

- Develop a model in HyperMesh
- Conduct simulation using LS DYNA
- Determine the buckling of the Al Cylinder
- Deflection of the cylinder in load direction
- Impact of striker at different angles and Velocities



Materials

- Cylinder

Aluminum

- End Caps

Steel

- Striker

Titanium



Material Models

- Inelastic Plastically deformed
kinematically hardened (MAT L3)
Elements
- Shell 163 Cylinder
- 3-D Solid End Caps & Striker

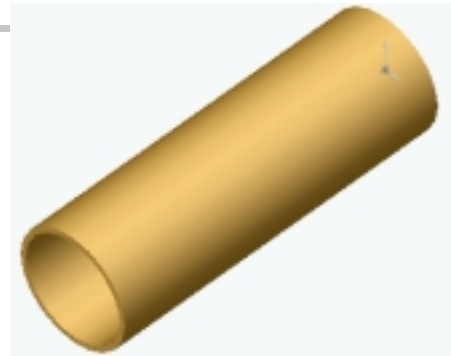


Boundary Conditions

- One of the end cap is fully constrained
- Other end cap is impacted by striker
- Initial velocity is applied to striker

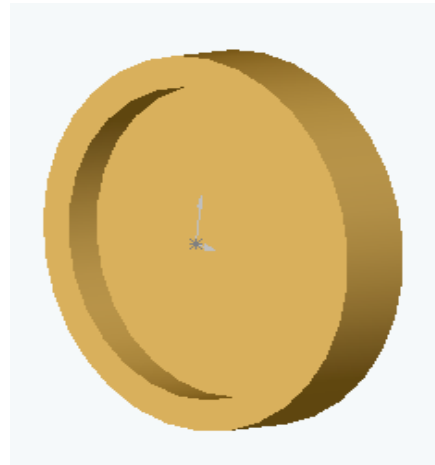
Dimensions

Diameter 20mm
Length 60mm
Thickness 1mm



Cylinder

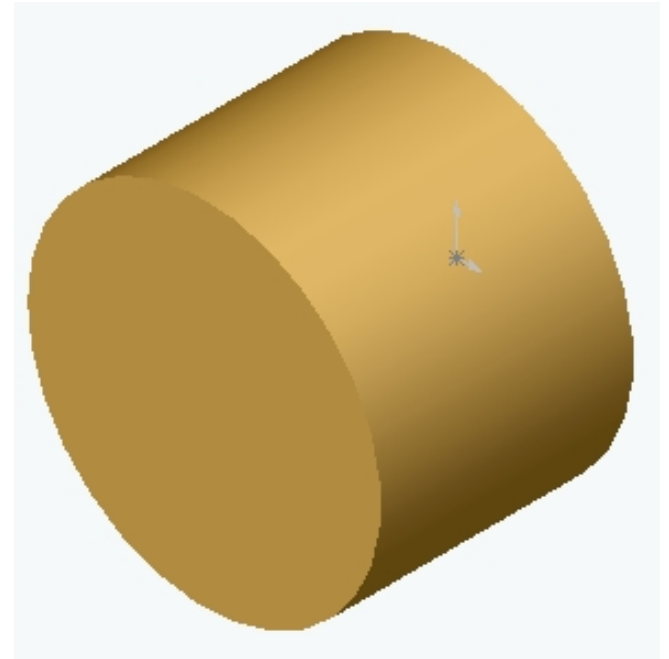
O.D 24mm
ID 20mm
Thickness 4mm
Flange 2mm



End Cap

Cont'd

Mass	200grams
Diameter	35mm
Length	50mm



Striker



Material Properties

	Densit y Kg/m3	Modulus of Elasticity Gpa	Modulus of rigidity Gpa	Poisson Ratio	Yield Stress Mpa
Aluminu m	2800	70	26	0.33	100
Steel	7860	200	77	0.33	345
Titanium	4730	115	-	0.33	830



Softwares

- Solid Works →

Modeling

- ANSYS

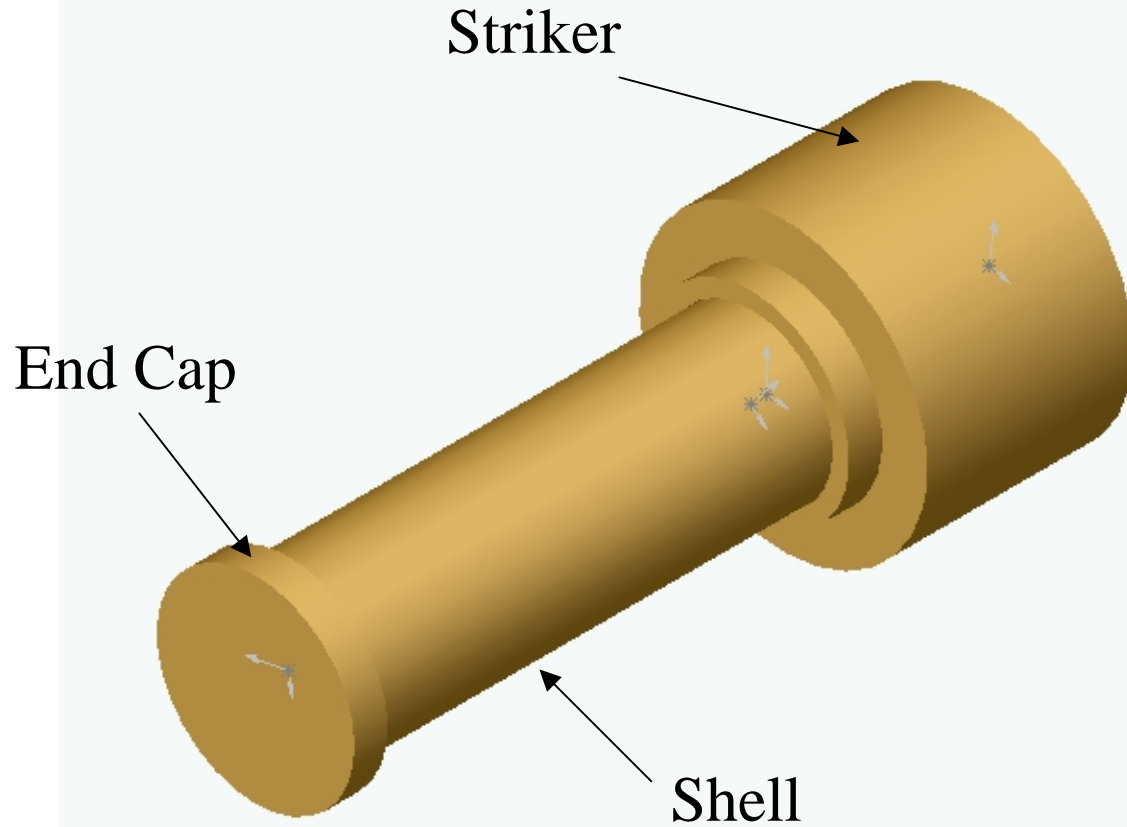
- Hypermesh

Pre Processor

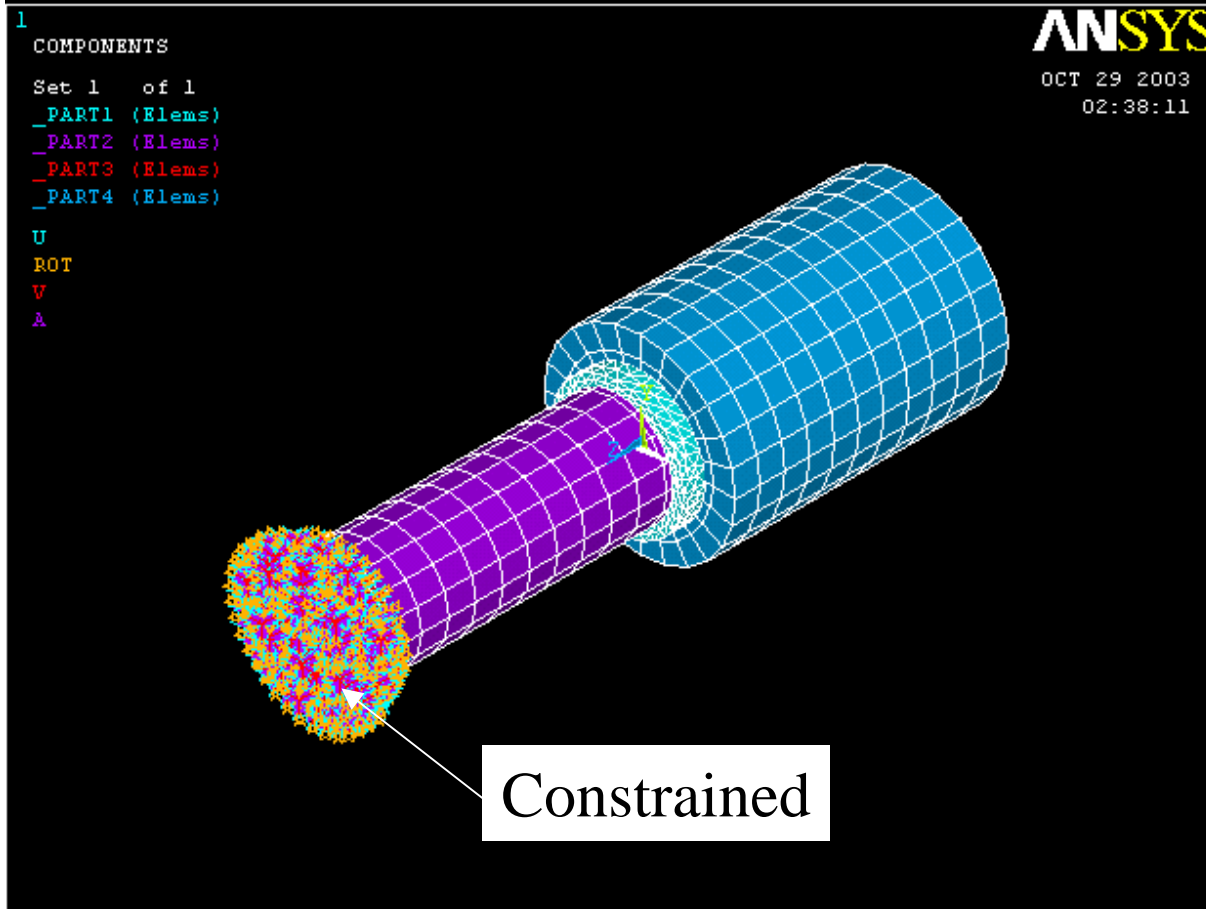
- LS POST →

Post Processor

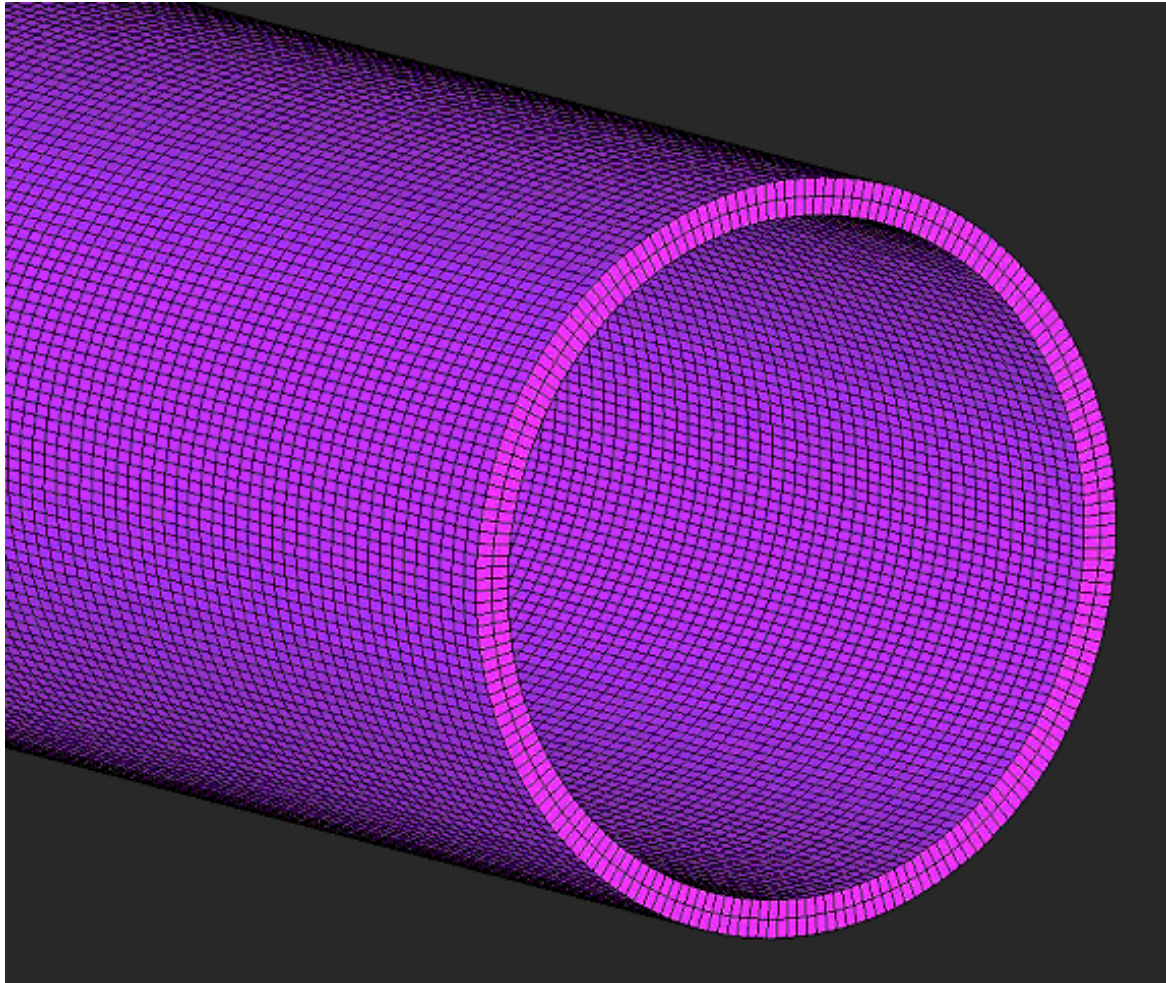
Solid Model



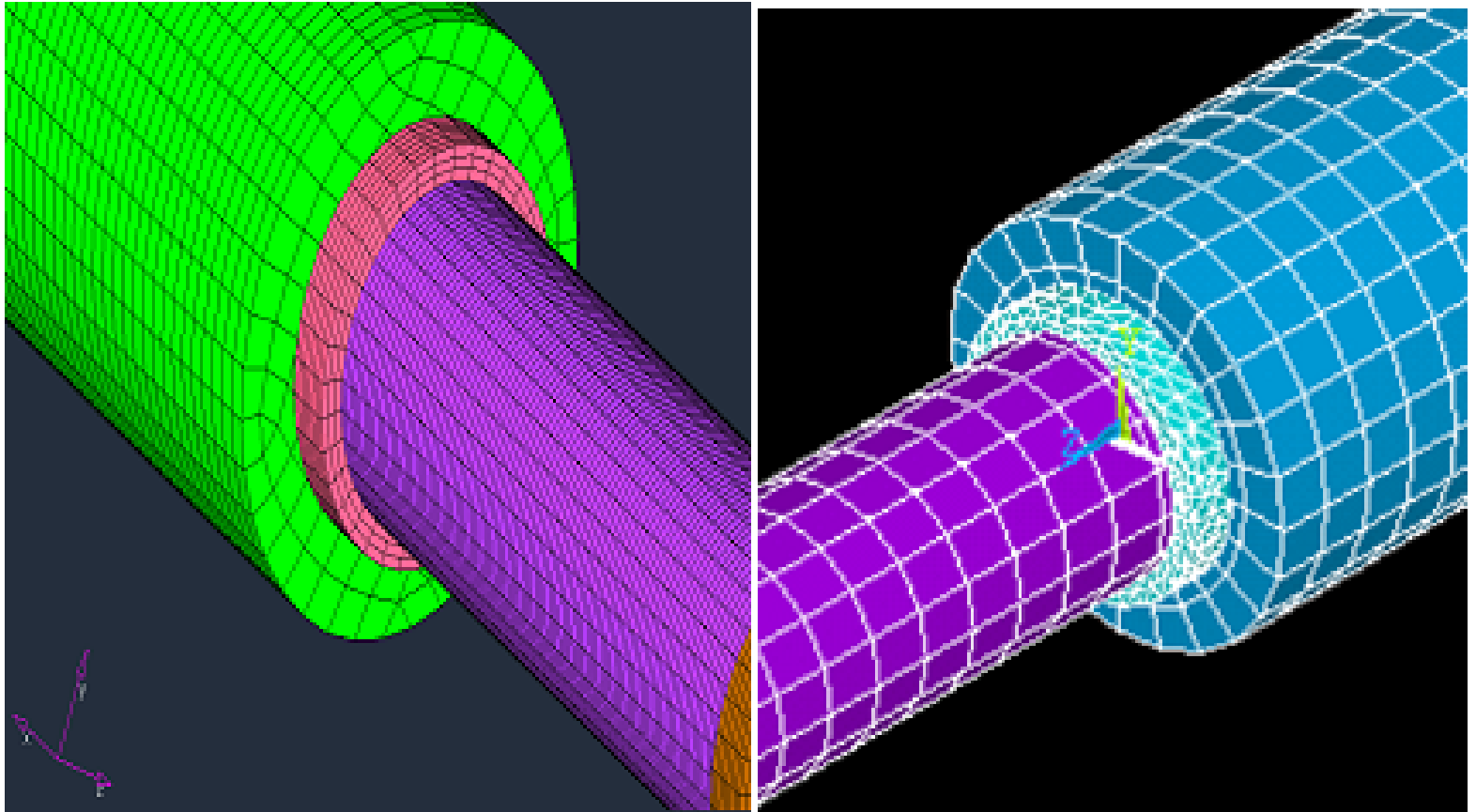
Meshed Model



Hyper Mesh Model



Hyper Mesh Vs Ansys



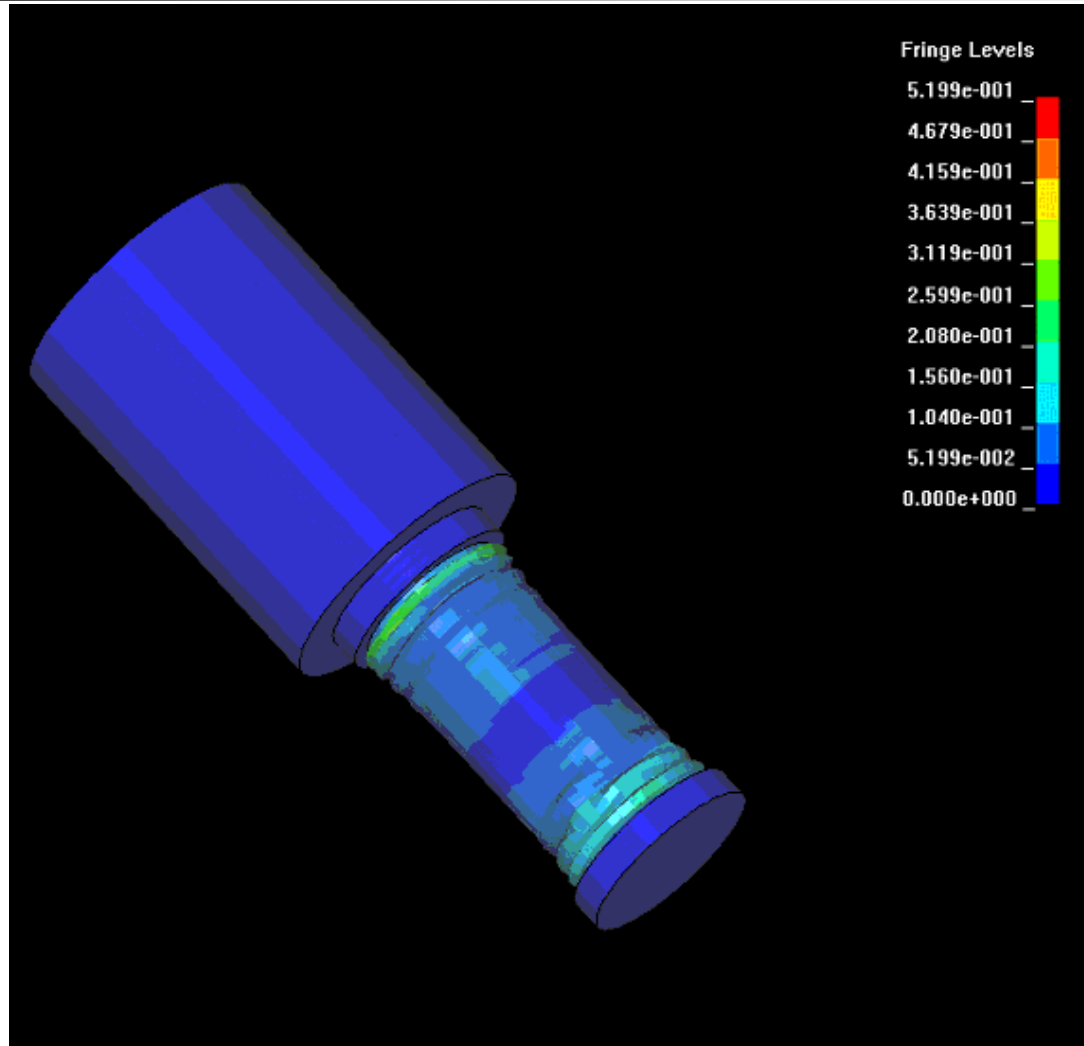
Mesh is much cleaner in Hyper Mesh



Contact Algorithms

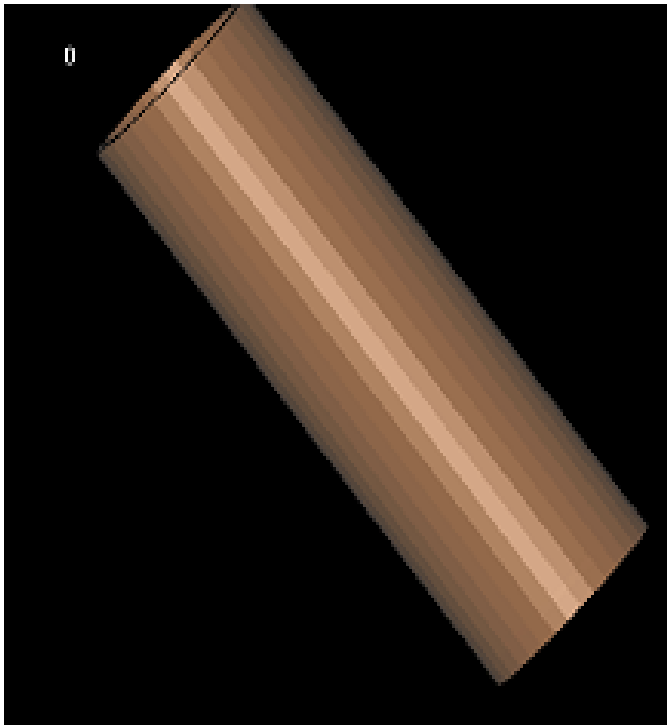
- Surface to Surface
- Surface to Node
- Tied option

Strain Contour



Strain
in the
Load direction

Deformed Cylinder

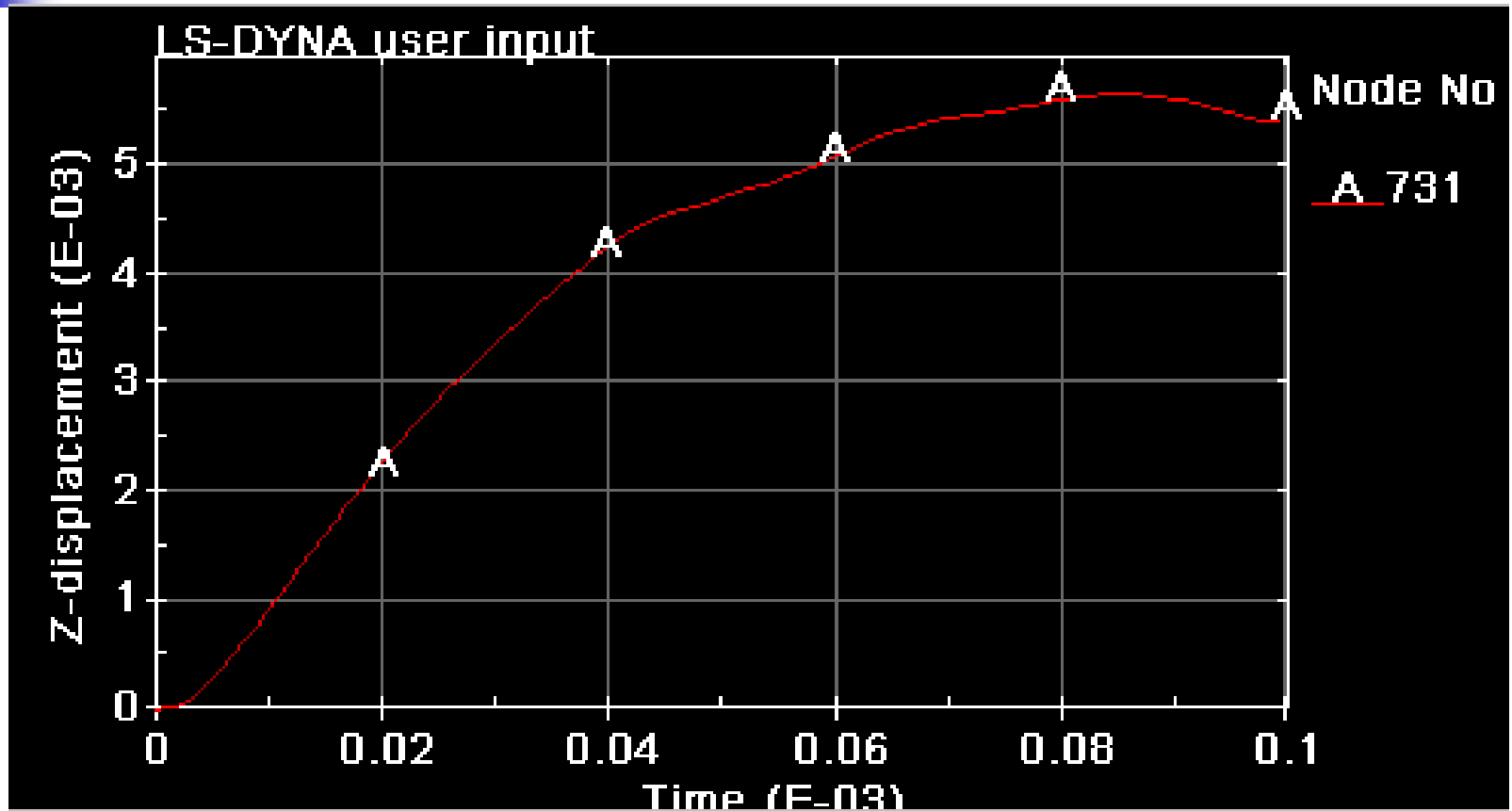


Before



After

Displacement



Initial Velocity 57.7 m/s



Future Work

- Experimental Data
- Load Application at Different Inclination
- Refinement of Mesh
- Adaptive Mesh