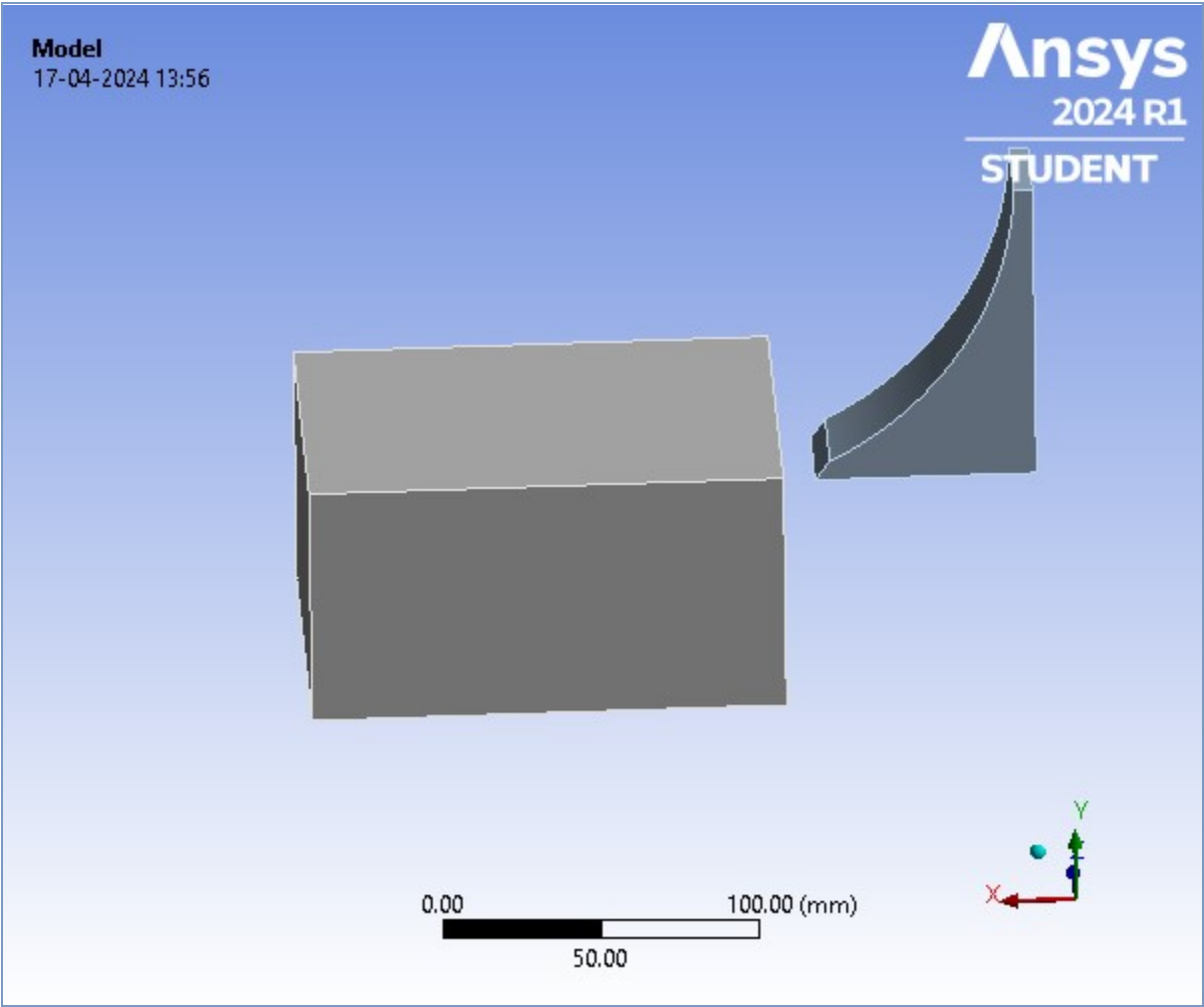




Project*

First Saved	Friday, April 12, 2024
Last Saved	Monday, April 15, 2024
Product Version	2024 R1
Save Project Before Solution	No
Save Project After Solution	No



Contents

- [Units](#)
- [Model \(A4\)](#)
 - [Geometry Imports](#)
 - [Geometry Import \(A3\)](#)
 - [Geometry](#)
 - [Parts](#)
 - [Materials](#)
 - [Coordinate Systems](#)
 - [Connections](#)
 - [Contacts 2](#)
 - [Frictional - planer1-FreeParts To planer1-FreeParts\[2\]](#)
 - [Body Interactions](#)
 - [Body Interaction](#)
 - [Mesh](#)
 - [Body Sizing](#)
 - [Explicit Dynamics \(A5\)](#)
 - [Initial Conditions](#)
 - [Initial Condition](#)
 - [Analysis Settings](#)
 - [Loads](#)
 - [Solution \(A6\)](#)
 - [Solution Information](#)
 - [Results](#)
- [Material Data](#)
 - [AL 6061-T6](#)
 - [Titanium Alloy](#)

Units

TABLE 1

Unit System	Metric (mm, kg, N, s, mV, mA) Degrees rad/s Celsius
Angle	Degrees
Rotational Velocity	rad/s
Temperature	Celsius

Model (A4)

TABLE 2

Model (A4) > Geometry Imports

Object Name	<i>Geometry Imports</i>
State	Solved

TABLE 3

Model (A4) > Geometry Imports > Geometry Import (A3)

Object Name	<i>Geometry Import (A3)</i>
State	Solved

Definition	
Source	C:\Users\digvi\OneDrive\Desktop\planer1.igs
Type	Iges
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	Program Tolerance
Stitch Tolerance	0.0000001
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

Geometry

TABLE 4
Model (A4) > Geometry

Object Name	<i>Geometry</i>
State	Fully Defined
Definition	
Source	C:\Users\digvi\OneDrive\Desktop\planer1.igs
Type	Iges
Length Unit	Millimeters
Display Style	Body Color
Bounding Box	
Length X	230.02 mm
Length Y	179.02 mm
Length Z	100.02 mm
Properties	
Volume	1.2791e+006 mm ³
Mass	3.6088 kg
Scale Factor Value	1.
Statistics	
Bodies	2
Active Bodies	2
Nodes	88903
Elements	81984

Mesh Metric	None
Update Options	
Assign Default Material	No
Basic Geometry Options	
Solid Bodies	Yes
Surface Bodies	Yes
Line Bodies	No
Parameters	Independent
Parameter Key	ANS;DS
Attributes	No
Named Selections	No
Material Properties	No
Advanced Geometry Options	
Use Associativity	Yes
Coordinate Systems	No
Reader Mode Saves Updated File	No
Use Instances	Yes
Smart CAD Update	Yes
Compare Parts On Update	No
Analysis Type	3-D
Mixed Import Resolution	None
Import Facet Quality	Source
Clean Bodies On Import	No
Stitch Surfaces On Import	Program Tolerance
Decompose Disjoint Geometry	Yes
Enclosure and Symmetry Processing	Yes

TABLE 5
Model (A4) > Geometry > Parts

Object Name	planer1-FreeParts		planer1-FreeParts[2]
State	Meshed		
Graphics Properties			
Visible	Yes		
Transparency	1		
Definition			
Suppressed	No		
Stiffness Behavior	Flexible		
Coordinate System	Default Coordinate System		
Reference Temperature	By Environment		
Reference Frame	Lagrangian		
Material			
Assignment	AL 6061-T6	Titanium Alloy	
Bounding Box			
Length X	150.02 mm	70.02 mm	
Length Y	80.02 mm	100.02 mm	
Length Z	100.02 mm	30.02 mm	
Properties			
Volume	1.2e+006 mm³	79056 mm³	
Mass	3.2436 kg	0.36524 kg	
Centroid X	155. mm	20.226 mm	
Centroid Y	-39. mm	29.933 mm	
Centroid Z	50. mm	15. mm	

Moment of Inertia Ip1	4432.9 kg·mm ²	290.21 kg·mm ²
Moment of Inertia Ip2	8784.7 kg·mm ²	81.287 kg·mm ²
Moment of Inertia Ip3	7811.7 kg·mm ²	316.72 kg·mm ²
Statistics		
Nodes	82533	6370
Elements	76800	5184
Mesh Metric	None	

TABLE 6
Model (A4) > Materials

Object Name	<i>Materials</i>
State	Fully Defined
Statistics	
Materials	4
Material Assignments	0

Coordinate Systems

TABLE 7
Model (A4) > Coordinate Systems > Coordinate System

Object Name	Global Coordinate System	Coordinate System	Coordinate System 2
State	Fully Defined		
Definition			
Type	Cartesian		
Suppressed		No	
Origin			
Origin X	0. mm	20.226 mm	155. mm
Origin Y	0. mm	29.933 mm	-39. mm
Origin Z	0. mm	15. mm	50. mm
Define By		Geometry Selection	
Geometry		Defined	
Directional Vectors			
X Axis Data	[1. 0. 0.]		[-1. 0. 0.]
Y Axis Data	[0. 1. 0.]		
Z Axis Data	[0. 0. 1.]		[0. 0. -1.]
Transfer Properties			
Source			
Read Only	No		
Principal Axis			
Axis		X	
Define By		Global X Axis	
Orientation About Principal Axis			
Axis		Y	
Define By		Default	
Transformations			
Base Configuration		Absolute	
Transformed Configuration		[20.226 29.933 15.]	[155. -39. 50.]

Connections

TABLE 8
Model (A4) > Connections

--	--

Object Name	<i>Connections</i>
State	Fully Defined
Auto Detection	
Generate Automatic Connection On Refresh	Yes
Transparency	
Enabled	Yes
Statistics	
Contacts	1
Active Contacts	1
Joints	0
Active Joints	0
Beams	0
Active Beams	0
Bearings	0
Active Bearings	0
Springs	0
Active Springs	0
Body Interactions	1
Active Body Interactions	1

TABLE 9
Model (A4) > Connections > Contacts 2

Object Name	<i>Contacts 2</i>
State	Fully Defined
Definition	
Connection Type	Contact
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Auto Detection	
Tolerance Type	Slider
Tolerance Slider	0.
Tolerance Value	0.7704 mm
Use Range	No
Face/Face	Yes
Face-Face Angle Tolerance	75. °
Face Overlap Tolerance	Off
Cylindrical Faces	Include
Face/Edge	No
Edge/Edge	No
Priority	Include All
Group By	Bodies
Search Across	Bodies
Statistics	
Connections	1
Active Connections	1

TABLE 10
Model (A4) > Connections > Contacts 2 > Contact Regions

Object Name	<i>Frictional - planer1-FreeParts To planer1-FreeParts[2]</i>
State	Fully Defined
Scope	
Scoping Method	Geometry Selection

Contact	3 Faces
Target	5 Faces
Contact Bodies	planer1-FreeParts
Target Bodies	planer1-FreeParts[2]
Protected	No
Definition	
Type	Frictional
Friction Coefficient	0.3
Dynamic Coefficient	0.
Decay Constant	0.
Scope Mode	Manual
Behavior	Program Controlled
Trim Contact	Program Controlled
Suppressed	No

TABLE 11
Model (A4) > Connections > Body Interactions

Object Name	<i>Body Interactions</i>
State	Fully Defined
Advanced	
Contact Detection	Trajectory
Formulation	Penalty
Sliding Contact	Discrete Surface
Body Self Contact	Program Controlled
Element Self Contact	Program Controlled
Tolerance	0.2

TABLE 12
Model (A4) > Connections > Body Interactions > Body Interaction

Object Name	<i>Body Interaction</i>
State	Fully Defined
Scope	
Scoping Method	Geometry Selection
Geometry	All Bodies
Definition	
Type	Frictional
Friction Coefficient	0.3
Dynamic Coefficient	0.
Decay Constant	0.
Suppressed	No

Mesh

TABLE 13
Model (A4) > Mesh

Object Name	<i>Mesh</i>
State	Solved
Display	
Display Style	Use Geometry Setting
Defaults	
Physics Preference	Explicit
Element Order	Linear

Element Size	2.5 mm
Sizing	
Use Adaptive Sizing	No
Growth Rate	Default (1.5)
Max Size	Default (2.5 mm)
Mesh Defeaturing	Yes
Defeature Size	Default (0.25 mm)
Capture Curvature	Yes
Curvature Min Size	Default (1.25 mm)
Curvature Normal Angle	Default (72.0°)
Capture Proximity	No
Bounding Box Diagonal	308.16 mm
Average Surface Area	6482.6 mm ²
Minimum Edge Length	6.0 mm
Quality	
Check Mesh Quality	Mesh Quality Worksheet
Target Element Quality	Default (0.2)
Target Characteristic Length (LS-DYNA)	Default (0.25 mm)
Target Aspect Ratio (Explicit)	Default (5.0)
Smoothing	High
Mesh Metric	None
Inflation	
Use Automatic Inflation	None
Inflation Option	Smooth Transition
Transition Ratio	0.272
Maximum Layers	1
Growth Rate	1.2
Inflation Algorithm	Pre
Inflation Element Type	Wedges
View Advanced Options	No
Advanced	
Number of CPUs for Parallel Part Meshing	Program Controlled
Straight Sided Elements	
Rigid Body Behavior	Full Mesh
Triangle Surface Mesher	Program Controlled
Topology Checking	Yes
Pinch Tolerance	Default (1.125 mm)
Generate Pinch on Refresh	No
Statistics	
Nodes	88903
Elements	81984
Show Detailed Statistics	No

TABLE 14
Model (A4) > Mesh > Mesh Controls

Object Name	<i>Body Sizing</i>
State	Suppressed
Scope	
Scoping Method	Geometry Selection
Geometry	1 Body
Definition	
Suppressed	Yes

Active	No, Suppressed
Type	Element Size
Element Size	2.0 mm
Advanced	
Defeature Size	Default (0.25 mm)
Growth Rate	Default (1.5)
Capture Curvature	Yes
Curvature Normal Angle	Default (72.0°)
Local Min Size	Default (1.25 mm)
Capture Proximity	No

Explicit Dynamics (A5)

TABLE 15
Model (A4) > Analysis

Object Name	<i>Explicit Dynamics (A5)</i>
State	Solved
Definition	
Physics Type	Structural
Analysis Type	Explicit Dynamics
Solver Target	AUTODYN
Options	
Environment Temperature	22. °C
Generate Input Only	No

TABLE 16
Model (A4) > Explicit Dynamics (A5) > Initial Conditions

Object Name	<i>Initial Conditions</i>
State	Fully Defined

TABLE 17
Model (A4) > Explicit Dynamics (A5) > Initial Conditions > Initial Condition

Object Name	Pre-Stress (None)	Velocity
State	Fully Defined	
Definition		
Pre-Stress Environment	None Available	
Input Type		Velocity
Define By		Components
Coordinate System		Coordinate System
X Component		2.9e+005 mm/s
Y Component		0. mm/s
Z Component		0. mm/s
Suppressed		No
Scope		
Scoping Method		Geometry Selection
Geometry		1 Body

TABLE 18
Model (A4) > Explicit Dynamics (A5) > Analysis Settings

Object Name	<i>Analysis Settings</i>
State	Fully Defined
Analysis Settings Preference	

Type	Program Controlled
Step Controls	
Number Of Steps	1
Current Step Number	1
Load Step Type	Explicit Time Integration
End Time	1.e-003
Resume From Cycle	0
Maximum Number of Cycles	1e+07
Maximum Energy Error	0.1
Reference Energy Cycle	0
Initial Time Step	Program Controlled
Minimum Time Step	Program Controlled
Maximum Time Step	Program Controlled
Time Step Safety Factor	0.9
Characteristic Dimension	Diagonals
Automatic Mass Scaling	No
Solver Controls	
Solve Units	mm, mg, ms
Beam Solution Type	Bending
Beam Time Step Safety Factor	0.5
Hex Integration Type	Exact
Shell Sublayers	3
Shell Shear Correction Factor	0.8333
Shell BWC Warp Correction	Yes
Shell Thickness Update	Nodal
Tet Integration	Average Nodal Pressure
Shell Inertia Update	Recompute
Density Update	Program Controlled
Minimum Timestep for SPH	1.e-010 s
Minimum Density Factor for SPH	0.2
Maximum Density Factor for SPH	3.
Density Cutoff Option For SPH	Limit Density
Minimum Velocity	1.e-003 mm s ⁻¹
Maximum Velocity	1.e+013 mm s ⁻¹
Radius Cutoff	1.e-003
Minimum Strain Rate Cutoff	1.e-010
Detonation Point Burn Type	Program Controlled
Euler Domain Controls	
Domain Size Definition	Program Controlled
Display Euler Domain	Yes
Scope	All Bodies
X Scale factor	1.2
Y Scale factor	1.2
Z Scale factor	1.2
Domain Resolution Definition	Total Cells
Total Cells	2.5e+05
Lower X Face	Flow Out
Lower Y Face	Flow Out
Lower Z Face	Flow Out
Upper X Face	Flow Out
Upper Y Face	Flow Out
Upper Z Face	Flow Out
Euler Tracking	

	By Body
Damping Controls	
Linear Artificial Viscosity	0.2
Quadratic Artificial Viscosity	1.
Linear Viscosity in Expansion	No
Artificial Viscosity For Shells	Yes
Linear Artificial Viscosity for SPH	1.
Quadratic Artificial Viscosity for SPH	1.
Hourglass Damping	AUTODYN Standard
Viscous Coefficient	0.1
Static Damping	0.
Erosion Controls	
On Geometric Strain Limit	Yes
Geometric Strain Limit	1.5
On Material Failure	No
On Minimum Element Time Step	No
Retain Inertia of Eroded Material	Yes
Output Controls	
Step-aware Output Controls	No
Save Results on	Equally Spaced Points
Result Number Of Points	20
Save Restart Files on	Equally Spaced Points
Restart Number Of Points	5
Save Result Tracker Data on	Cycles
Tracker Cycles	1
Output Contact Forces	Off
Analysis Data Management	
Solver Files Directory	C:\Users\digvi\OneDrive\Desktop\planertry1_files\dp0\SYS\MECH\
Scratch Solver Files Directory	

TABLE 19
Model (A4) > Explicit Dynamics (A5) > Loads

Object Name	<i>Displacement</i>	<i>Displacement 2</i>	<i>Velocity</i>	<i>Fixed Support</i>
State	Suppressed	Fully Defined	Suppressed	Fully Defined
Scope				
Scoping Method	Geometry Selection			
Geometry	6 Faces	7 Faces	1 Body	3 Faces
Definition				
Type	Displacement		Velocity	Fixed Support
Define By	Components			
Coordinate System	Coordinate System 2	Coordinate System		
X Component	0. mm (ramped)	Free	50000 mm/s (step applied)	
Y Component	0. mm (ramped)		Free	
Z Component	0. mm (ramped)		Free	
Suppressed	Yes	No	Yes	No

FIGURE 1
Model (A4) > Explicit Dynamics (A5) > Displacement

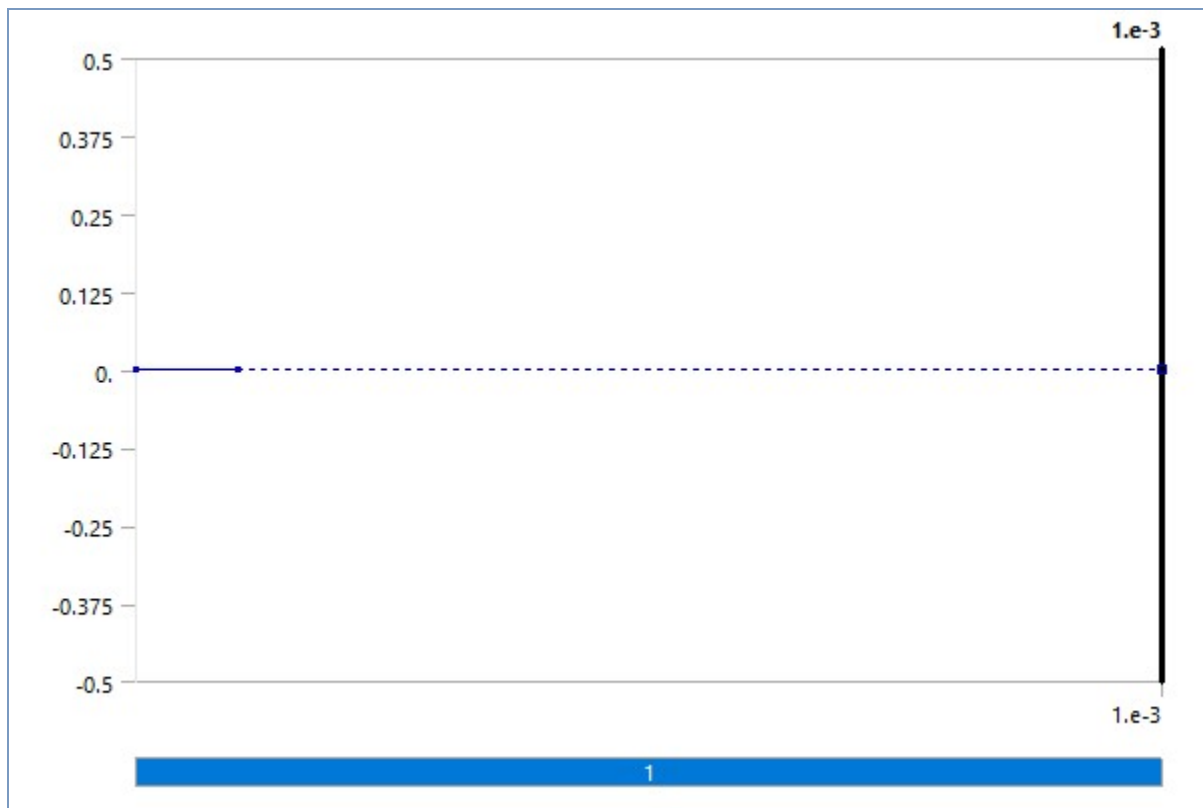
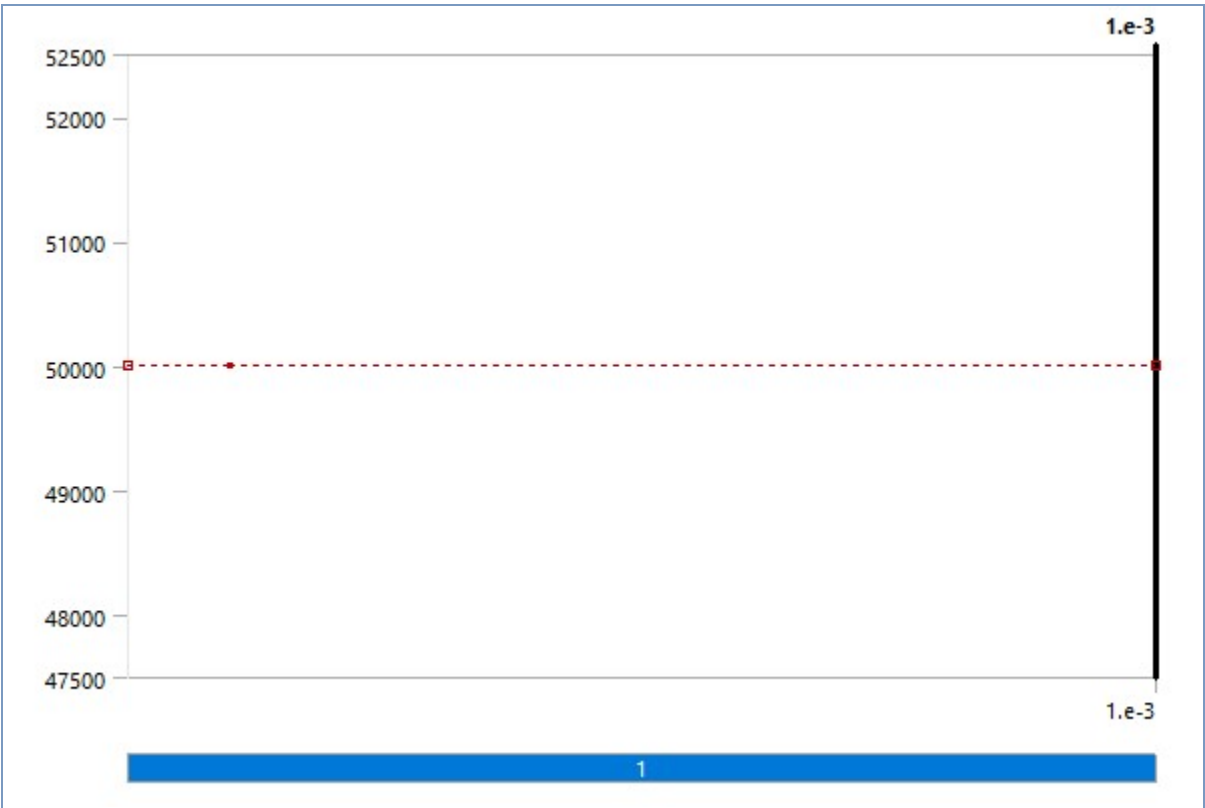


FIGURE 2
Model (A4) > Explicit Dynamics (A5) > Displacement 2



FIGURE 3
Model (A4) > Explicit Dynamics (A5) > Velocity



Solution (A6)

TABLE 20
Model (A4) > Explicit Dynamics (A5) > Solution

Object Name	<i>Solution (A6)</i>
State	Solved
Information	
Status	Done

TABLE 21
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Solution Information

Object Name	<i>Solution Information</i>
State	Solved
Solution Information	
Solution Output	Solver Output
Update Interval	2.5 s
Display Points	All
Display Filter During Solve	Yes

TABLE 22
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Results

Object Name	<i>Total Deformation</i>	<i>Equivalent Stress</i>	<i>Total Deformation 2</i>	<i>Equivalent Stress 2</i>	<i>Equivalent Stress 3</i>
State	Solved				
Scope					
Scoping Method	Geometry Selection				
Geometry	All Bodies		1 Body		
Definition					

Type	Total Deformation	Equivalent (von-Mises) Stress	Total Deformation	Equivalent (von-Mises) Stress	
By	Time				
Display Time	Last				
Separate Data by Entity	No				
Calculate Time History	Yes				
Identifier					
Suppressed	No				
Results					
Minimum	0. mm	0.2352 MPa	0. mm	0.2352 MPa	6.1947 MPa
Maximum	460.14 mm	2397.6 MPa	460.14 mm	356.25 MPa	2397.6 MPa
Average	10.166 mm	30.597 MPa	1.0492 mm	25.981 MPa	89.947 MPa
Minimum Occurs On	planer1-FreeParts				planer1-FreeParts[2]
Maximum Occurs On	planer1-FreeParts	planer1-FreeParts[2]	planer1-FreeParts		planer1-FreeParts[2]
Minimum Value Over Time					
Minimum	0. mm	0. MPa	0. mm	0. MPa	
Maximum	0. mm	0.9333 MPa	0. mm	0.9333 MPa	20.169 MPa
Maximum Value Over Time					
Minimum	0. mm	0. MPa	0. mm	0. MPa	
Maximum	460.14 mm	8849.3 MPa	460.14 mm	444.39 MPa	8849.3 MPa
Information					
Time	1.e-003 s				
Set	21				
Cycle Number	29212				
Integration Point Results					
Display Option		Averaged		Averaged	
Average Across Bodies		No		No	

FIGURE 4
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation

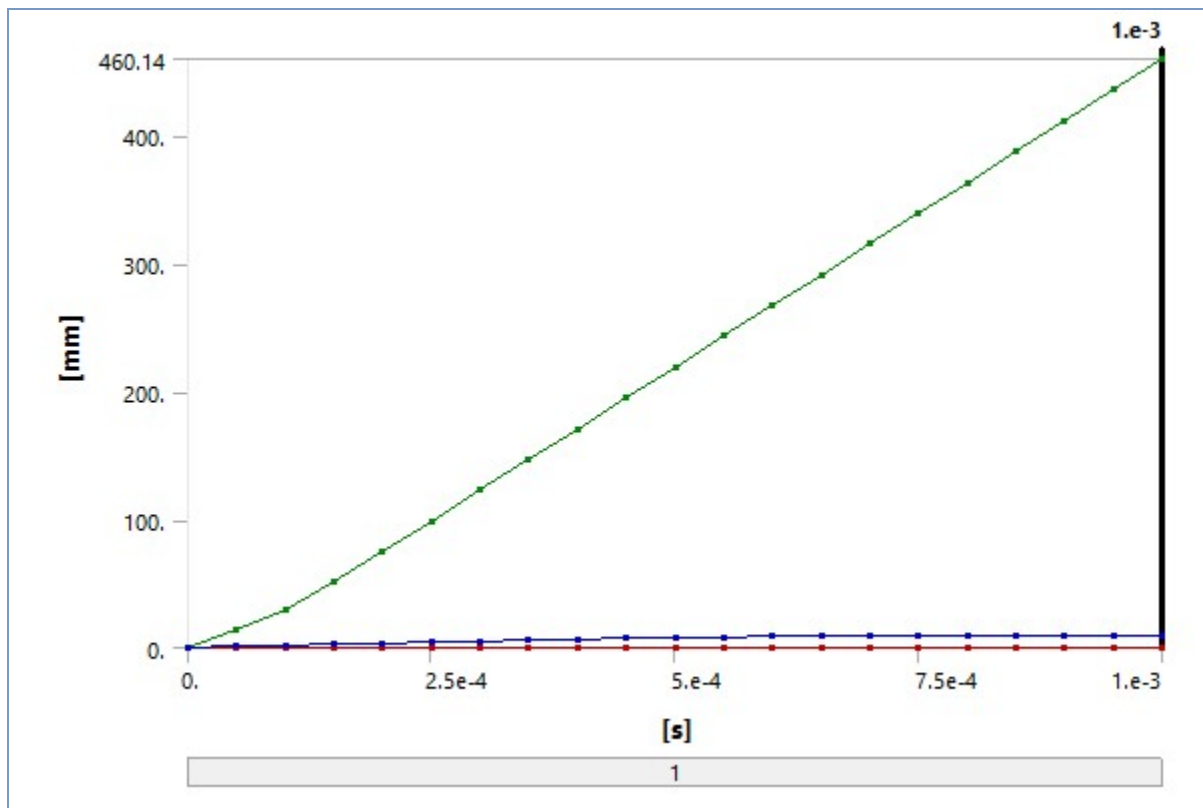


TABLE 23
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation

Time [s]	Minimum [mm]	Maximum [mm]	Average [mm]
1.1755e-038	0.	0.	0.
5.002e-005		14.577	1.0438
1.0002e-004		29.101	2.057
1.5001e-004		51.234	2.9835
2.0001e-004		75.1	3.8512
2.5003e-004		99.175	4.6673
3.e-004		123.22	5.4189
3.5002e-004		147.3	6.1089
4.0002e-004		171.36	6.7456
4.5001e-004		195.42	7.3292
5.0001e-004		219.49	7.8473
5.5001e-004		243.55	8.3141
6.0002e-004		267.62	8.7241
6.5003e-004		291.69	9.0684
7.0001e-004		315.75	9.3638
7.5001e-004		339.82	9.6084
8.0001e-004		363.88	9.798
8.5002e-004		387.95	9.9472
9.e-004		412.01	10.056
9.5002e-004		436.08	10.12
1.e-003		460.14	10.166

FIGURE 5
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress

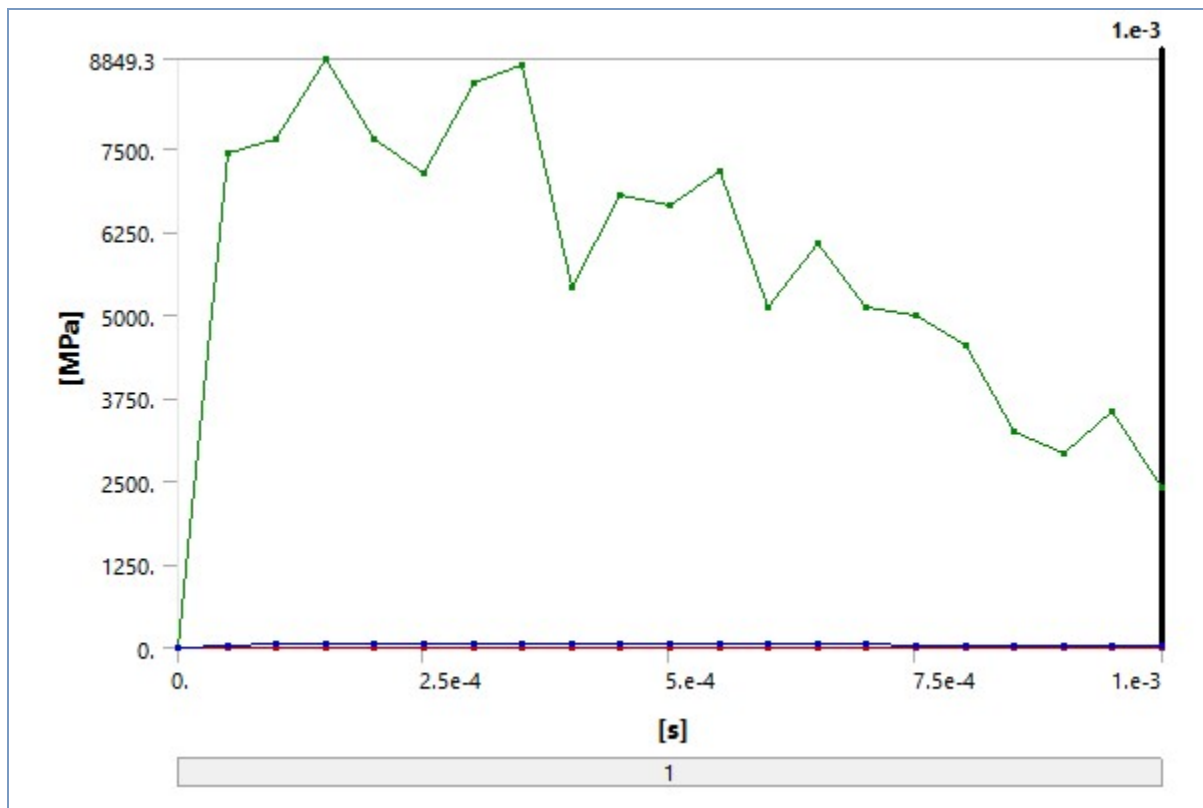


TABLE 24
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress

Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
1.1755e-038	0.	0.	0.
5.002e-005		7426.9	26.067
1.0002e-004	0.13435	7637.3	68.952
1.5001e-004	0.6758	8849.3	68.539
2.0001e-004	0.91266	7656.	64.069
2.5003e-004	0.32446	7120.6	64.608
3.e-004	0.29876	8502.9	65.103
3.5002e-004	0.9333	8761.8	64.182
4.0002e-004	0.35521	5426.8	56.151
4.5001e-004	0.16433	6794.2	58.229
5.0001e-004	0.4874	6656.7	53.663
5.5001e-004	6.2869e-002	7157.8	54.364
6.0002e-004	0.53935	5104.3	52.074
6.5003e-004	0.21579	6085.2	45.622
7.0001e-004	0.5354	5122.5	46.011
7.5001e-004	0.22855	4993.7	44.933
8.0001e-004	0.62542	4537.4	39.771
8.5002e-004	0.73535	3265.7	38.33
9.e-004	0.19129	2916.8	37.325
9.5002e-004	0.41186	3565.4	32.122
1.e-003	0.2352	2397.6	30.597

FIGURE 6
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation 2

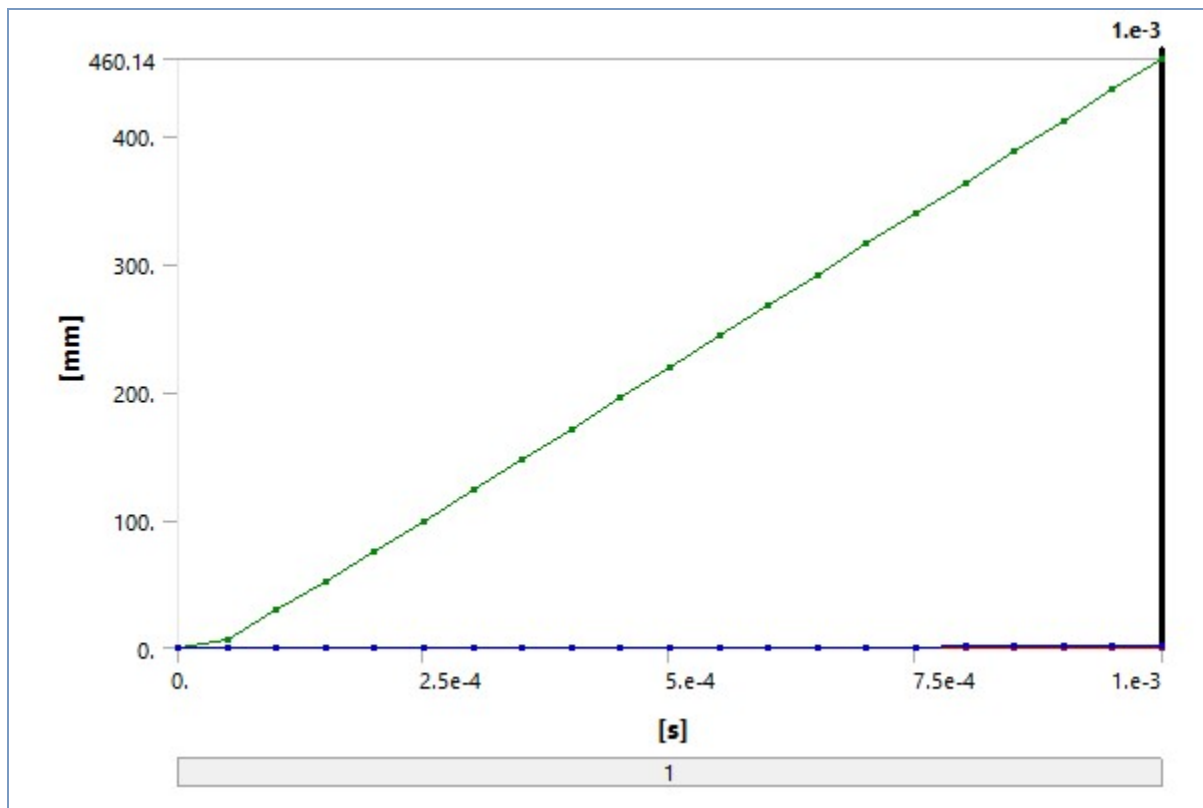


TABLE 25
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Total Deformation 2

Time [s]	Minimum [mm]	Maximum [mm]	Average [mm]
1.1755e-038	0.	0.	0.
5.002e-005		6.7505	7.8327e-003
1.0002e-004		29.101	4.3958e-002
1.5001e-004		51.234	6.5365e-002
2.0001e-004		75.1	9.7048e-002
2.5003e-004		99.175	0.14602
3.e-004		123.22	0.19541
3.5002e-004		147.3	0.24604
4.0002e-004		171.36	0.30626
4.5001e-004		195.42	0.3719
5.0001e-004		219.49	0.42868
5.5001e-004		243.55	0.4935
6.0002e-004		267.62	0.56275
6.5003e-004		291.69	0.62188
7.0001e-004		315.75	0.68607
7.5001e-004		339.82	0.75179
8.0001e-004		363.88	0.8111
8.5002e-004		387.95	0.87229
9.e-004		412.01	0.93342
9.5002e-004		436.08	0.98916
1.e-003		460.14	1.0492

FIGURE 7
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress 2

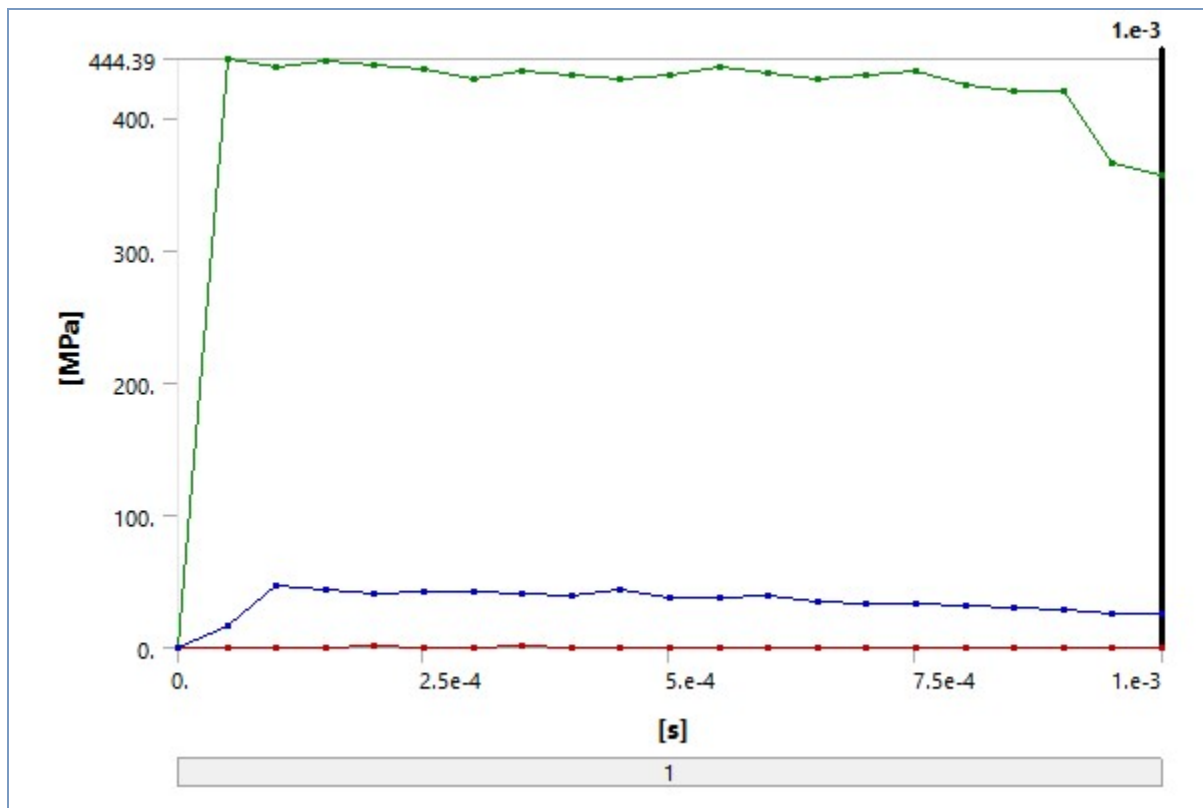


TABLE 26
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress 2

Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
1.1755e-038	0.	0.	0.
5.002e-005		444.39	15.907
1.0002e-004	0.13435	437.65	47.601
1.5001e-004	0.6758	443.42	44.135
2.0001e-004	0.91266	439.48	41.079
2.5003e-004	0.32446	436.4	42.961
3.e-004	0.29876	429.62	42.42
3.5002e-004	0.9333	435.66	40.855
4.0002e-004	0.35521	433.04	38.676
4.5001e-004	0.16433	429.86	44.373
5.0001e-004	0.4874	432.12	37.531
5.5001e-004	6.2869e-002	438.21	37.28
6.0002e-004	0.53935	434.52	38.877
6.5003e-004	0.21579	429.92	34.323
7.0001e-004	0.5354	432.48	33.54
7.5001e-004	0.22855	434.76	32.996
8.0001e-004	0.62542	425.15	31.362
8.5002e-004	0.73535	420.35	29.673
9.e-004	0.19129	420.55	29.242
9.5002e-004	0.41186	366.5	24.966
1.e-003	0.2352	356.25	25.981

FIGURE 8
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress 3

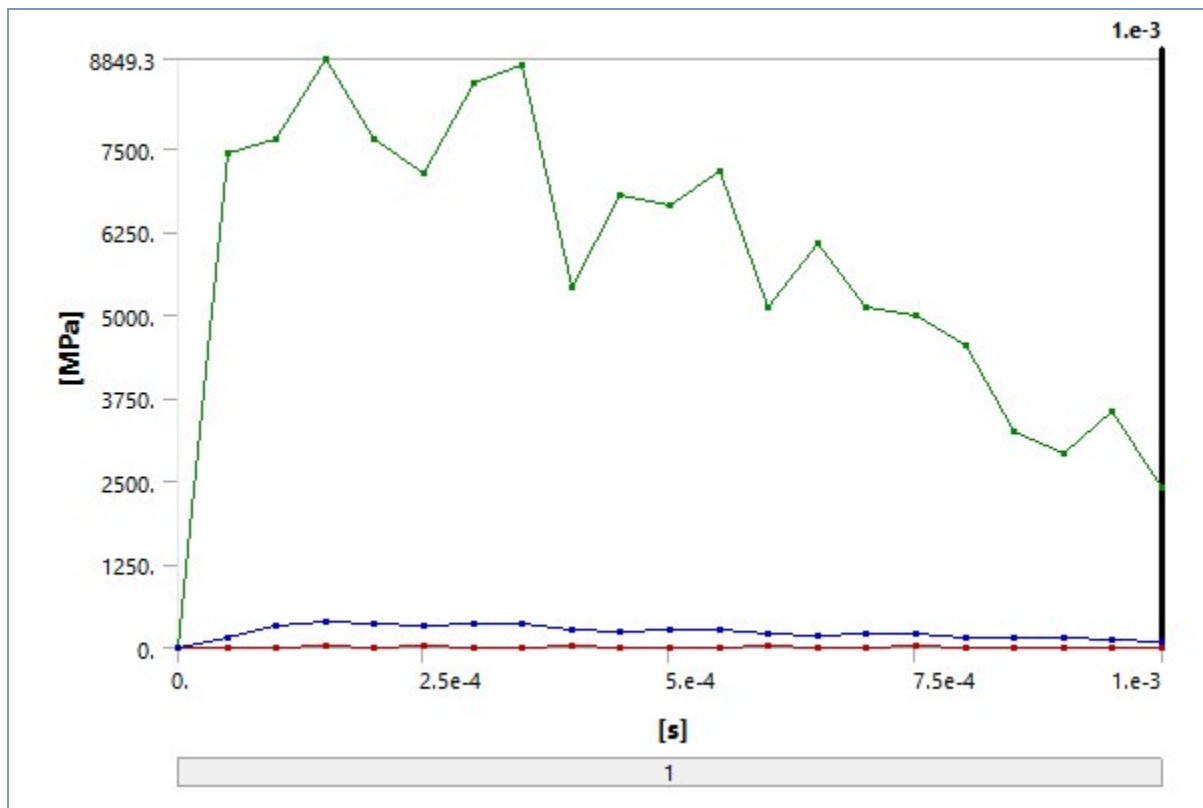


TABLE 27
Model (A4) > Explicit Dynamics (A5) > Solution (A6) > Equivalent Stress 3

Time [s]	Minimum [MPa]	Maximum [MPa]	Average [MPa]
1.1755e-038	0.	0.	0.
5.002e-005		7426.9	157.7
1.0002e-004	12.287	7637.3	345.43
1.5001e-004	15.729	8849.3	384.2
2.0001e-004	7.3684	7656.	361.13
2.5003e-004	20.169	7120.6	344.1
3.e-004	7.5627	8502.9	357.74
3.5002e-004	6.6517	8761.8	364.93
4.0002e-004	20.16	5426.8	281.3
4.5001e-004	10.961	6794.2	236.67
5.0001e-004	13.321	6656.7	261.3
5.5001e-004	11.188	7157.8	274.2
6.0002e-004	17.513	5104.3	221.88
6.5003e-004	9.3435	6085.2	190.97
7.0001e-004	14.123	5122.5	206.4
7.5001e-004	16.928	4993.7	198.43
8.0001e-004	8.1479	4537.4	147.89
8.5002e-004	11.797	3265.7	149.62
9.e-004	4.2371	2916.8	141.25
9.5002e-004	10.599	3565.4	124.12
1.e-003	6.1947	2397.6	89.947

Material Data

AL 6061-T6

TABLE 28
AL 6061-T6 > Constants

Density	2.703e-006 kg mm ⁻³
Specific Heat	8.85e+005 mJ kg ⁻¹ C ⁻¹

TABLE 29
AL 6061-T6 > Shock EOS Linear

Gruneisen Coefficient	Parameter C1 mm s ⁻¹	Parameter S1	Parameter Quadratic S2 s mm ⁻¹
1.97	5.24e+006	1.4	0

TABLE 30
AL 6061-T6 > Steinberg Guinan Strength

Initial Yield Stress Y MPa	Maximum Yield Stress Ymax MPa	Hardening Constant B	Hardening Exponent n	Derivative dG/dP G'P	Derivative dG/dT G'T MPa C ⁻¹	Derivative dY/dP Y'P	Melting Temperature Tmelt C
290	680	125	0.1	1.8	-17	1.8908e-002	946.85

TABLE 31
AL 6061-T6 > Shear Modulus

Shear Modulus MPa
27600

TABLE 32
AL 6061-T6 > Color

Red	Green	Blue
170	170	170

Titanium Alloy

TABLE 33
Titanium Alloy > Constants

Density	4.62e-006 kg mm ⁻³
Coefficient of Thermal Expansion	9.4e-006 C ⁻¹
Specific Heat	5.22e+005 mJ kg ⁻¹ C ⁻¹
Thermal Conductivity	2.19e-002 W mm ⁻¹ C ⁻¹
Resistivity	1.7e-003 ohm mm

TABLE 34
Titanium Alloy > Color

Red	Green	Blue
88	72	117

TABLE 35
Titanium Alloy > Compressive Ultimate Strength

Compressive Ultimate Strength MPa
0

TABLE 36
Titanium Alloy > Compressive Yield Strength

Compressive Yield Strength MPa

930

TABLE 37
Titanium Alloy > Tensile Yield Strength

Tensile Yield Strength MPa
930

TABLE 38
Titanium Alloy > Tensile Ultimate Strength

Tensile Ultimate Strength MPa
1070

TABLE 39
Titanium Alloy > Isotropic Secant Coefficient of Thermal Expansion

Zero-Thermal-Strain Reference Temperature C
22

TABLE 40
Titanium Alloy > Isotropic Elasticity

Young's Modulus MPa	Poisson's Ratio	Bulk Modulus MPa	Shear Modulus MPa	Temperature C
96000	0.36	1.1429e+005	35294	

TABLE 41
Titanium Alloy > Isotropic Relative Permeability

Relative Permeability
1

PROJECT ON

ANALYSIS OF SHAPER MECHANISM

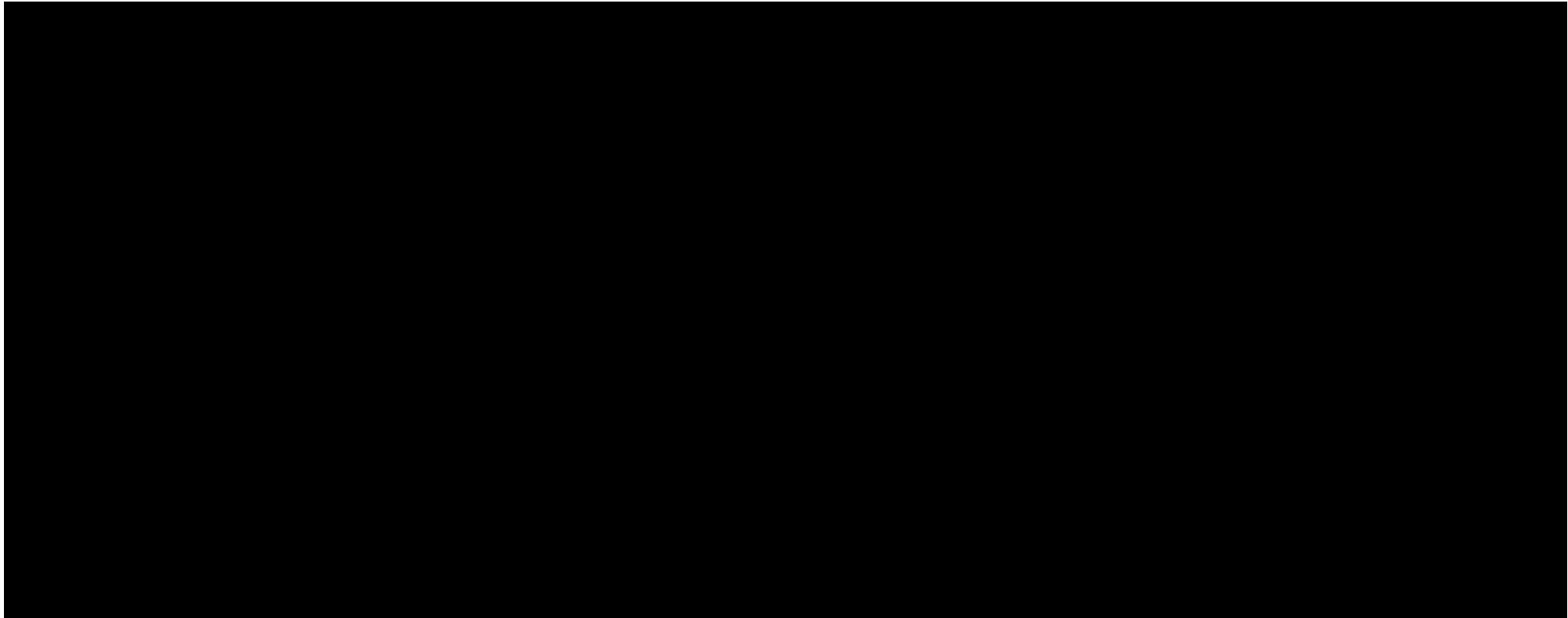
Group-3

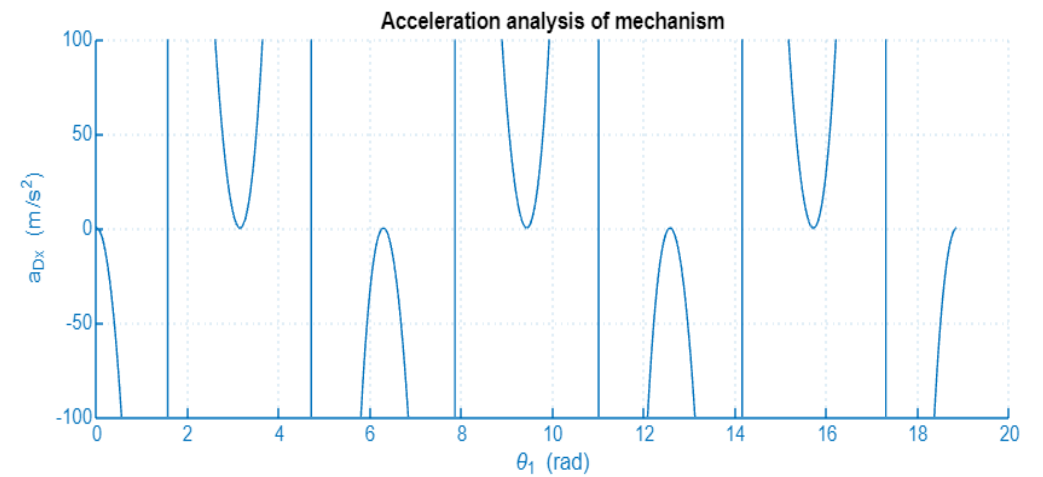
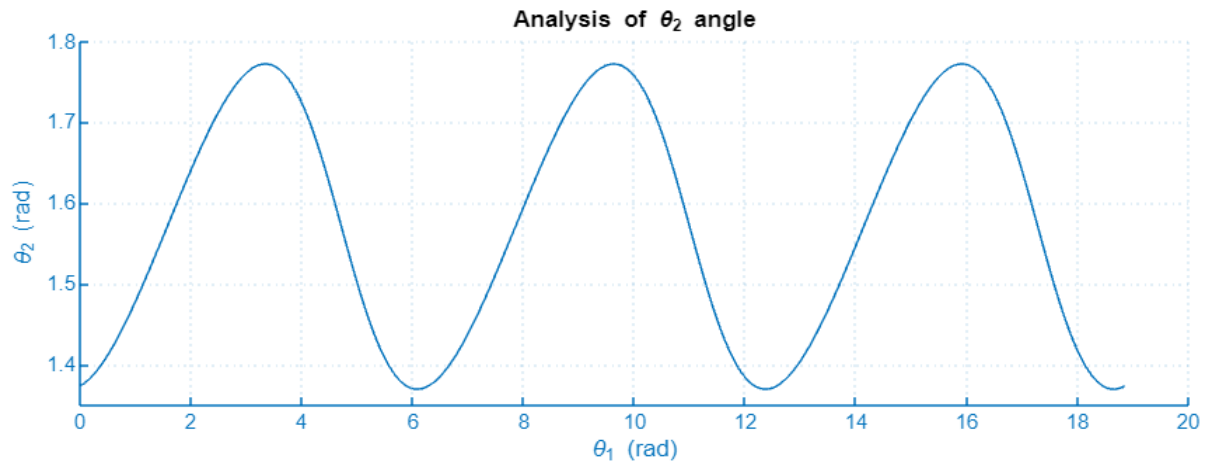
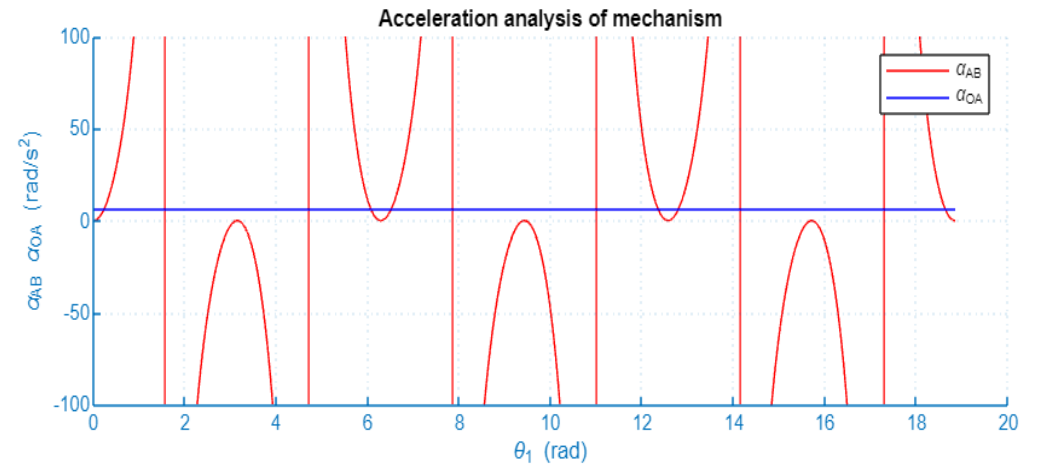
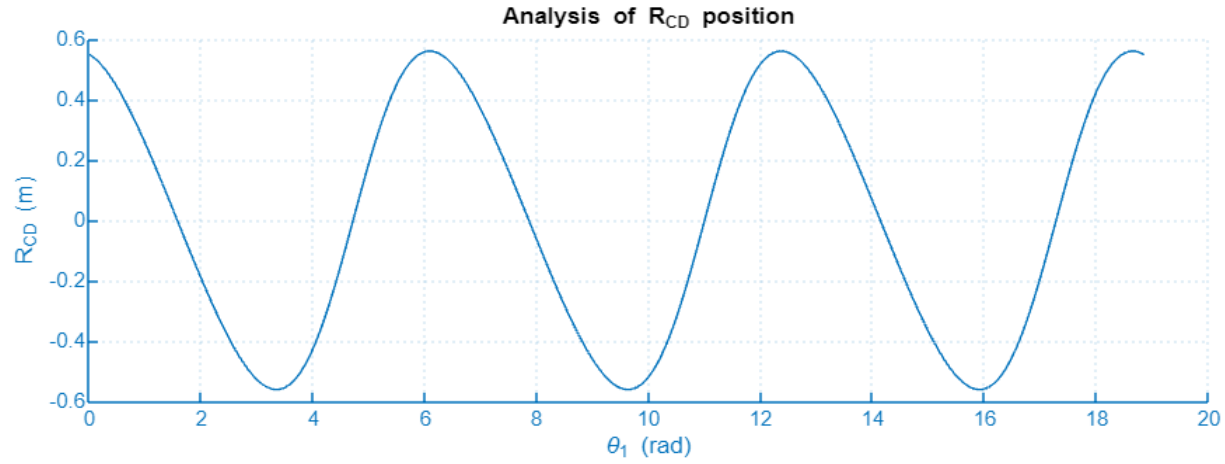
Anjeet Kumar- 234103407
Digvijay Kumar-234103415
Sanjay Kumar- 234103434



Introduction

- A **Shaper mechanism** is a robust machine used to remove material from work pieces to achieve flat and smooth surfaces with high precision.
- Mechanism: Quick Return Mechanism





Objectives

- To perform a Explicit Dynamics analysis of Shaper Mechanism
- Compare the result of Total deformation, Equivalent stress ,Force
- Conducting the parametric study for other cutting tool velocity.
- Analyzing the result and developing the interference with different velocity

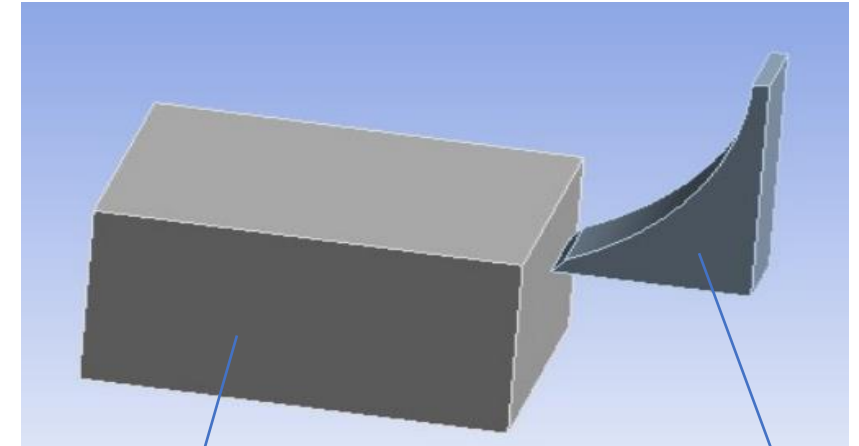
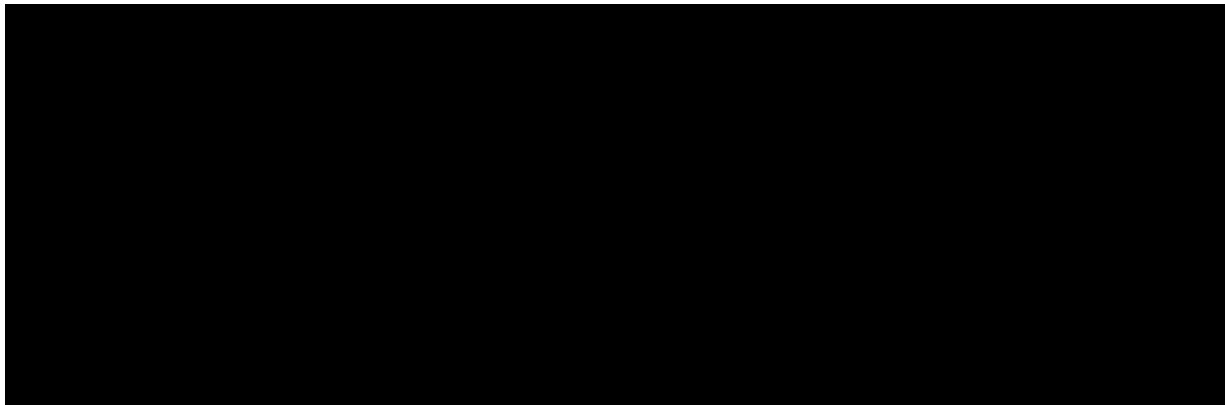
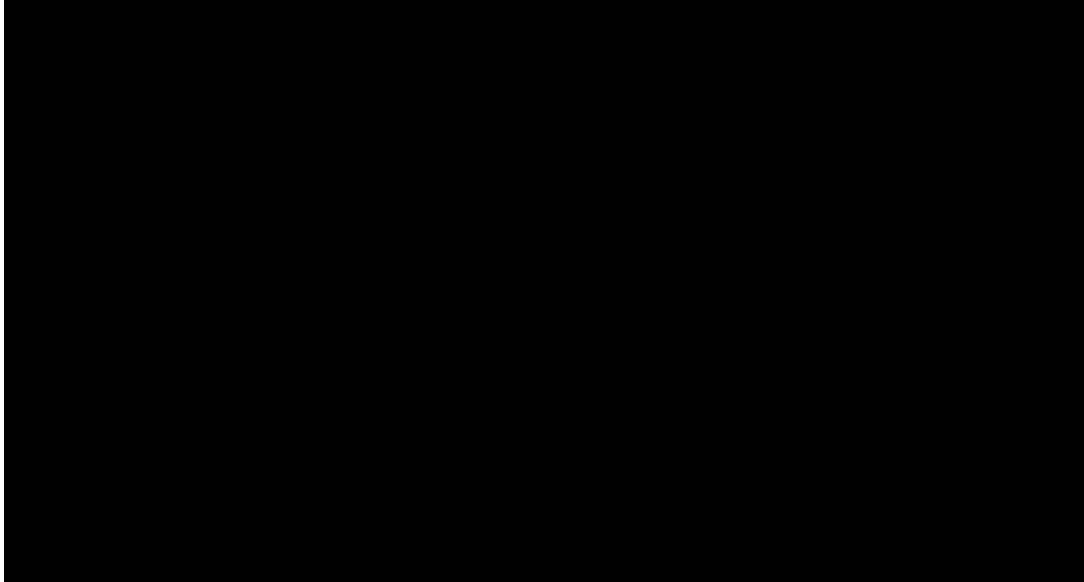
Methodology

- **Geometry**-3D object with work pieces and Tool
- **Meshing**
- **Boundary Condition** : Fixed Support and Velocity for the tool
- **Connection Details**: The body intersection is set to be frictional



Main Parts of Shaper Machine

Methodology



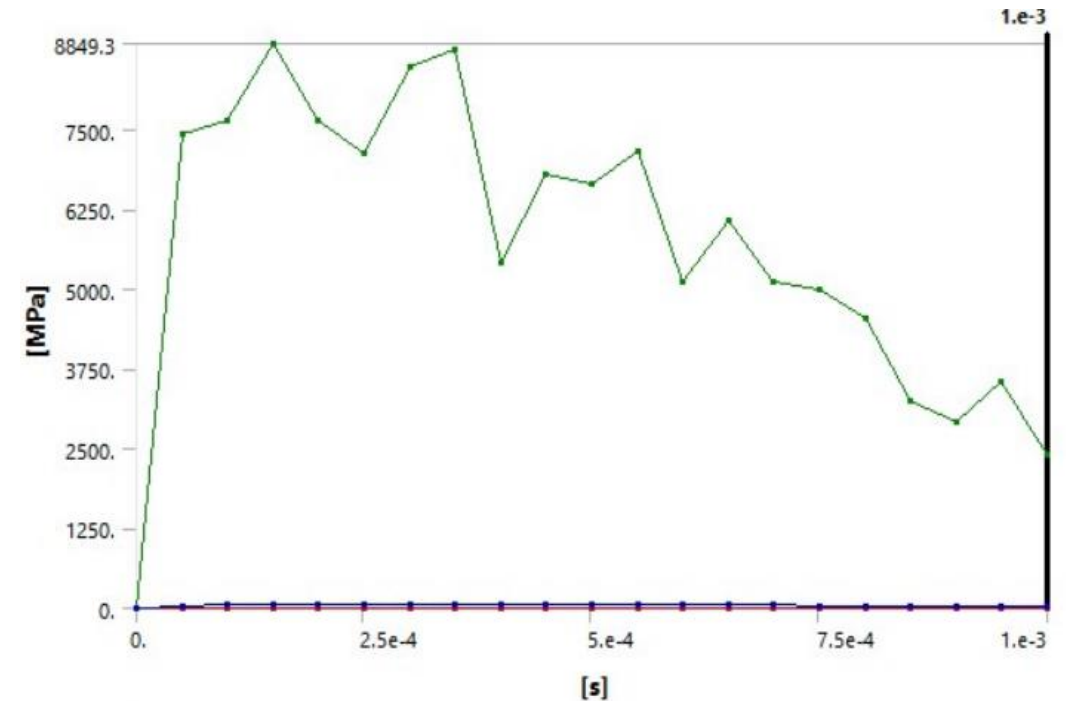
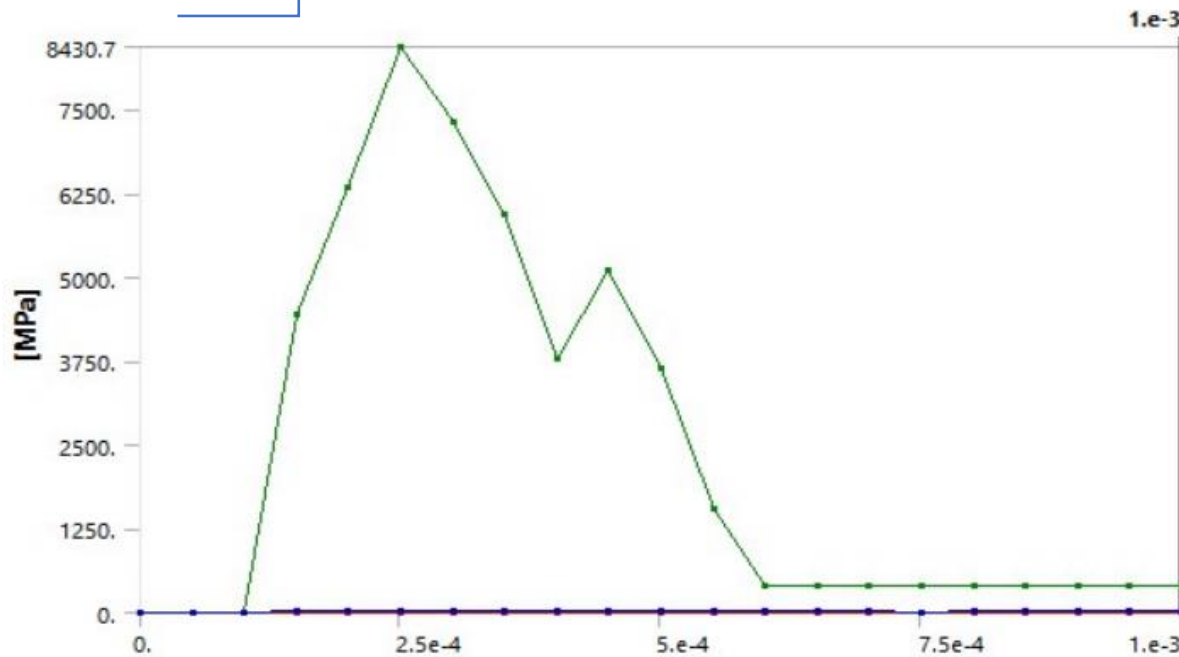
Work pieces(AL 6061)

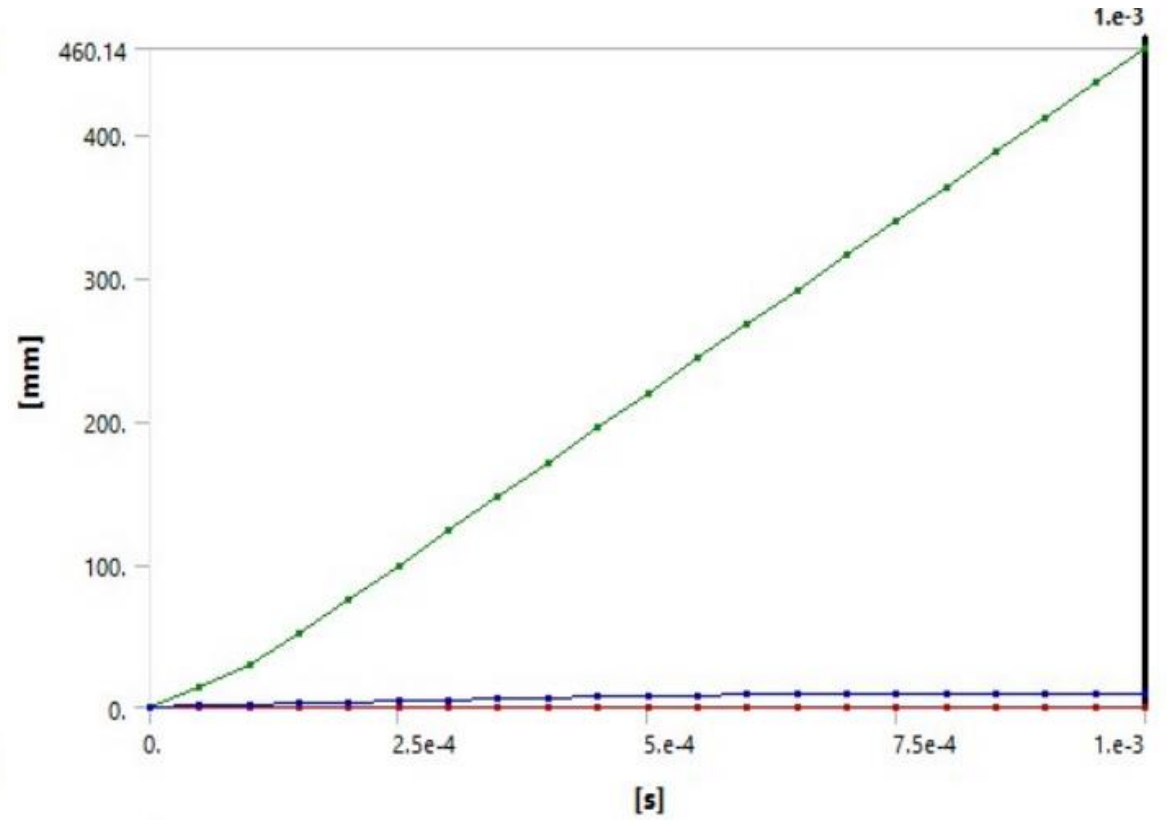
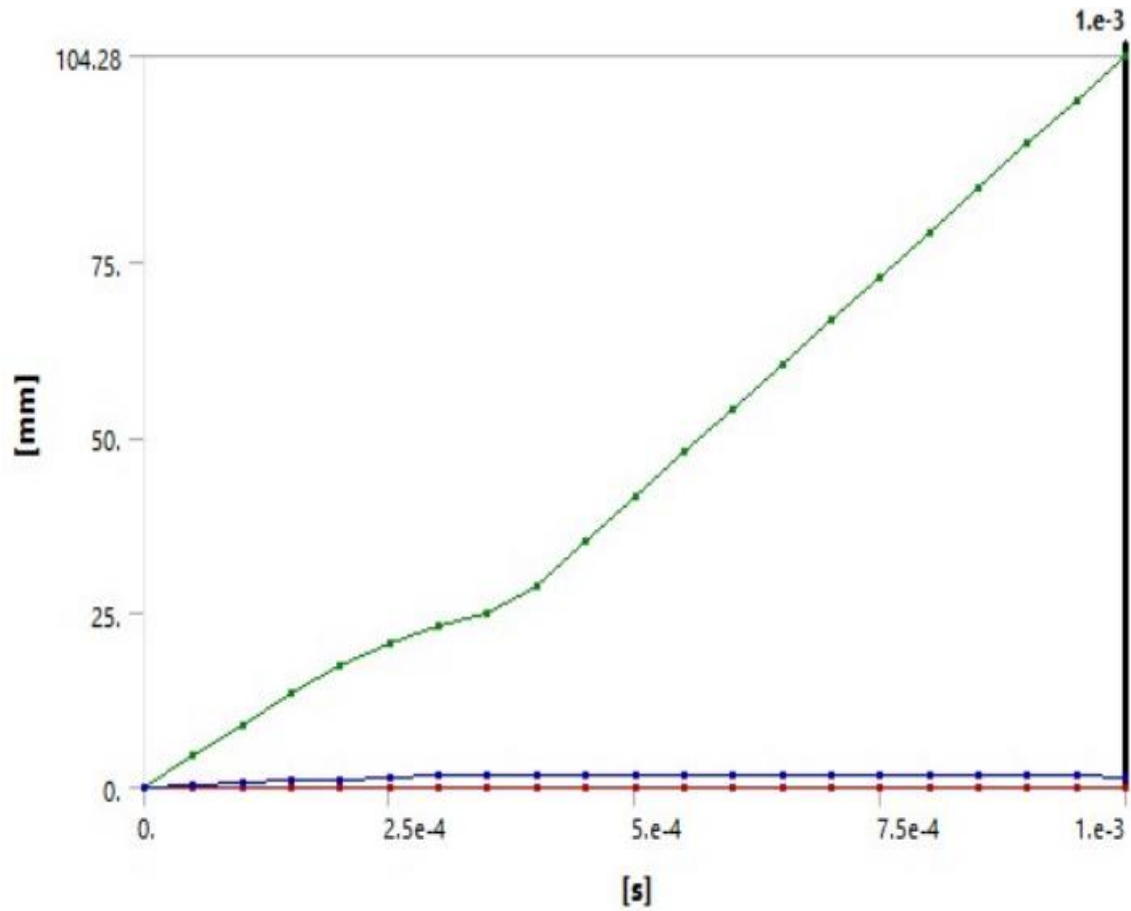
Tool(Titanium)

RESULTS

➤ Results:

Velocity	Max. Total Deformation	Force
2.9e+005 mm/s	460.14 mm	748.33 KN
90000 mm/s	104.28 mm	847.80KN





Conclusion

- Higher the velocity of the cutting tool, lower will be stress developed.
- Hence ,lower effort required for higher cutting speed.
- Productivity will increase.

THANK YOU