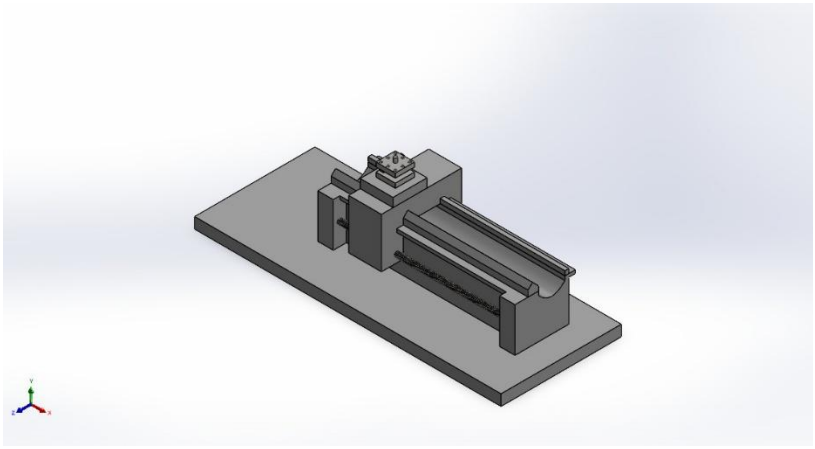


Simulation of Lathe Machine Assembly

Date: 13 April 2025
Designer: Solidworks
Study name: Static 1
Analysis type: Static

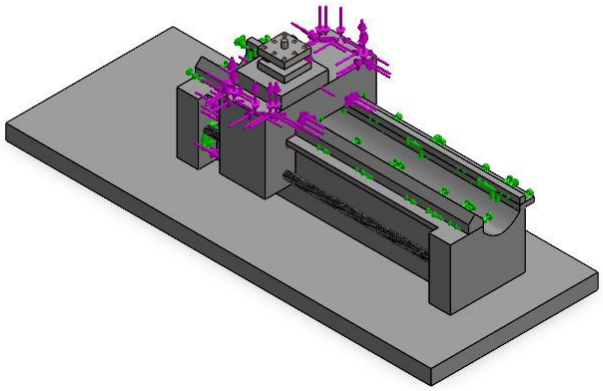
Table of Contents

Description

No Data

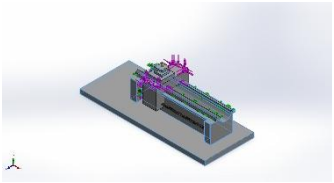
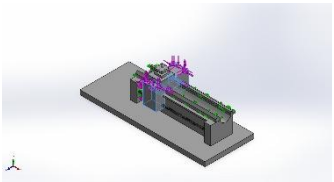
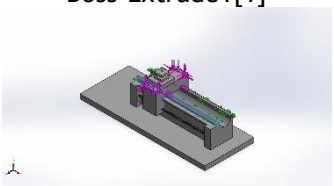
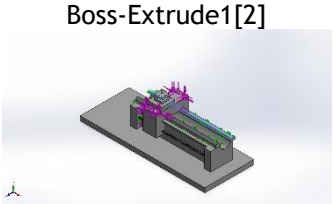
Assumptions

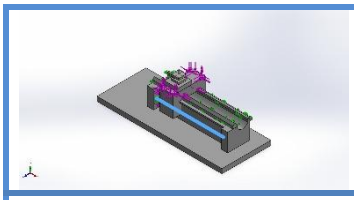
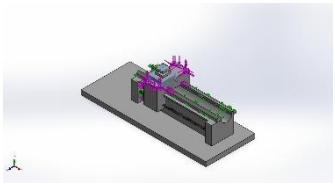
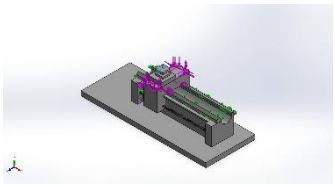
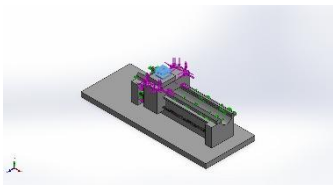
Model Information



Model name: Lathe Machine Assembly
Current Configuration: Default

Solid Bodies

Document Name and Reference	Treated As	Volumetric Properties	Document Path/Date Modified
Boss-Extrude6 	Solid Body	**Mass:505.076 kg** **Volume:0.0701495 m^3** **Density:7,200 kg/m^3** **Weight:4,949.75 N**	**E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine\Bed.SLDPRT** Apr 12 00:05:46 2025
Boss-Extrude1 	Solid Body	**Mass:54.1029 kg** **Volume:0.00751429 m^3** **Density:7,200 kg/m^3** **Weight:530.208 N**	**E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine\Carraige.SLDPRT** Apr 11 17:36:22 2025
Boss-Extrude1[1] 	Solid Body	**Mass:11.1227 kg** **Volume:0.00154482 m^3** **Density:7,200 kg/m^3** **Weight:109.002 N**	**E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine\Guideways.SLDPRT** Apr 11 19:36:35 2025
Boss-Extrude1[2] 	Solid Body	**Mass:2.3328 kg** **Volume:0.000324 m^3** **Density:7,200 kg/m^3** **Weight:22.8614 N**	**E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine\Guideways.SLDPRT** Apr 11 19:36:35 2025
Cut-Sweep1	Solid Body	**Mass:2.30949 kg** **Volume:0.000294203 m^3**	**E:\Semester VI\Design of Machine**

		**Density:7,850 kg/m^3** **Weight:22.633 N**	**Elements\Project\Lathe Machine CAD Model\Lathe Machine\Lead Screw.SLDPRT** Apr 12 01:03:39 2025
Boss-Extrude2 	Solid Body	**Mass:6.87394 kg** **Volume:0.000954713 m^3** **Density:7,200 kg/m^3** **Weight:67.3646 N**	**C:\Users\Yogesh\AppData\Local\Temp\swx10344\VC~~\Lathe Machine Assembly\Part4^Lathe Machine Assembly.SLDPRT** Apr 13 21:18:40 2025
Cut-Extrude5 	Solid Body	**Mass:0.305902 kg** **Volume:3.75339e-05 m^3** **Density:8,150 kg/m^3** **Weight:2.99784 N**	**E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine\Single Point Cutting Tool.SLDPRT** Apr 11 16:19:35 2025
LPattern2 	Solid Body	**Mass:2.25731 kg** **Volume:0.000309221 m^3** **Density:7,300.01 kg/m^3** **Weight:22.1217 N**	**E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine\Tool Post Head.SLDPRT** Apr 11 17:36:22 2025

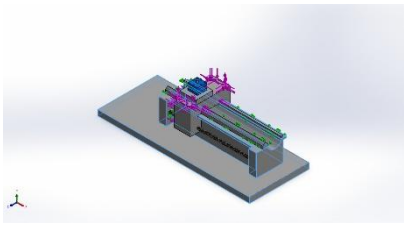
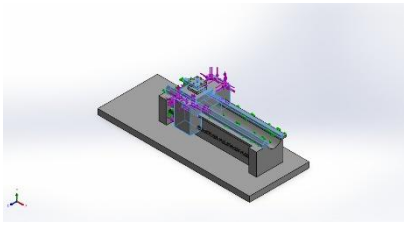
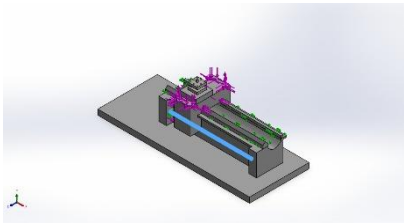
Study Properties

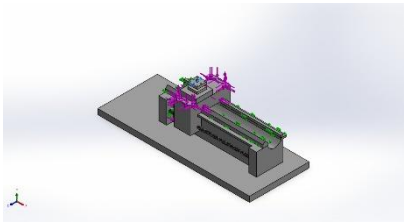
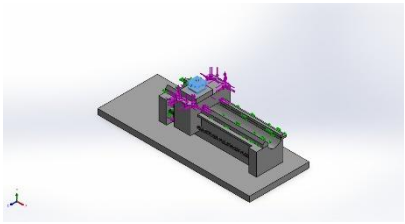
Study name	Static 1
Analysis type	Static
Mesh type	Solid Mesh
Thermal Effect:	On
Thermal option	Include temperature loads
Zero strain temperature	298 Kelvin
Include fluid pressure effects from SOLIDWORKS Flow Simulation	Off
Solver type	Automatic
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Incompatible bonding options	Automatic
Large displacement	Off
Compute free body forces	On
Friction	Off
Use Adaptive Method:	Off
Result folder	SOLIDWORKS document (E:\Semester VI\Design of Machine Elements\Project\Lathe Machine CAD Model\Lathe Machine)

Units

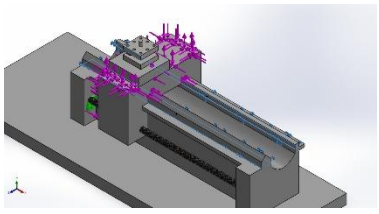
Unit system:	SI (MKS)
Length/Displacement	mm
Temperature	Kelvin
Angular velocity	Rad/sec
Pressure/Stress	N/m^2

Material Properties

Model Reference	Properties	Components
	**Name:** Default (3) **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 2.2e+08 N/m^2 **Tensile strength:** 2e+08 N/m^2 **Compressive strength:** 9e+08 N/m^2 **Elastic modulus:** 1.1e+11 N/m^2 **Poisson's ratio:** 0.28 **Mass density:** 7,200 kg/m^3 **Shear modulus:** 4.2e+10 N/m^2 **Thermal expansion coefficient:** 1.1e-05 /Kelvin	SolidBody 1(Boss-Extrude6)(Bed-2)
Curve Data:N/A		
	**Name:** FG260 **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 2.2e+08 N/m^2 **Tensile strength:** 1.8e+08 N/m^2 **Compressive strength:** 9e+08 N/m^2 **Elastic modulus:** 1.1e+11 N/m^2 **Poisson's ratio:** 0.28 **Mass density:** 7,200 kg/m^3 **Shear modulus:** 4.2e+10 N/m^2 **Thermal expansion coefficient:** 1.1e-05 /Kelvin	SolidBody 1(Boss-Extrude1)(Carraige-2), SolidBody 1(Boss-Extrude1[1])(Guideways-3), SolidBody 2(Boss-Extrude1[2])(Guideways-3), SolidBody 1(Boss-Extrude2)(Part4^Lathe Machine Assembly-1)
Curve Data:N/A		
	**Name:** AISI 1045 Steel, cold drawn **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 5.3e+08 N/m^2 **Tensile strength:** 6.25e+08 N/m^2 **Elastic modulus:** 2.05e+11 N/m^2 **Poisson's ratio:** 0.29 **Mass density:** 7,850 kg/m^3 **Shear modulus:** 8e+10 N/m^2 **Thermal expansion coefficient:** 1.15e-05 /Kelvin	SolidBody 1(Cut-Sweep1)(Lead Screw-1)
Curve Data:N/A		

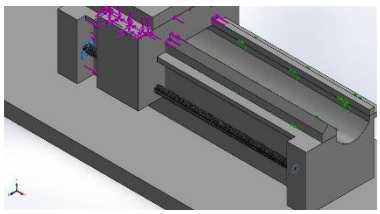
	**Name:** HSS **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 9e+08 N/m^2 **Tensile strength:** 1.1e+09 N/m^2 **Compressive strength:** 2e+09 N/m^2 **Elastic modulus:** 2.1e+11 N/m^2 **Poisson's ratio:** 0.3 **Mass density:** 8,150 kg/m^3 **Shear modulus:** 8e+10 N/m^2 **Thermal expansion coefficient:** 1.15e-05 /Kelvin	SolidBody 1(Cut-Extrude5)(Single Point Cutting Tool-3)
Curve Data:N/A		
	**Name:** Cast Alloy Steel **Model type:** Linear Elastic Isotropic **Default failure criterion:** Unknown **Yield strength:** 2.41275e+08 N/m^2 **Tensile strength:** 4.48082e+08 N/m^2 **Elastic modulus:** 1.9e+11 N/m^2 **Poisson's ratio:** 0.26 **Mass density:** 7,300 kg/m^3 **Shear modulus:** 7.8e+10 N/m^2 **Thermal expansion coefficient:** 1.5e-05 /Kelvin	SolidBody 1(LPattern2)(Tool Post Head-2)
Curve Data:N/A		

Loads and Fixtures

Fixture name	Fixture Image	Fixture Details
Fixed-1		**Entities:** 2 face(s) **Type:** Fixed Geometry

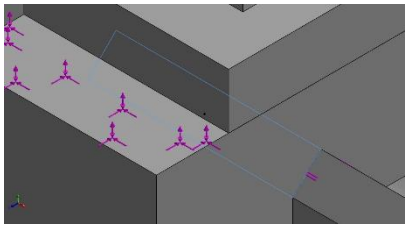
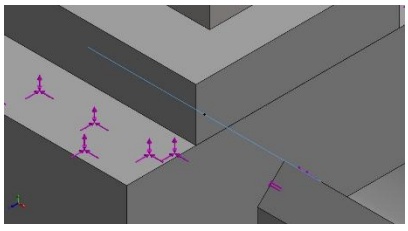
Resultant Forces

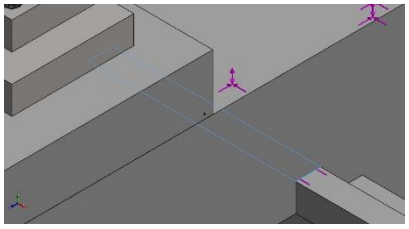
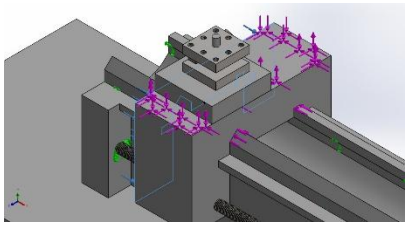
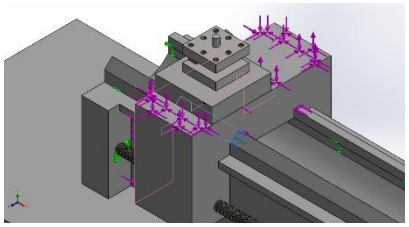
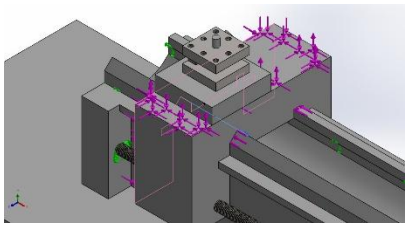
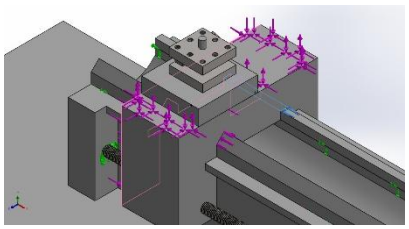
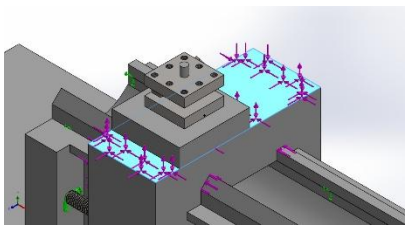
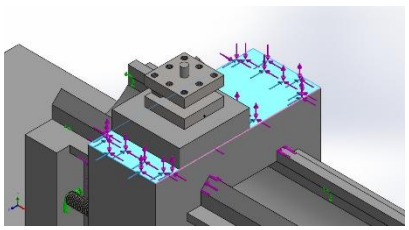
Components	X	Y	Z	Resultant
Reaction force(N)	1,192.26	153.67	1,539.2	1,953.01
Reaction Moment(N.m)	0	0	0	0

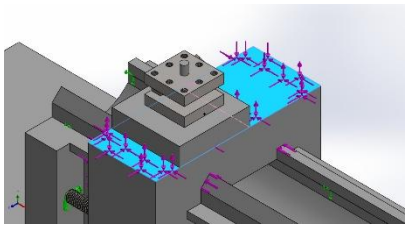
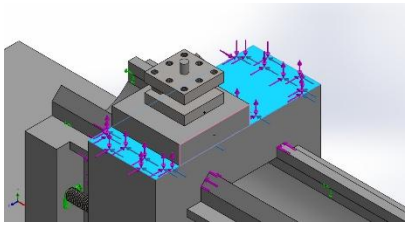
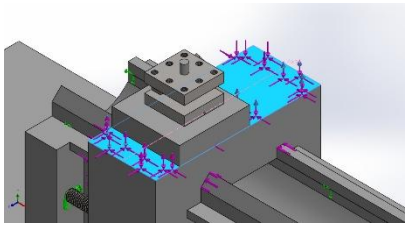
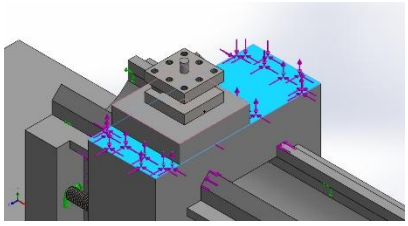
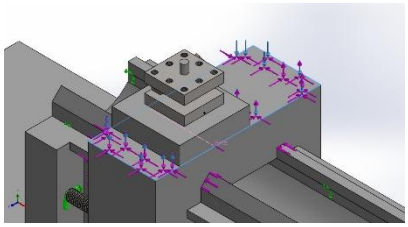
Fixed-3		**Entities:** 2 face(s) **Type:** Fixed Geometry

Resultant Forces

Components	X	Y	Z	Resultant
Reaction force(N)	27.7018	-43.5207	-102.788	115.007
Reaction Moment(N.m)	0	0	0	0

Load name	Load Image	Load Details
Force-1		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 2,600 N
Force-2		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 3,500 N

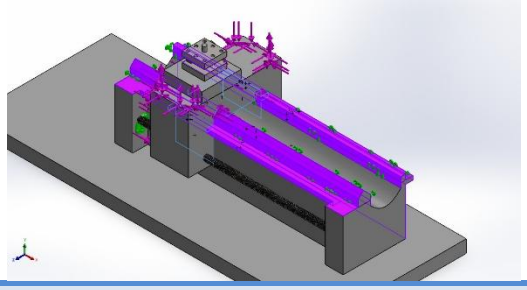
Force-3		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 1,600 N
Force-4		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 50 N
Force-5		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** ---, ---, 260 N
Force-6		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** ---, ---, 350 N
Force-7		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** ---, ---, 160 N
Force-8		**Entities:** 1 face(s) **Type:** Apply normal force **Value:** 2,000 N
Force-9		**Entities:** 1 face(s) **Reference:** Edge< 1 > **Type:** Apply force **Values:** ---, ---, -,800 N

Torque-1		**Entities:** 1 face(s) **Reference:** Axis3 **Type:** Apply torque **Value:** -104 N.m
Force-10		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** ---, ---, 500 N
Torque-2		**Entities:** 1 face(s) **Reference:** Axis4 **Type:** Apply torque **Value:** 65 N.m
Force-11		**Entities:** 1 face(s) **Reference:** Face< 1 > **Type:** Apply force **Values:** ---, ---, -4,000 N
Torque-3		**Entities:** 1 face(s) **Reference:** Axis5 **Type:** Apply torque **Value:** 60 N.m

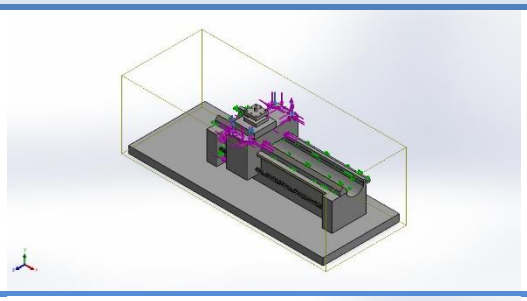
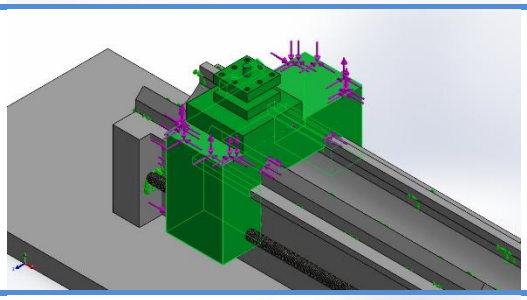
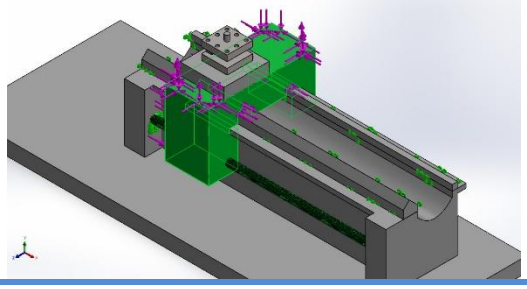
Connector Definitions

No Data

Interaction Information

Interaction	Interaction Image	Interaction Properties
Local Interaction-46		**Type:** Contact interaction pair **Entities:** 32 face(s) **Advanced:** Surface to surface
Contact/Friction force		

Components	X	Y	Z	Resultant
Contact Force(N)	-3.1547E-29	-2.7534E-14	9.9287E-13	9.9325E-13

Global Interaction		**Type:** Bonded **Components:** 1 component(s) **Options:** Independent mesh
Component Interaction-5		**Type:** Bonded **Components:** 2 component(s), 2 Solid Body (s) **Options:** Independent mesh
Component Interaction-6		**Type:** Contact (Surface to surface) **Components:** 1 component(s), 1 Solid Body (s)

Mesh information

Mesh type	Solid Mesh
Mesher Used:	Blended curvature-based mesh
Jacobian points for High quality mesh	16 Points
Maximum element size	86.4827 mm
Minimum element size	4.32414 mm
Mesh Quality	High
Remesh failed parts independently	Off

Mesh information - Details

Total Nodes	242873
Total Elements	149509
Maximum Aspect Ratio	55.354
% of elements with Aspect Ratio < 3	53.2
Percentage of elements with Aspect Ratio > 10	10.5
Percentage of distorted elements	0
Time to complete mesh(hh;mm;ss):	00:06:07
Computer name:	YOGESH

Sensor Details

No Data

Resultant Forces

Reaction forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	1,219.96	110.15	1,436.42	1,887.79

Reaction Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	0

Free body forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N	-0.00377651	0.00368318	0.000541538	0.00530294

Free body moments

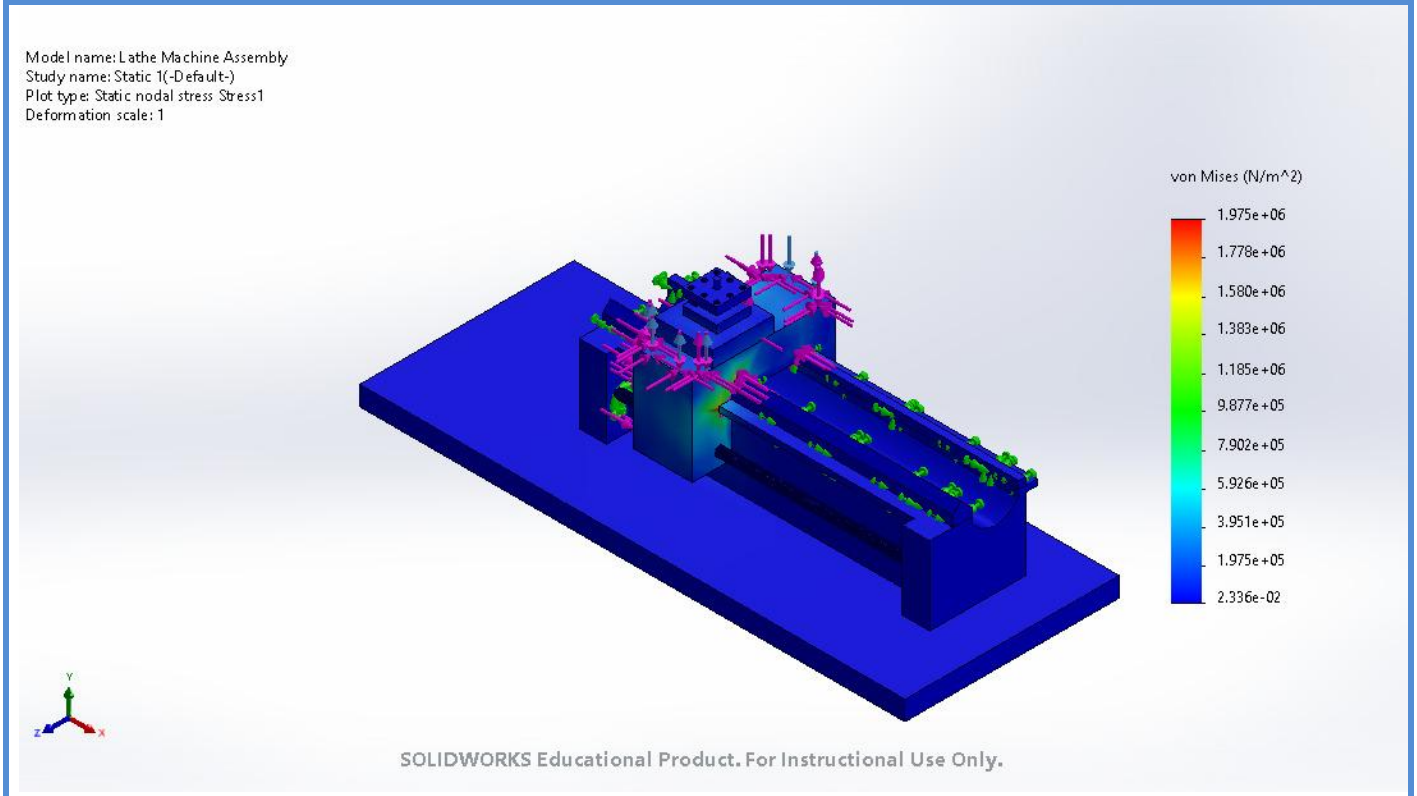
Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Model	N.m	0	0	0	1e-33

Beams

No Data

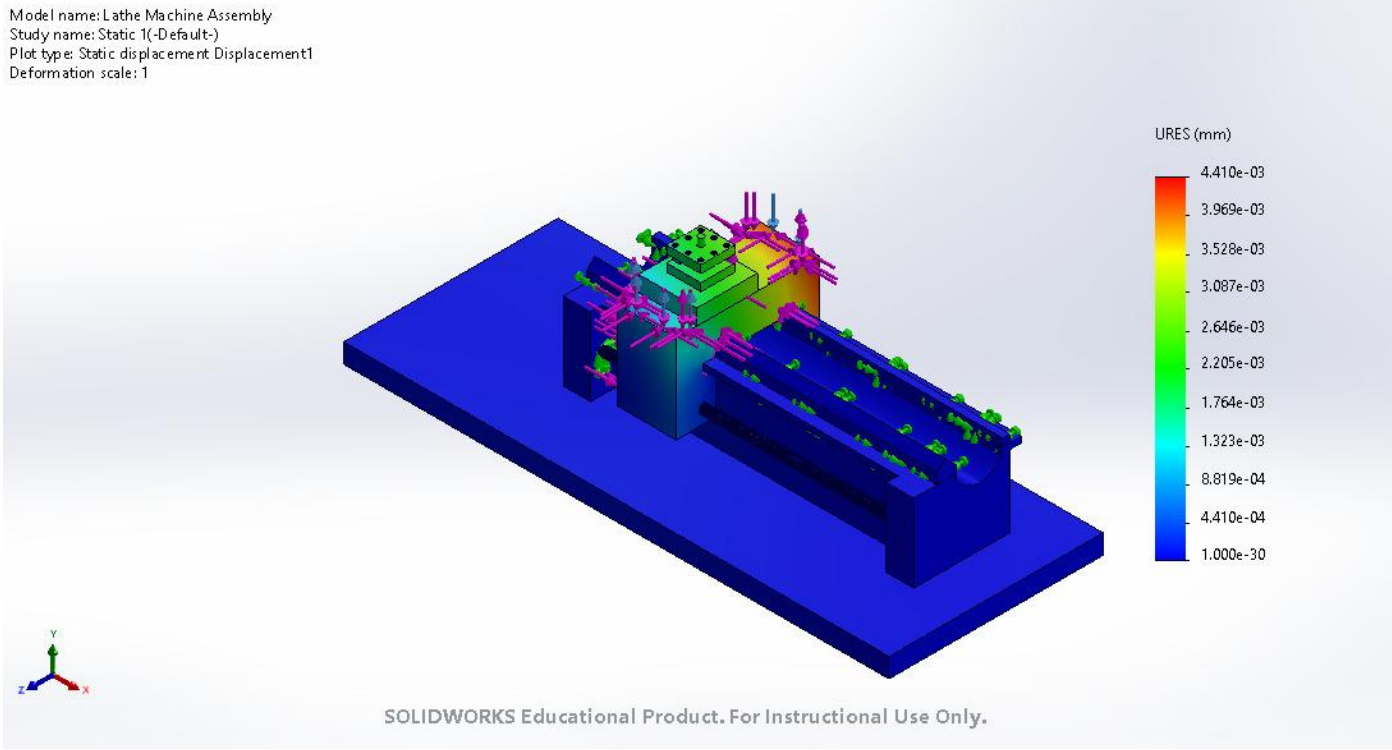
Study Results

Name	Type	Min	Max
Stress1	VON: von Mises Stress	2.336e-02N/m^2 Node: 3403	1.975e+06N/m^2 Node: 3088



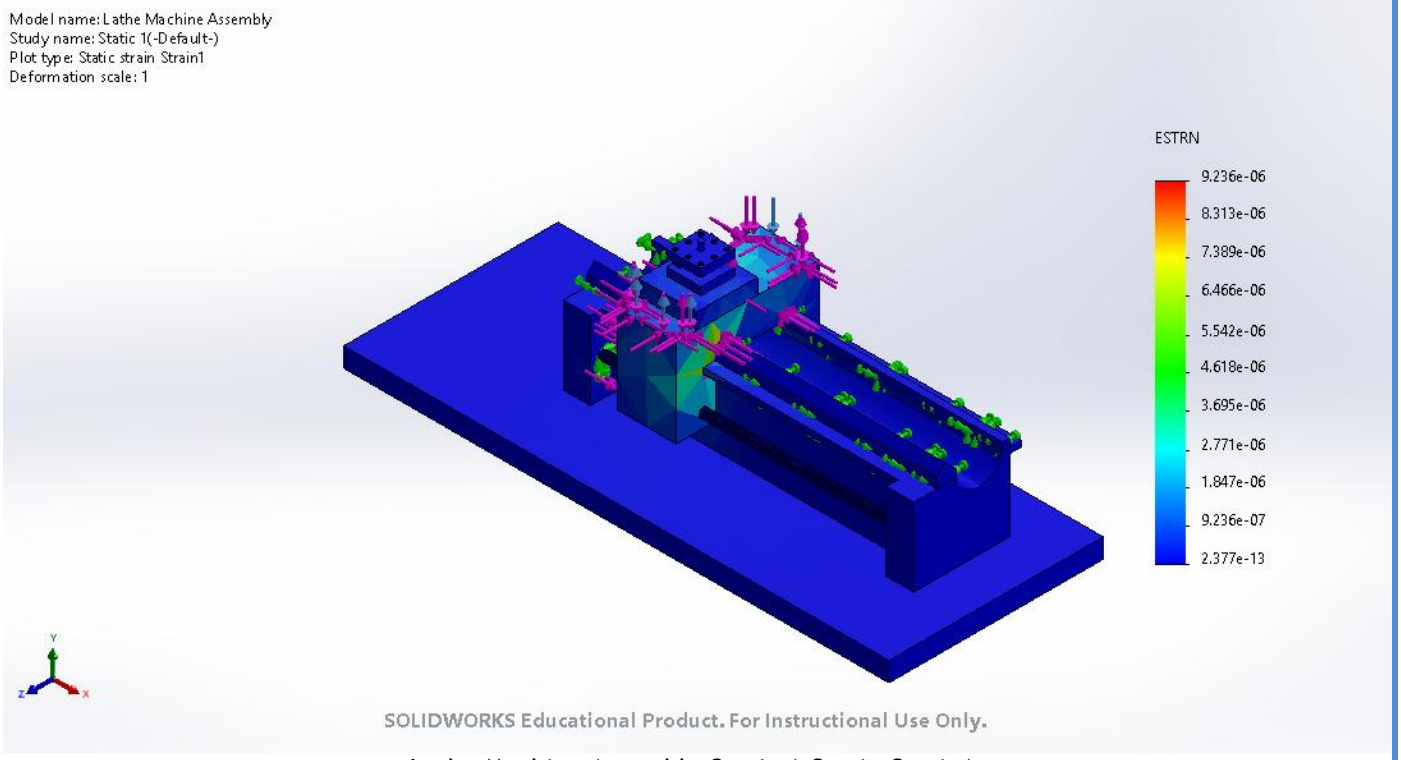
Lathe Machine Assembly-Static 1-Stress-Stress1

Name	Type	Min	Max
Displacement1	URES: Resultant Displacement	0.000e+00mm Node: 3376	4.410e-03mm Node: 2894



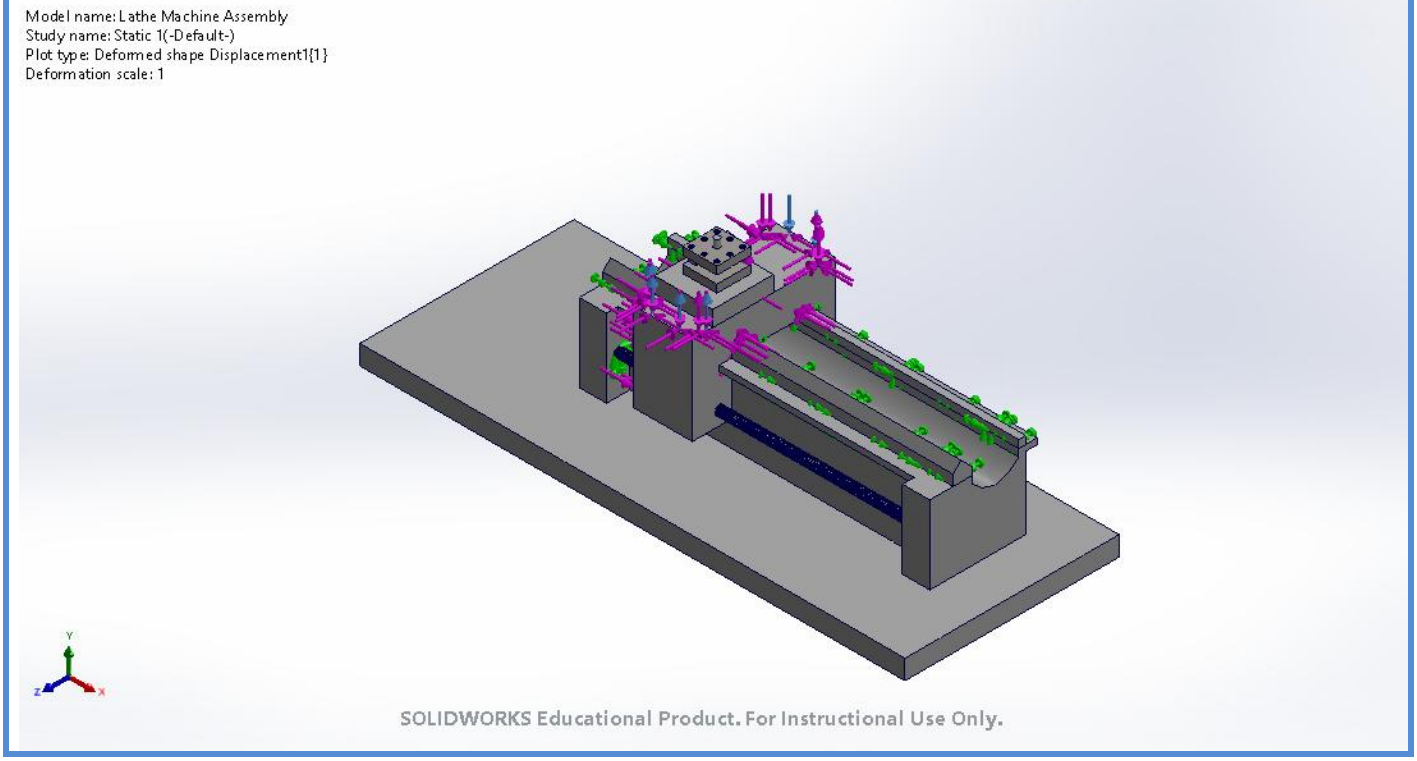
Lathe Machine Assembly-Static 1-Displacement-Displacement1

Name	Type	Min	Max
Strain1	ESTRN: Equivalent Strain	2.377e-13 Element: 1833	9.236e-06 Element: 1501



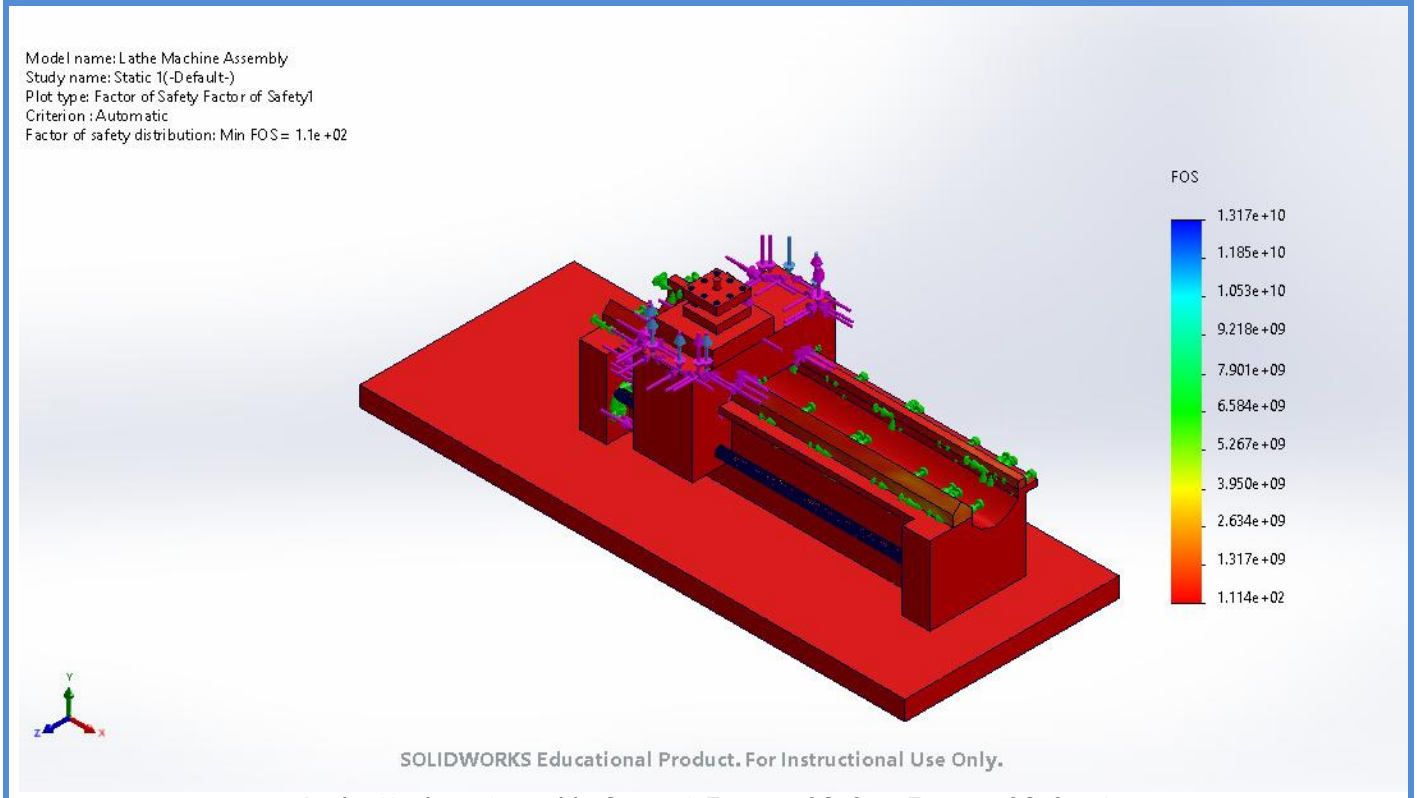
Lathe Machine Assembly-Static 1-Strain-Strain1

Name	Type
Displacement1{1}	Deformed shape



Lathe Machine Assembly-Static 1-Displacement-Displacement1{1}

Name	Type	Min	Max
Factor of Safety1	Automatic	1.114e+02 Node: 3088	1.317e+10 Node: 13793



Lathe Machine Assembly-Static 1-Factor of Safety-Factor of Safety1

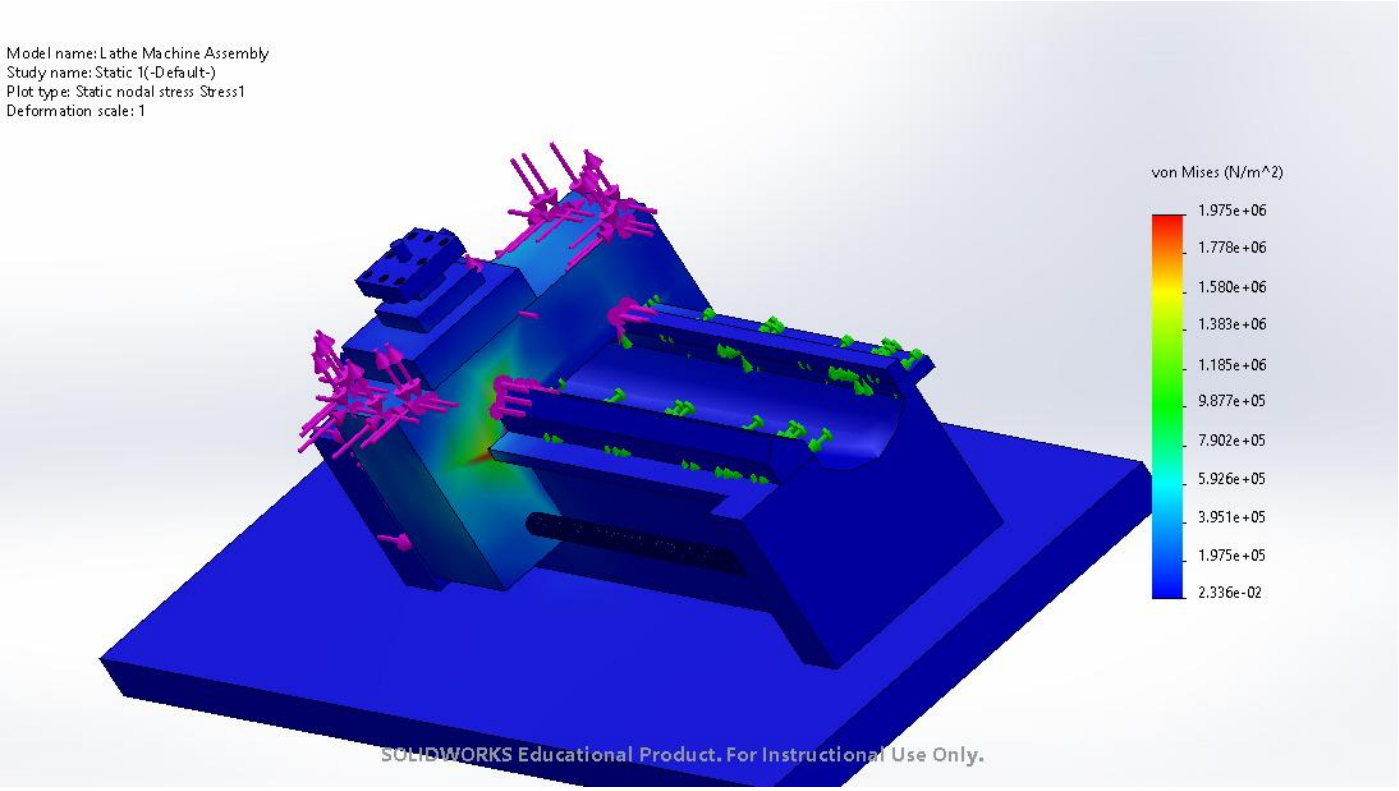


Image-1

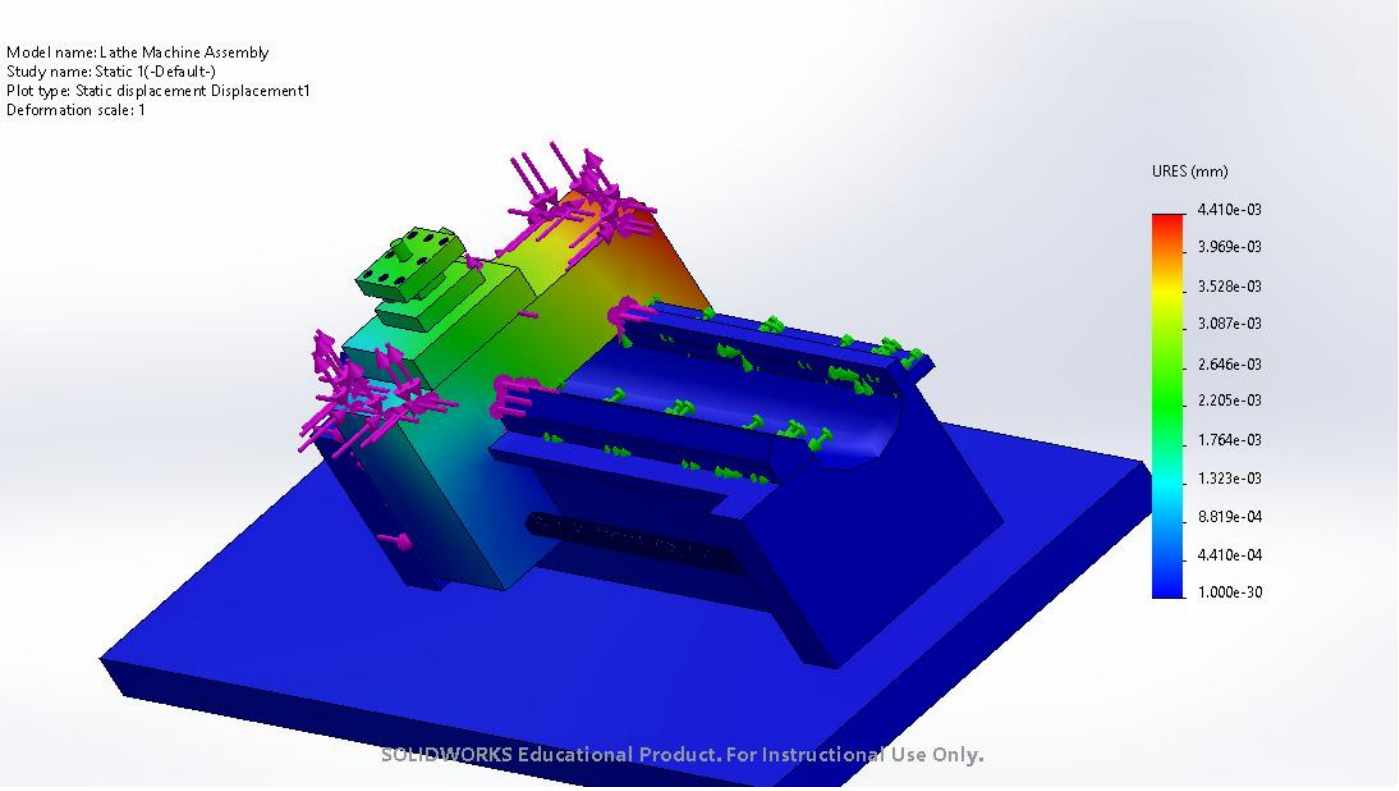


Image-2

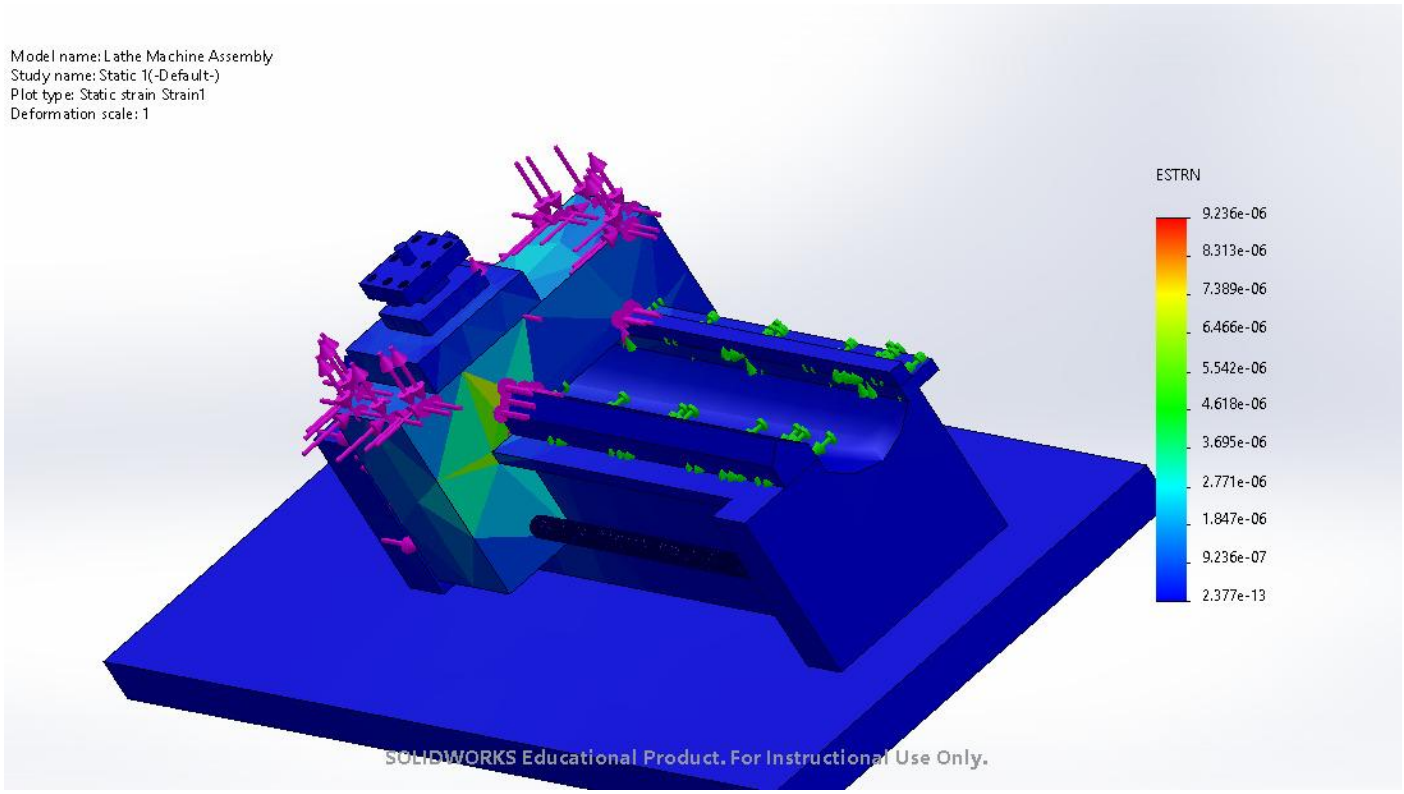


Image-3

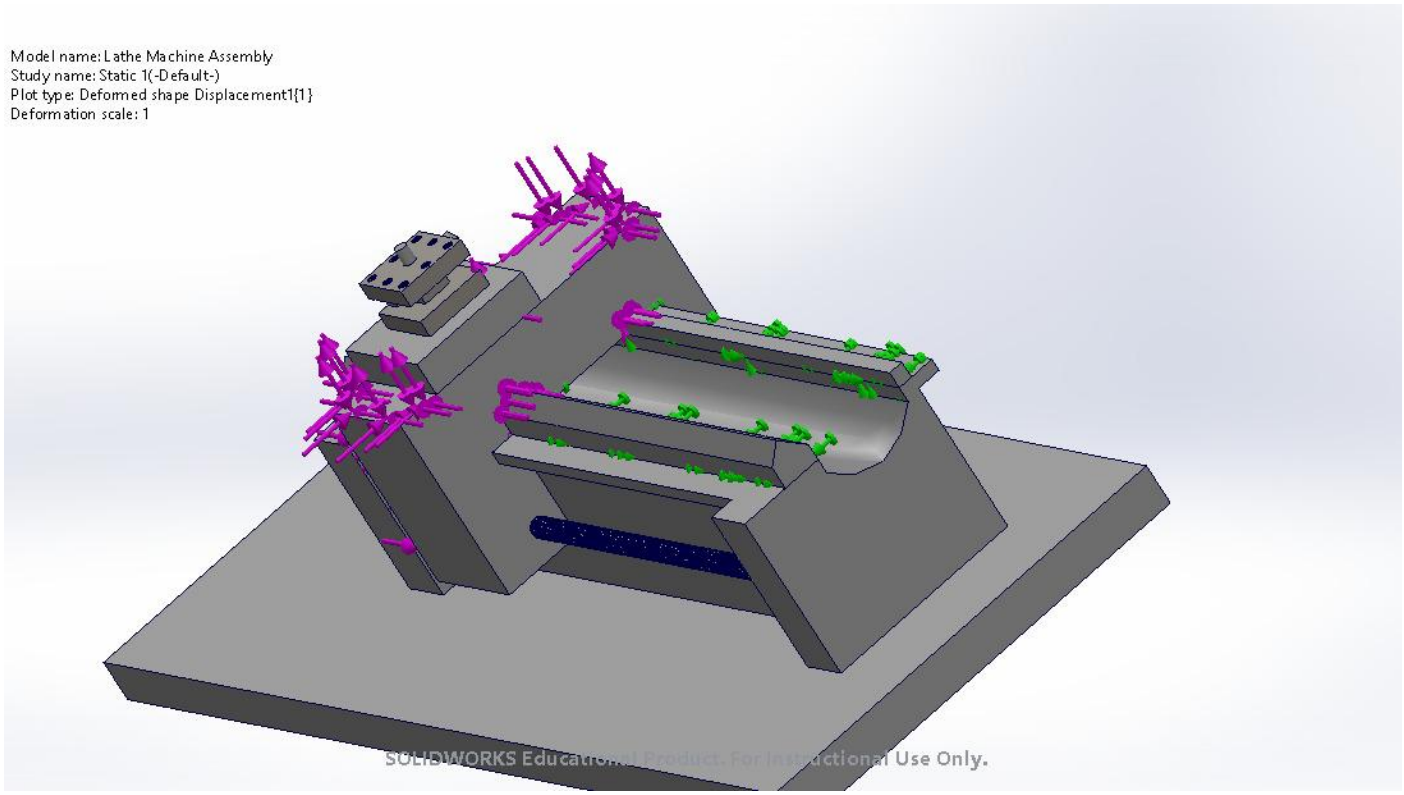


Image-4

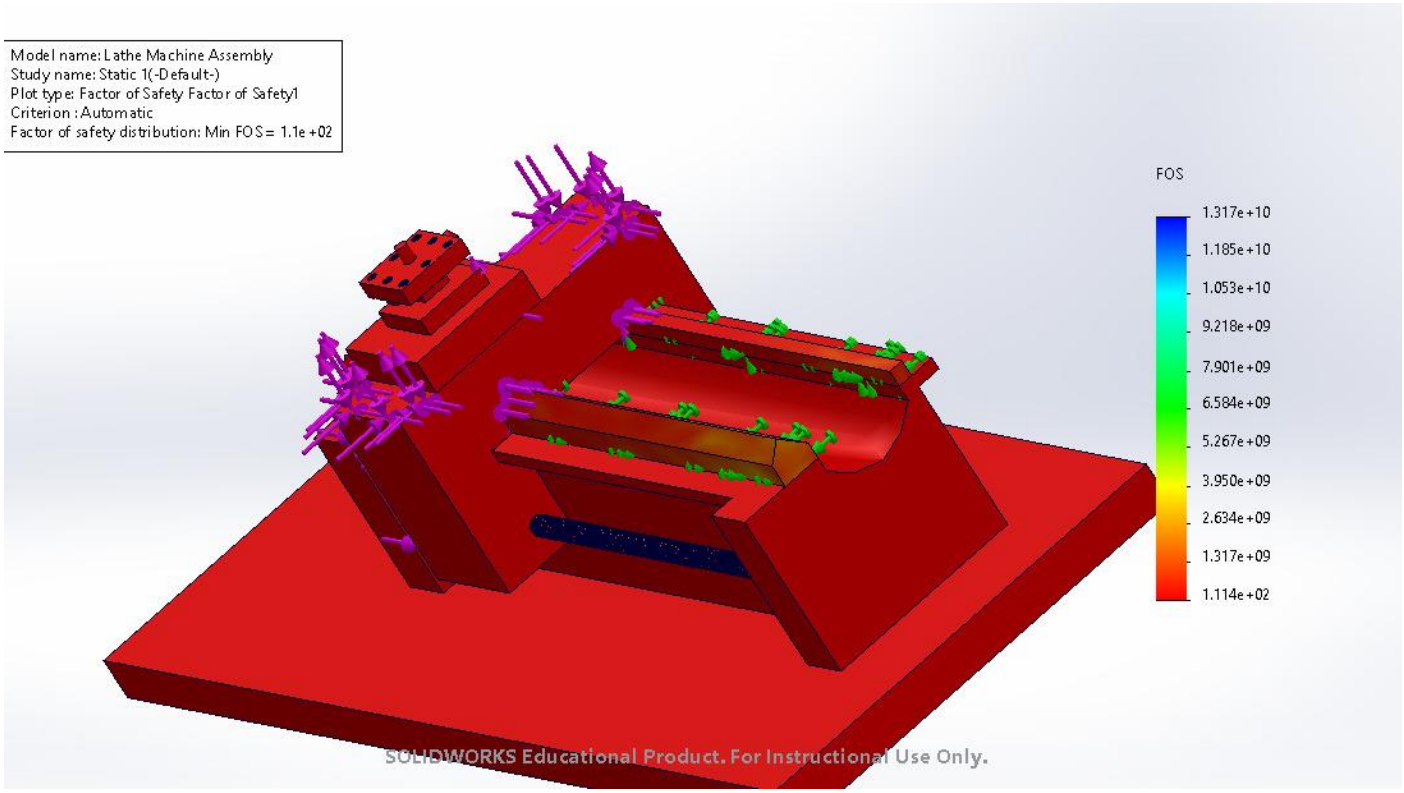


Image-5

Conclusion