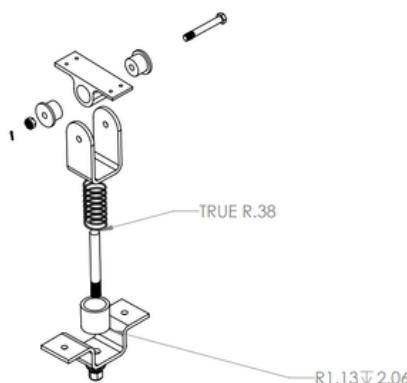
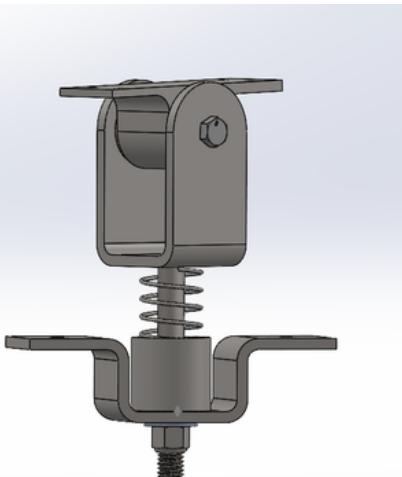


SHOCK ABSORBER ASSEMBLY



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	U-support	AISI 1020	1
2	Shaft	AISI 1020 CRS	1
3	Pivot	AISI 1020	1
4	Bracket	AISI 1020	1
5	Bushing	Manganese Bronze	2
6	Washer	1.50 x 7.50 x 1.25	1
7	Spacer	AISI 1020	1
8	Locknut	AISI 1020	1
9	Castle Nut	AISI 1020	1
10	Spring	Plain Carbon Steel	1
11	Hex Head Screw	-	1
12	Cotter Pin	Plain Carbon Steel	1

What?

- Designed various parts needed for a shock absorber
- Created a shock absorber assembly in **SolidWorks**

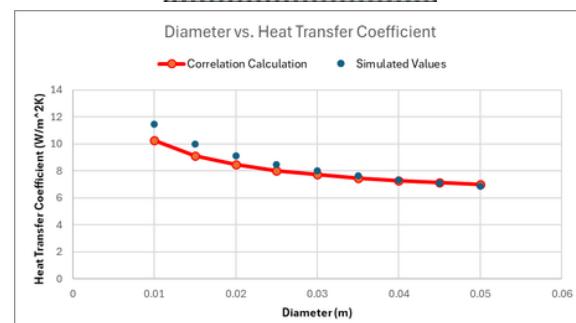
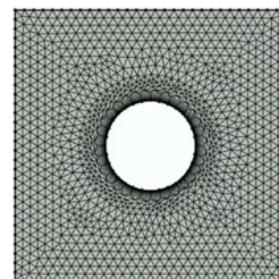
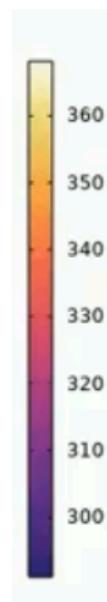
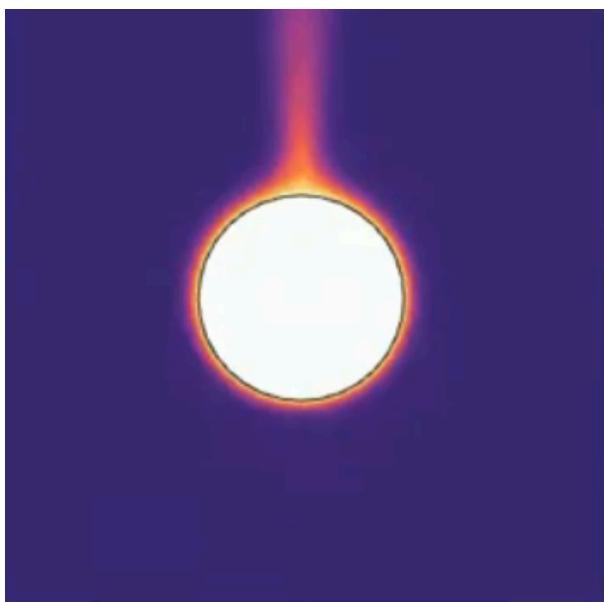
How?

- Created digital **drawings** for each part
- Connected parts using **SolidWorks** assembly
- Created **bill of materials** for all parts used in assembly

Results

- Final shock absorber assembly composed of all necessary parts
- Assembly had realistic movement for a shock absorber

NATURAL CONVECTION SIMULATION



What?

- Simulated 2D natural convection around an isothermal horizontal cylinder heated to 95 degrees C
- Compared heat transfer coefficient found from COMSOL with results from theory to understand accuracy

How?

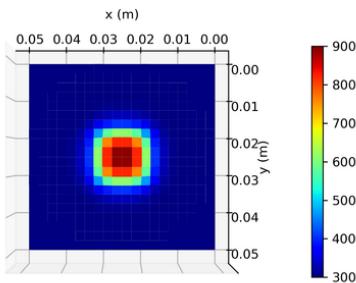
- Created 2D isothermal laminar flow study for heated cylinder with 1-5 cm diameter
- Added boundary layer mesh to resolve steep velocity and temperature gradients at the wall
- Created MATLAB script to calculate heat transfer coefficient from theory

Results

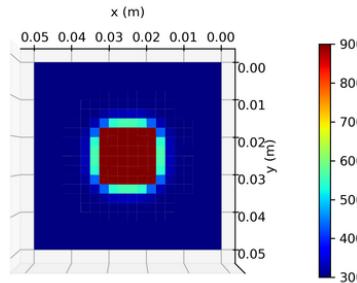
- Simulation and theory results closely matched, validating simulation accuracy
- Results converged as diameter increased
- Useful to evaluate how geometry affects convective cooling

LASER HEATING SIMULATION

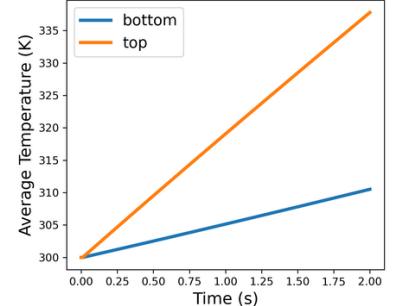
Final Temperature Profile of Block Top Plane



Final Temperature Profile of Block Top Plane



Avg. Temperatures of Top and Bottom Plane



What?

- Created simulation with Python to model and simulate laser heating of a 3D cubic block
- Predict temperature distribution to understand material response and guide process parameters

How?

- Modeled laser penetration using Beer-Lambert law
- Built vectorized 3D transient heat transfer solver using sparse matrix operators
- Implemented mask arrays to simulate region-specific thermal boundary conditions (heat sink, insulation, laser input)

Results

- Lower conductivity and heat capacity materials preserved thermal resolution
- Surface temperature increased much faster than surroundings
- Demonstrated relationship between material properties and thermal distribution