Ansys Mechanical Beyond the Basics

Module 06 Workshop:
Expanded Results and Validation

Release 2021 R2

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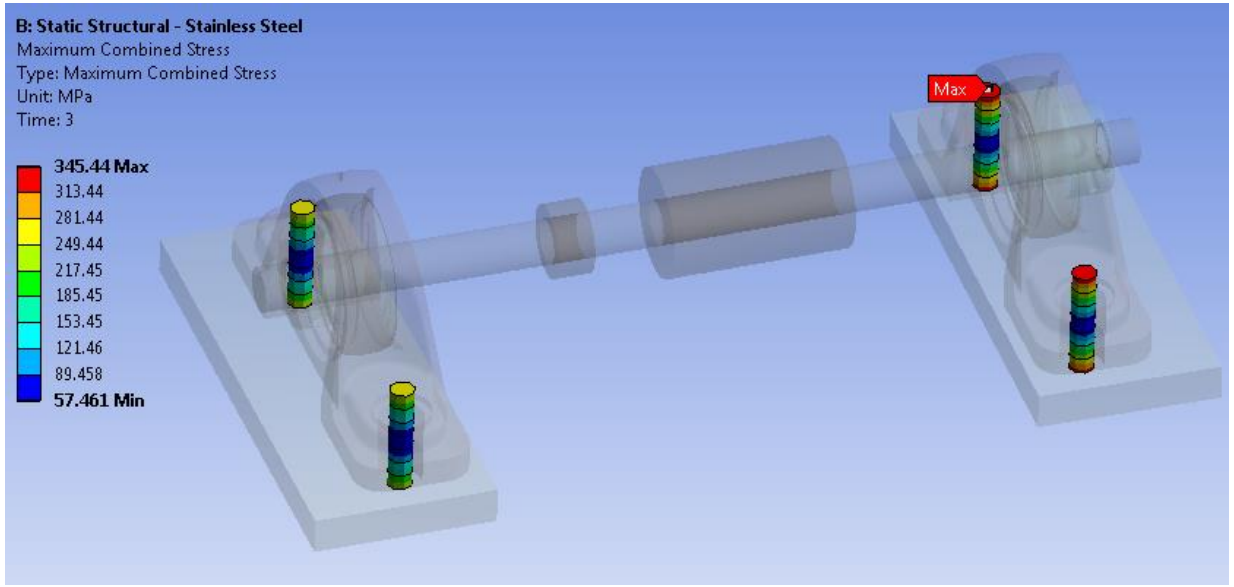
Workshop 06: Expanded Results and Validation

Use this guide to work on the Journal Bearing model.



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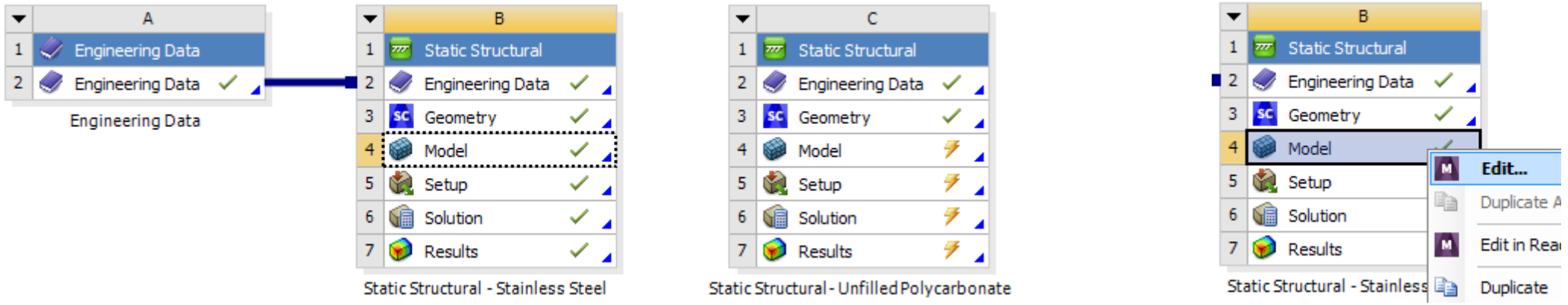
- Open **Archive:** “Shaft_Bearings_WS06_Start.wbpz”
- In order to save some time, the project has already been solved for the Stainless Steel housing material option.
- Open Mechanical for the Stainless Steel material option, Analysis System B.



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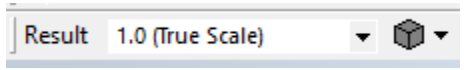
- Review **Total Deformation** and **Equivalent Stress** results for Time 3.0
- **Animate** results. Change the displacement scale factor as desired.



- **Review** results for each body, entering them into a table like the one below:

	A	B	C	D	E	F
1			Stainless Steel		Unfilled Polycarbonate	
2	Results	Units	Min	Max	Min	Max
3	Total Deformation - 3. s	mm				
4	Equivalent (von-Mises) Stress - 3. s	Mpa				
5	Equivalent (von-Mises) Stress - Multiple - 3. s (housings)	MPa				
6	Equivalent (von-Mises) Stress - Multiple - 3. s (bearings)	MPa				
7	Equivalent (von-Mises) Stress - Component4\Shaft - 3. s	MPa				
8	Total Deformation - Component4\Shaft - 3. s	mm				
9	(UX**2+UZ**2)**0.5 - 3s	mm				
10	(UX**2+UZ**2)**0.5 - 3 s	mm				
11						
12	Misalignment calculation					

(see next slide)

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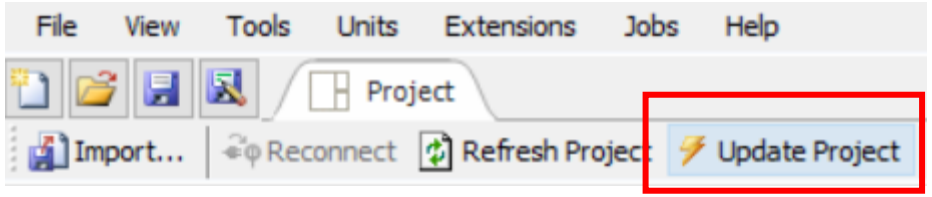
- **Calculate misalignment:**
  - Q: Is the displacement vector in the same direction for both sides of the shaft? A: Yes, and this is different from the results observed in Module 08.
  - Q: How can we calculate the misalignment in this case? A: Subtract one vector from the other
- **Return** to the **Workbench** project page and Update Project in order to solve Analysis System C.



- Open Mechanical for the Polycarbonate material option, Analysis System C

- Review the results and finish filling in the results table. Compare misalignment with the first solution and draw conclusions. Focus in particular on the stress in the shaft.

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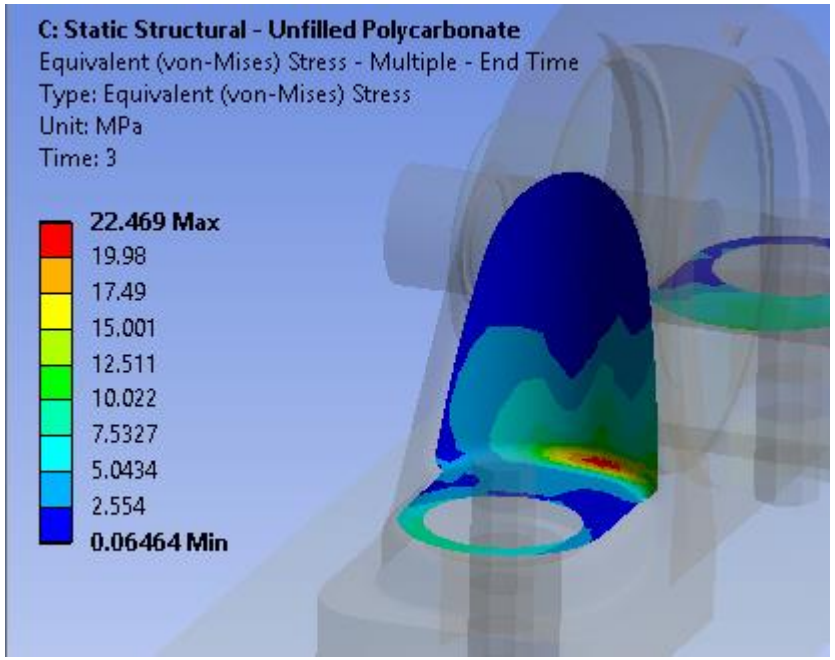
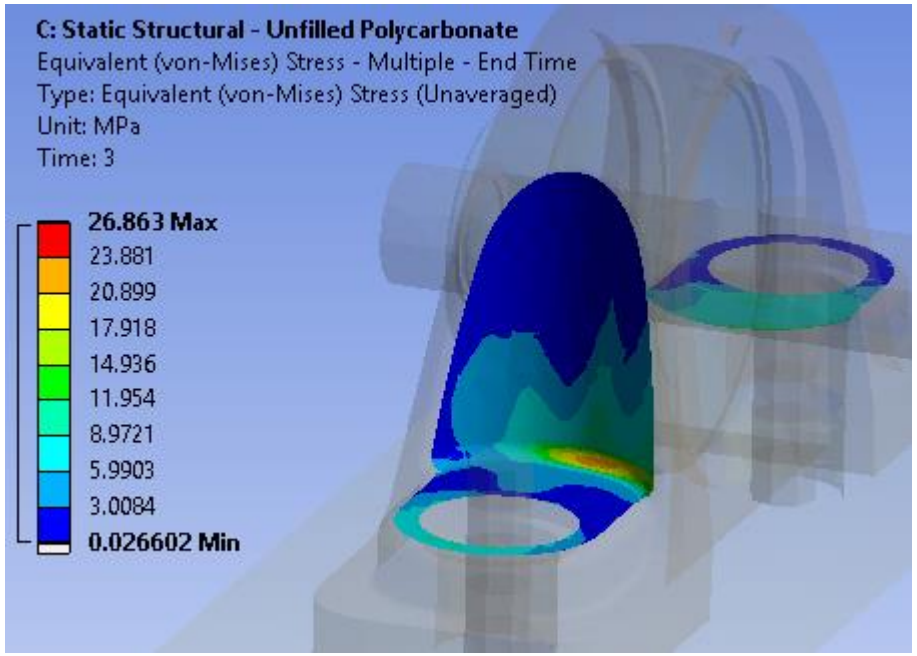
- Review both **Averaged** and **Unaveraged** stress results. What are your thoughts about the validity of the results?
- What would you recommend? (The **Averaged** and **Unaveraged** results are slightly different. If you observe local regions of high stresses in the results, check to see if they are near a boundary condition—in these locations, the results values should not be trusted. If the high stresses are not near a boundary condition, consider a mesh convergence study to achieve higher accuracy in those regions.)





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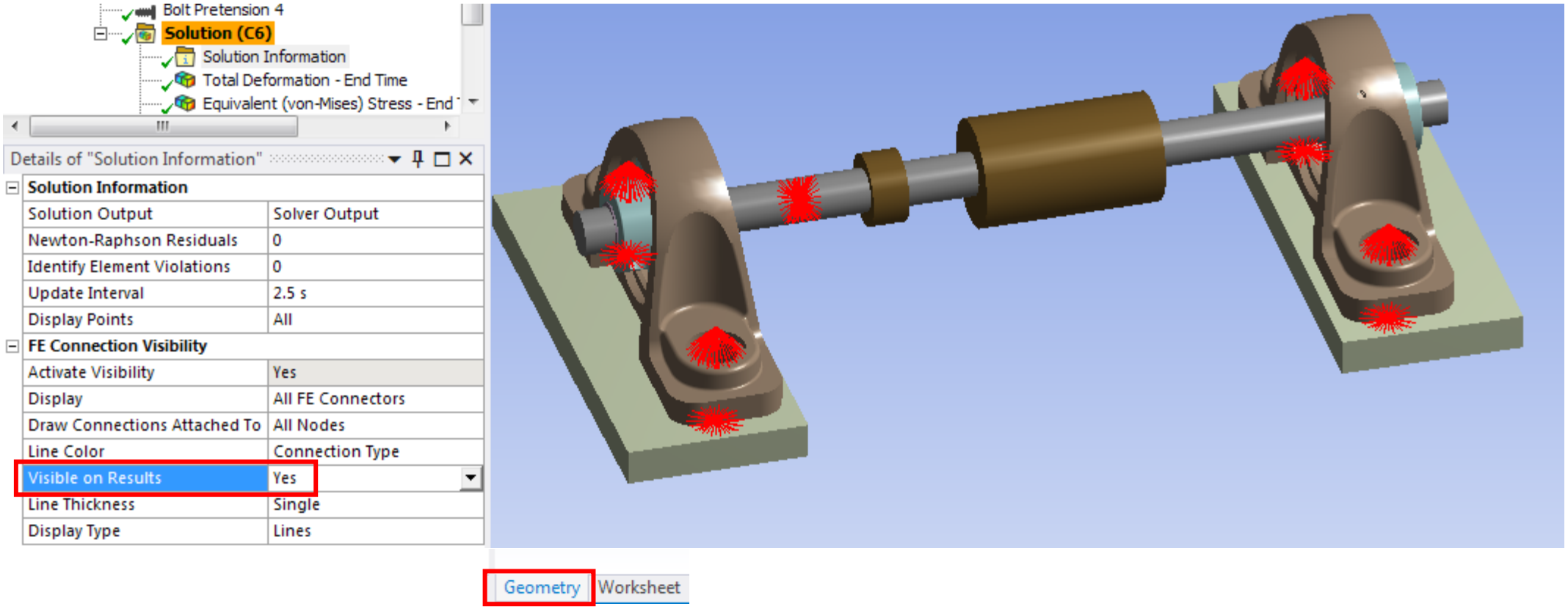
- Bolt postprocessing:
  - Graphically review the constraint equations near the bolts



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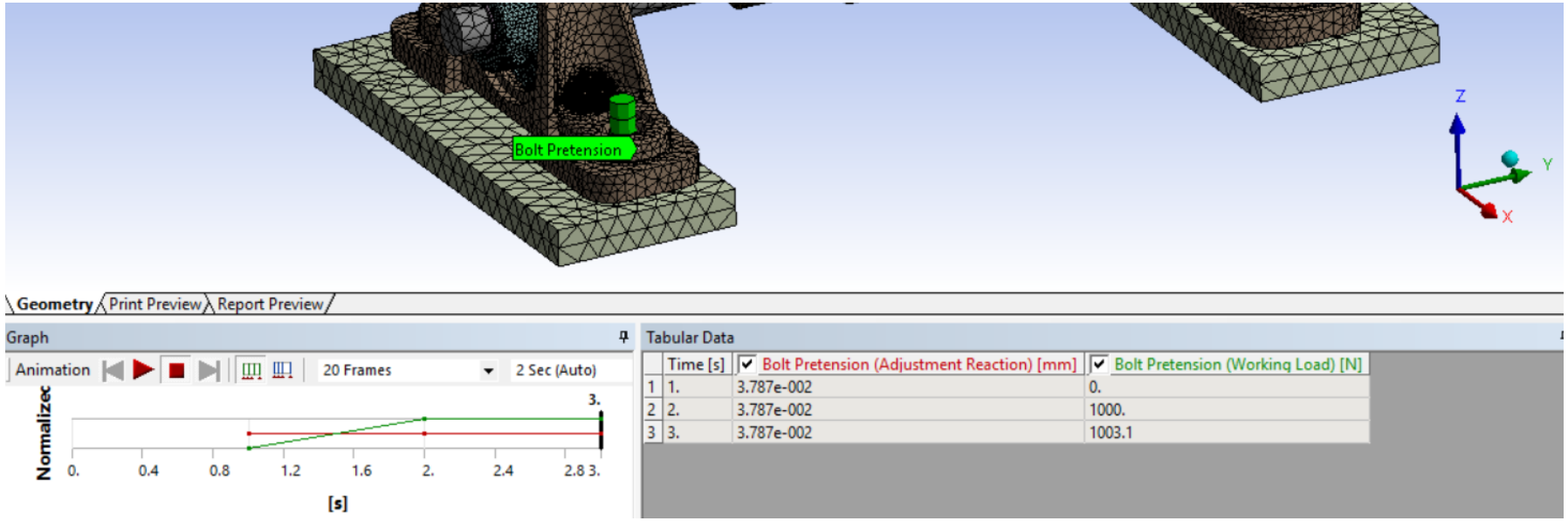
- Bolt postprocessing:
  - Retrieve clamping force for each bolt: drag and drop **Bolt Pretension** Loads onto the **Solution** branch
  - Consider what's happening in each bolt. Which bolt has the highest load?



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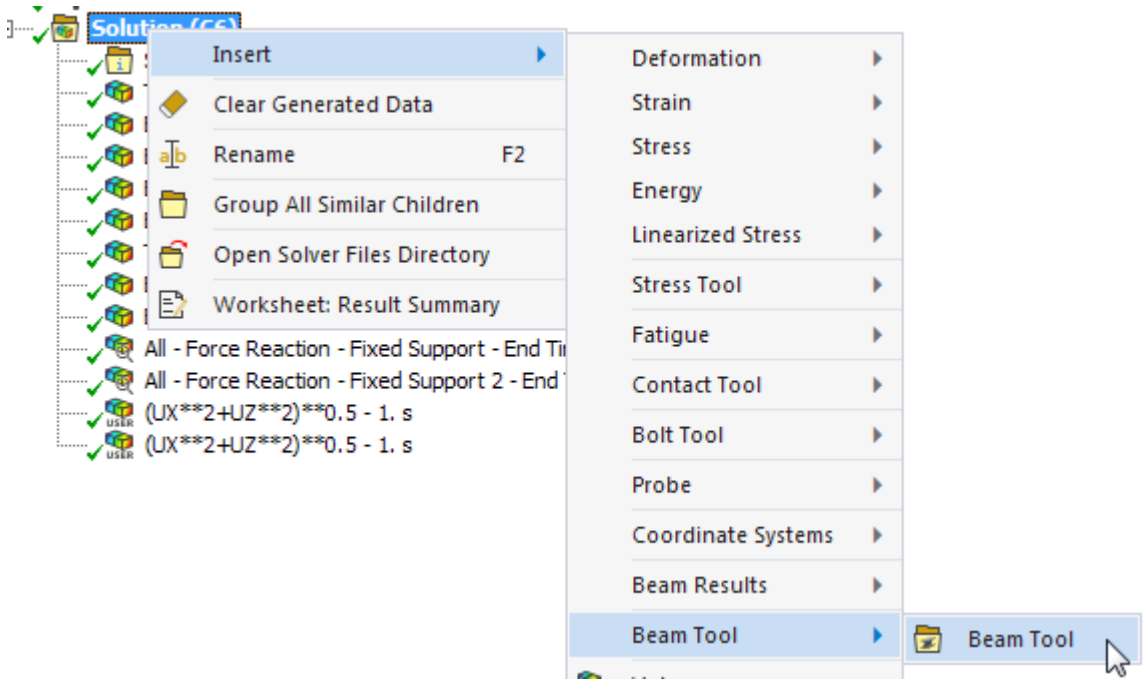
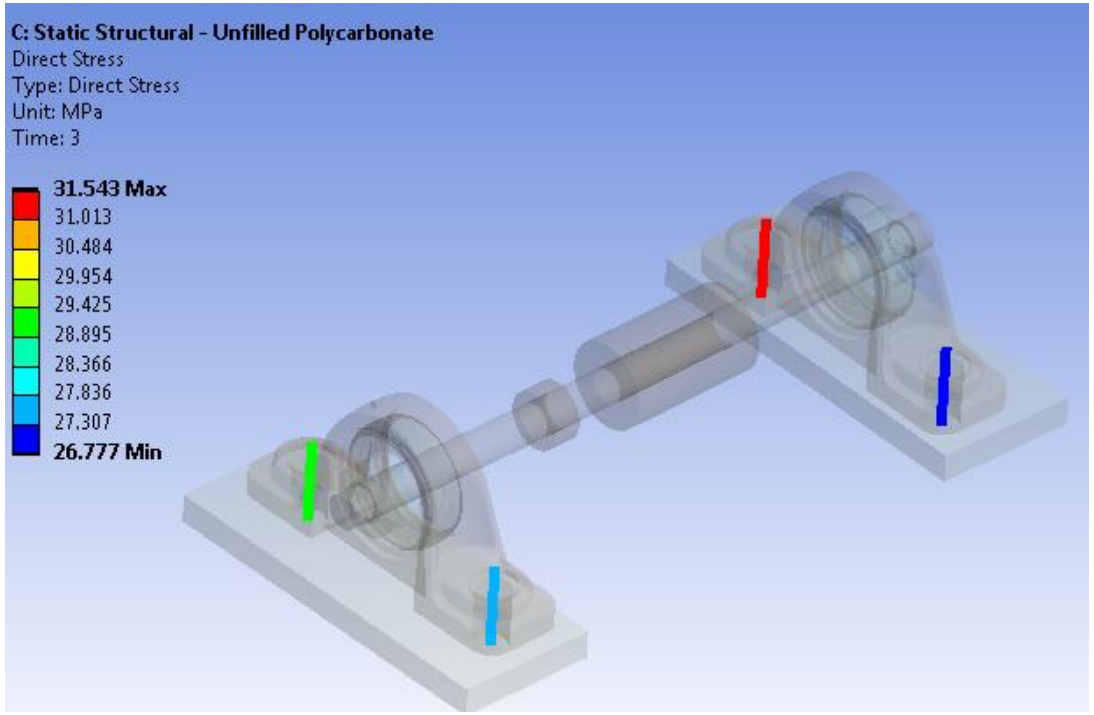
- Bolt postprocessing:
  - Review stresses (Direct, Min Combined, and Max Combined) in beam bodies using the Beam Tool
  - What are your conclusions? (Max Combined stress is high at certain locations, beyond yield stress)





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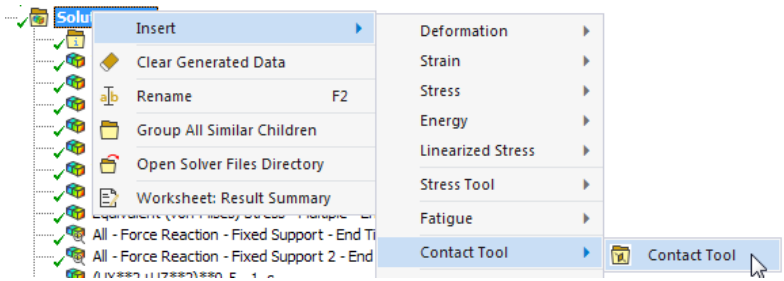
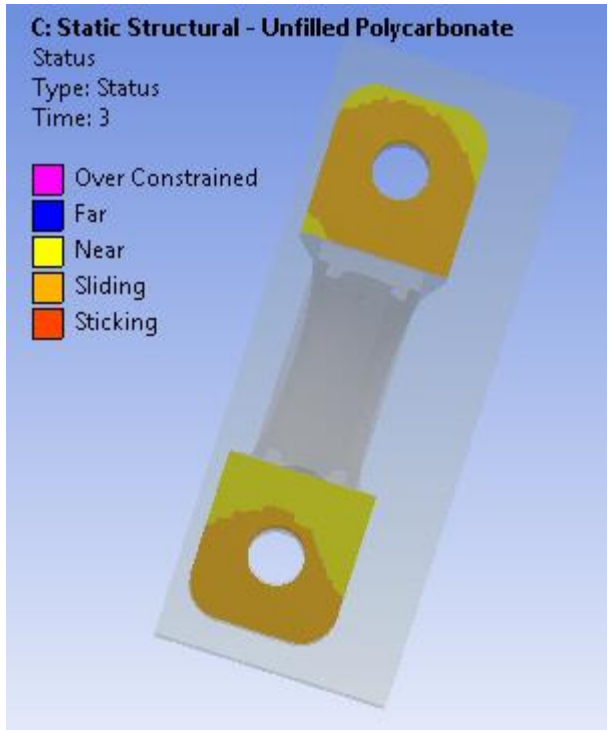
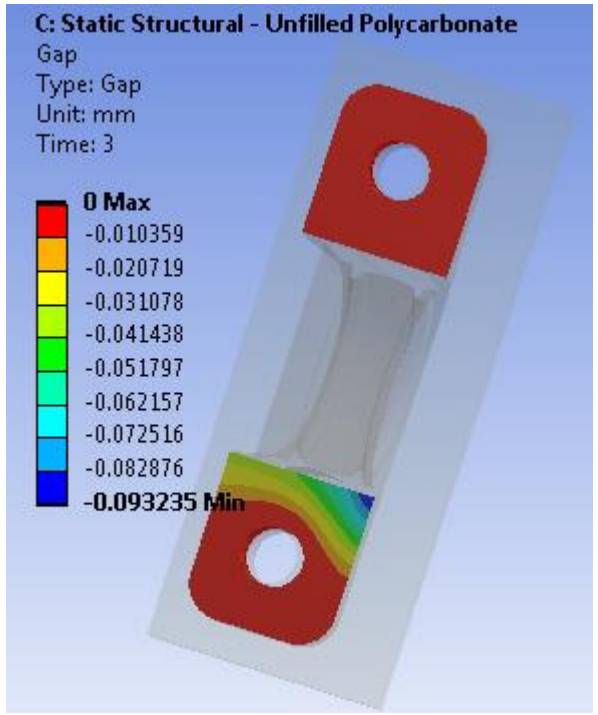
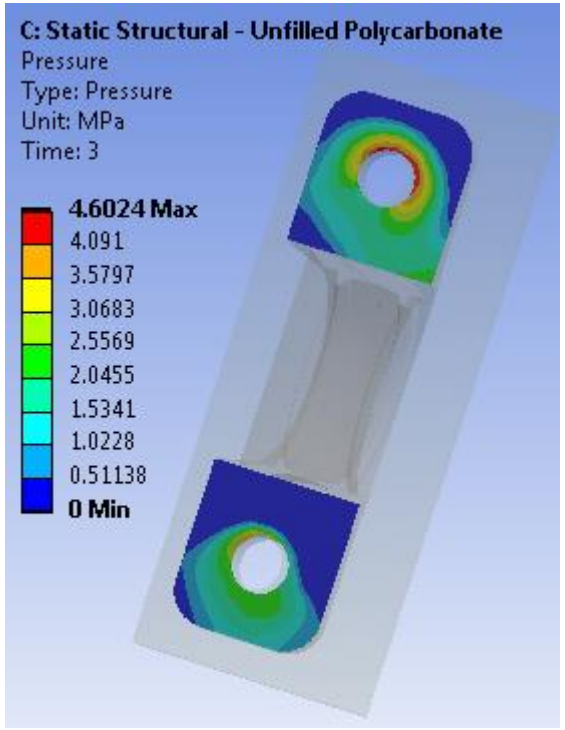
- Contacts postprocessing:
  - Insert a **Contact Tool** to review Frictionless contact results between **Housing** bodies and **Ground** bodies
  - Review **Status, Gap,** and **Pressure**
  - Do the housings lift between the bolts?









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- Contacts postprocessing:
  - Review contact results on the Rings to Bearings contact regions
  - Is Frictional contact a good choice? Or should this contact pair be made linear?

- **Conclude:**
  - **Can Unfilled Polycarbonate replace Stainless Steel for the Housings?**

  Recall that the misalignment values must not be different by more than 5 % between simulations for both Stainless Steel and Polycarbonate materials.

  Equivalent Stress must not be greater than the yield strength for each material.

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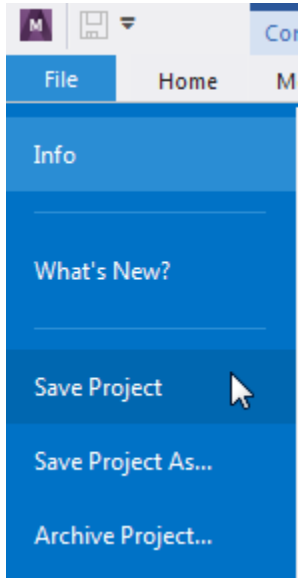
Save Project for use later if desired.



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