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|  | |  | | --- | | **Simulation of Waxo\_C2**  **Date: Tuesday, May 9, 2017 Designer: Solidworks**  **Study name: Static 2**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc482120066)  [Assumptions 2](#_Toc482120067)  [Model Information 2](#_Toc482120068)  [Study Properties 3](#_Toc482120069)  [Units 4](#_Toc482120070)  [Material Properties 5](#_Toc482120071)  [Loads and Fixtures 6](#_Toc482120072)  [Connector Definitions 6](#_Toc482120073)  [Contact Information 7](#_Toc482120074)  [Mesh information 8](#_Toc482120075)  [Sensor Details 10](#_Toc482120076)  [Resultant Forces 11](#_Toc482120077)  [Beams 11](#_Toc482120078)  [Study Results 12](#_Toc482120079)  [Conclusion 15](#_Toc482120080) | |
| Description No Data |

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| Assumptions  |  |  | | --- | --- | | Original Model | Model Analyzed | |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** Waxo\_C2**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Cut-Extrude2** | **Solid Body** | ****Mass:0.00710912 kg****  ****Volume:2.78789e-006 m^3****  ****Density:2550 kg/m^3****  ****Weight:0.0696694 N**** | ****Z:\Research project\myWork\Design\WaxoDesign\curvedBarRight.SLDPRT****  **May 05 15:40:53 2017** | | **Split Line2** | **Solid Body** | ****Mass:0.0166659 kg****  ****Volume:6.53566e-006 m^3****  ****Density:2550 kg/m^3****  ****Weight:0.163326 N**** | ****Z:\Research project\myWork\Design\WaxoDesign\torqueBar.SLDPRT****  **May 05 15:40:54 2017** | |

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| Study Properties  |  |  | | --- | --- | | Study name | Static 2 | | 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 | FFEPlus | | 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 (Z:\Research project\myWork\Design\WaxoDesign) | |

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

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| Material Properties  |  |  |  | | --- | --- | --- | | ****Model Reference**** | ****Properties**** | ****Components**** | |  | |  |  | | --- | --- | | ****Name:**** | **Std CF** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **2.75e+009 N/m^2** | | ****Tensile strength:**** | **1.95e+009 N/m^2** | | ****Compressive strength:**** | **4e+009 N/m^2** | | ****Elastic modulus:**** | **7e+010 N/m^2** | | ****Poisson's ratio:**** | **0.21** | | ****Mass density:**** | **2550 kg/m^3** | | ****Shear modulus:**** | **3e+010 N/m^2** | | **SolidBody 1(Cut-Extrude2)(curvedBarRight-1),**  **SolidBody 1(Split Line2)(torqueBar-2)** | | **Curve Data:N/A** | | | |  | |  |  | | --- | --- | | ****Name:**** | **E fiberglass** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **1.95e+009 N/m^2** | | ****Tensile strength:**** | **2.75e+009 N/m^2** | | ****Compressive strength:**** | **4e+009 N/m^2** | | ****Elastic modulus:**** | **7e+010 N/m^2** | | ****Poisson's ratio:**** | **0.21** | | ****Mass density:**** | **2550 kg/m^3** | | ****Shear modulus:**** | **3e+010 N/m^2** | | **<Material\_ComponentList1/>** | | **Curve Data:N/A** | | | |  | |  |  | | --- | --- | | ****Name:**** | **6061 Alloy** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Max von Mises Stress** | | ****Yield strength:**** | **5.51485e+007 N/m^2** | | ****Tensile strength:**** | **1.24084e+008 N/m^2** | | ****Elastic modulus:**** | **6.9e+010 N/m^2** | | ****Poisson's ratio:**** | **0.33** | | ****Mass density:**** | **2700 kg/m^3** | | ****Shear modulus:**** | **2.6e+010 N/m^2** | | ****Thermal expansion coefficient:**** | **2.4e-005 /Kelvin** | | **<Material\_ComponentList1/>** | | **Curve Data:N/A** | | | |

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| **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)** | **-121.553** | **-0.0267** | **123.01** | **172.935** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-3** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Apply normal force** | | Value: | **200 N** | | |

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| Connector Definitions No Data |

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| Contact Information  | Contact | Contact Image | Contact Properties | | --- | --- | --- | | Global Contact |  | |  |  | | --- | --- | | Type: | **Bonded** | | Components: | **1 component(s)** | | Options: | **Compatible mesh** | | |

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| Mesh information  |  |  | | --- | --- | | Mesh type | Solid Mesh | | Mesher Used: | Standard mesh | | Automatic Transition: | Off | | Include Mesh Auto Loops: | Off | | Jacobian points | 4 Points | | Element Size | 4.43824 mm | | Tolerance | 0.221912 mm | | Mesh Quality | High | | Remesh failed parts with incompatible mesh | Off |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 4391 | | Total Elements | 1825 | | Maximum Aspect Ratio | 11.446 | | % of elements with Aspect Ratio < 3 | 74 | | % of elements with Aspect Ratio > 10 | 0.11 | | % of distorted elements(Jacobian) | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:02 | | Computer name: | ASUS-YACINE | |  | | |

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| Sensor Details  | Sensor name | Location | Sensor Details | | --- | --- | --- | | Stress1 |  | Value : 1008.04 N/mm^2 (MPa)  Entities :  Result :Stress  Component :VON: von Mises Stress  Criterion :Model Max  Step Criterion : Across all Steps  Step No.:1  Alert Value: is greater than 1e+009 N/mm^2 (MPa) | | Mass1 |  | Value : 25.1735868 g  Entities :2 component(s)  Result :Stress  Component :VON: von Mises Stress  Criterion :Model Max  Step Criterion : Across all Steps  Step No.:1  Alert Value: NA | | Stress2 |  | Value : 146204 psi  Entities :  Result :Stress  Component :VON: von Mises Stress  Criterion :Model Max  Step Criterion : Across all Steps  Step No.:1  Alert Value: NA | | Minimum Factor of Safety1 |  | Value : 1.62916  Entities :  Result :Factor of Safety  Component :Automatic  Criterion :Model Max  Step Criterion : Across all Steps  Step No.:1  Alert Value: NA | | Mass2 |  | Value : 25.1735868 g  Entities :  Result :Stress  Component :VON: von Mises Stress  Criterion :Model Max  Step Criterion : Across all Steps  Step No.:1  Alert Value: NA | |

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| Resultant ForcesReaction forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | -121.553 | -0.0267 | 123.01 | 172.935 |  Reaction Moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 0 | |
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| Beams No Data |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 23078.2 N/m^2  Node: 4041 | 1.00804e+009 N/m^2  Node: 3559 | | **Waxo\_C2-Static 2-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0 mm  Node: 33 | 96.9149 mm  Node: 3209 | | **Waxo\_C2-Static 2-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 5.15855e-007  Element: 1495 | 0.0107206  Element: 1633 | | **Waxo\_C2-Static 2-Strain-Strain1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety1 | Max von Mises Stress | 1.62916  Node: 17 | 84495.2  Node: 4041 | | **Waxo\_C2-Static 2-Factor of Safety-Factor of Safety1** | | | | |

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| Conclusion |