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|  | |  | | --- | | **Simulation of Injector Breakaway Head**  **Date: Monday, March 17, 2025 Designer: Solidworks**  **Study name: Static 1**  **Analysis type: Static** | | Table of Contents  [Description 1](#_Toc193130566)  [Assumptions 2](#_Toc193130567)  [Model Information 2](#_Toc193130568)  [Study Properties 3](#_Toc193130569)  [Units 3](#_Toc193130570)  [Material Properties 4](#_Toc193130571)  [Loads and Fixtures 5](#_Toc193130572)  [Connector Definitions 5](#_Toc193130573)  [Interaction Information 5](#_Toc193130574)  [Mesh information 6](#_Toc193130575)  [Sensor Details 6](#_Toc193130576)  [Resultant Forces 7](#_Toc193130577)  [Beams 7](#_Toc193130578)  [Study Results 8](#_Toc193130579)  [Conclusion 10](#_Toc193130580)  [Appendix 10](#_Toc193130581) | |
| Description No Data |

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| Assumptions |

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| Model Information  |  |  |  |  |  | | --- | --- | --- | --- | --- | | |  | | --- | |  |   ****Model name:** Injector Breakaway Head**  ****Current Configuration:** Default** | | | | | ****Solid Bodies**** | | | | | ****Document Name and Reference**** | ****Treated As**** | ****Volumetric Properties**** | ****Document Path/Date Modified**** | | **Split Line2** | **Solid Body** | ****Mass:0.00223629 kg****  ****Volume:1.86358e-06 m^3****  ****Density:1,200 kg/m^3****  ****Weight:0.0219157 N**** | ****D:\New Life\Learning SOLIDWORKS\Vertanux1 Simulations\Lab 2\INJECTOR\Injector Breakaway Head.SLDPRT****  **Feb 14 05:55:08 2017** | |

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| 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 (D:\New Life\Learning SOLIDWORKS\Vertanux1 Simulations\Lab 2\INJECTOR) | |

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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:**** | **Acrylic (Medium-high impact)** | | ****Model type:**** | **Linear Elastic Isotropic** | | ****Default failure criterion:**** | **Unknown** | | ****Yield strength:**** | **4.5e+07 N/m^2** | | ****Tensile strength:**** | **7.3e+07 N/m^2** | | ****Elastic modulus:**** | **3e+09 N/m^2** | | ****Poisson's ratio:**** | **0.35** | | ****Mass density:**** | **1,200 kg/m^3** | | ****Shear modulus:**** | **8.9e+08 N/m^2** | | ****Thermal expansion coefficient:**** | **5.2e-05 /Kelvin** | | **SolidBody 1(Split Line2)(Injector Breakaway Head)** | | **Curve Data:N/A** | | | |

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| **Loads and Fixtures**  | ****Fixture name**** | ****Fixture Image**** | ****Fixture Details**** | | --- | --- | --- | | **Fixed-1** |  | |  |  | | --- | --- | | Entities: | **1 face(s)** | | Type: | **Fixed Geometry** | | | ****Resultant Forces****   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Components** | **X** | **Y** | **Z** | **Resultant** | | **Reaction force(N)** | **-3.53961e-06** | **-1.41823e-07** | **3.24287e-06** | **4.80262e-06** | | **Reaction Moment(N.m)** | **0** | **0** | **0** | **0** | | | |  | ****Load name**** | ****Load Image**** | ****Load Details**** | | --- | --- | --- | | **Force-1** |  | |  |  | | --- | --- | | Entities: | **2 face(s)** | | Type: | **Apply normal force** | | Value: | **20 lbf** | | |

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| Connector Definitions No Data |

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| Interaction Information No Data |

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| Mesh information  |  |  | | --- | --- | | Mesh type | Solid Mesh | | Mesher Used: | Blended curvature-based mesh | | Jacobian points for High quality mesh | 16 Points | | Maximum element size | 0.09694 in | | Minimum element size | 0.0153073 in | | Mesh Quality | High |  Mesh information - Details  |  |  | | --- | --- | | Total Nodes | 5835 | | Total Elements | 3037 | | Maximum Aspect Ratio | 28.176 | | % of elements with Aspect Ratio < 3 | 92 | | Percentage of elements with Aspect Ratio > 10 | 1.48 | | Percentage of distorted elements | 0 | | Time to complete mesh(hh;mm;ss): | 00:00:06 | | Computer name: |  | |

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| Sensor Details No Data |

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| Resultant ForcesReaction forces  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N | -3.53961e-06 | -1.41823e-07 | 3.24287e-06 | 4.80261e-06 |  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 | -9.97691e-06 | -5.36704e-07 | 2.91504e-07 | 9.99559e-06 |  Free body moments  | Selection set | Units | Sum X | Sum Y | Sum Z | Resultant | | --- | --- | --- | --- | --- | --- | | Entire Model | N.m | 0 | 0 | 0 | 1e-33 | |

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| Beams No Data |

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| Study Results  | Name | Type | Min | Max | | --- | --- | --- | --- | | Stress1 | VON: von Mises Stress | 1.669e-02N/m^2  Node: 3893 | 2.983e+08N/m^2  Node: 5510 | | **Injector Breakaway Head-Static 1-Stress-Stress1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Displacement1 | URES: Resultant Displacement | 0.000e+00mm  Node: 26 | 2.974e-01mm  Node: 97 | | **Injector Breakaway Head-Static 1-Displacement-Displacement1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Strain1 | ESTRN: Equivalent Strain | 9.337e-12  Element: 2070 | 7.249e-02  Element: 1868 | | **Injector Breakaway Head-Static 1-Strain-Strain1** | | | |  | Name | Type | Min | Max | | --- | --- | --- | --- | | Factor of Safety1 | Automatic | 1.509e-01  Node: 5510 | 1.000e+00  Node: 1 | | **Injector Breakaway Head-Static 1-Factor of Safety-Factor of Safety1** | | | | |

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| Conclusion |

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| Appendix |