

Stress analysis of deflection analysis flexure and obif

Note:

Do not base your design decisions solely on the data presented in this report. Use this information in conjunction with experimental data and practical experience. Field testing is mandatory to validate your final design. COSMOSWorks helps you reduce your time-to-market by reducing but not eliminating field tests.

Comments:

125 pound normal load with 4 OCM Tested Flexures, .166 thick as deliverd.

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Description

Summarize the FEM analysis on deflection analysis flexure and obif

Assumptions

Model Information

Document Name	Configuration	Document Path	Date Modified
deflection analysis flexure and obif	full contact mate	D:\FIRE\FIRE SolidWorks\Instrument Assembly\Dewar Vessel\deflection analysis flexure and obif.SLDASM	Tue Jul 22 10:21:27 2008
33-20001-1	Fabrication-1	D:\FIRE\FIRE SolidWorks\Instrument Assembly\Dewar Vessel\33-20001.SLDPRT	Tue Jul 22 10:03:36 2008
33-20001-2	Fabrication-1	D:\FIRE\FIRE SolidWorks\Instrument Assembly\Dewar Vessel\33-20001.SLDPRT	Tue Jul 22 10:03:36 2008
33-20001-3	Fabrication-1	D:\FIRE\FIRE SolidWorks\Instrument Assembly\Dewar Vessel\33-20001.SLDPRT	Tue Jul 22 10:03:36 2008
33-20001-4	Fabrication-1	D:\FIRE\FIRE SolidWorks\Instrument Assembly\Dewar Vessel\33-20001.SLDPRT	Tue Jul 22 10:03:36 2008

33-20101_deflection analysis-1	Fabrication	D:\FIRE\FIRE SolidWorks\Instrument Assembly\Dewar Vessel\Vacuum Chamber\33-20101_deflection analysis.SLDPRT	Tue Jul 22 06:39:41 2008
Part1^deflection analysis fle-1	Default	C:\DOCUME~1\MATTHE~1\LOCALS~1\Temp\swx4856\deflection analysis flexure and obif\Part1^deflection analysis fle.sldprt	Tue Jul 22 10:41:10 2008

Study Properties

Study name	normal load
Analysis type	Static
Mesh Type:	Solid Mesh
Solver type	FFEPlus
Inplane Effect:	Off
Soft Spring:	Off
Inertial Relief:	Off
Thermal Effect:	Input Temperature
Zero strain temperature	298.000000
Units	Kelvin
Include fluid pressure effects from COSMOSFloWorks	Off
Friction:	Off
Ignore clearance for surface contact	Off
Use Adaptive Method:	Off

Units

Unit system:	SI
Length/Displacement	m
Temperature	Kelvin
Angular velocity	rad/s
Stress/Pressure	psi

Material Properties

No.	Body Name	Material	Mass	Volume
1	33-20001-1	User Defined	0.248187 lb	3.81826 in ³
2	33-20001-2	User Defined	0.248187 lb	3.81826 in ³
3	33-20001-3	User Defined	0.248187 lb	3.81826 in ³
4	33-20001-4	User Defined	0.248187 lb	3.81826 in ³
5	33-20101_deflection analysis-1	[SW]6061 Alloy	22.7422 kg	0.00842304 m ³
6	Part1^deflection analysis fle-1	[SW]6061 Alloy	31.4824 kg	0.0116601 m ³

Material name:	User Defined
Description:	
Material Source:	Input
Material Model Type:	Linear Elastic Isotropic

Property Name	Value	Units	Value Type
Elastic modulus	2.4656e+006	psi	Constant
Poisson's ratio	0.1	NA	Constant

Mass density	0.065	lb/in ³	Constant
Tensile strength	50550	psi	Constant
Compressive strength	65000	psi	Constant
Yield strength	50550	psi	Constant

Material name:	User Defined
Description:	
Material Source:	Input
Material Model Type:	Linear Elastic Isotropic

Property Name	Value	Units	Value Type
Elastic modulus	2.4656e+006	psi	Constant
Poisson's ratio	0.1	NA	Constant
Mass density	0.065	lb/in ³	Constant
Tensile strength	50550	psi	Constant
Compressive strength	65000	psi	Constant
Yield strength	50550	psi	Constant

Material name:	User Defined
Description:	
Material Source:	Input
Material Model Type:	Linear Elastic Isotropic

Property Name	Value	Units	Value Type
Elastic modulus	2.4656e+006	psi	Constant
Poisson's ratio	0.1	NA	Constant

Mass density	0.065	lb/in ³	Constant
Tensile strength	50550	psi	Constant
Compressive strength	65000	psi	Constant
Yield strength	50550	psi	Constant

Material name:	User Defined
Description:	
Material Source:	Input
Material Model Type:	Linear Elastic Isotropic

Property Name	Value	Units	Value Type
Elastic modulus	2.4656e+006	psi	Constant
Poisson's ratio	0.1	NA	Constant
Mass density	0.065	lb/in ³	Constant
Tensile strength	50550	psi	Constant
Compressive strength	65000	psi	Constant
Yield strength	50550	psi	Constant

Material name:	[SW]6061 Alloy
Description:	
Material Source:	Used SolidWorks material
Material Library Name:	SolidWorks Materials
Material Model Type:	Linear Elastic Isotropic

Property Name	Value	Units	Value Type
Elastic modulus	6.9e+010	N/m ²	Constant

Poisson's ratio	0.33	NA	Constant
Shear modulus	2.6e+010	N/m ²	Constant
Mass density	2700	kg/m ³	Constant
Tensile strength	1.2408e+008	N/m ²	Constant
Yield strength	5.5149e+007	N/m ²	Constant
Thermal expansion coefficient	2.4e-005	/Kelvin	Constant
Thermal conductivity	170	W/(m.K)	Constant
Specific heat	1300	J/(kg.K)	Constant

Loads and Restraints

Restraint

Restraint name	Selection set	Description
Restraint-1 <33-20101_deflection analysis-1>	on 1 Face(s) fixed.	

Load

Load name	Selection set	Loading type	Description
Force-1 <33-20101_deflection analysis-1, Part1^deflection analysis fle-1>	on 1 Face(s) apply force - 125 lb normal to reference plane with respect to selected reference Edge< 1 > using uniform distribution	Sequential Loading	
Gravity-1	Gravity with respect to Edge< 1 > with gravity acceleration -9.81 m/s ² normal to reference plane	Sequential Loading	

Connector Definitions

No Connectors were defined

Contact

Contact state: Touching faces - Bonded

Mesh Information

Mesh Type:	Solid Mesh
Mesher Used:	Standard
Automatic Transition:	Off
Smooth Surface:	On
Jacobian Check:	4 Points
Element Size:	1.0747 in
Tolerance:	0.024 in
Quality:	High
Number of elements:	50305
Number of nodes:	91210
Time to complete mesh(hh:mm:ss):	00:00:12
Computer name:	FIRE

Mesh Control Information:

Control-1{1} <33-20001-4, 33-20001-3, 33-20001-2, 33-20001-1>	Mesh control on 16 Face(s) with seed 0.08 in, 3 layers and ration 1.5.
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Control-2 <33-20101_deflection analysis-1>

Mesh control on 13 Face(s) with seed 0.38 in, 3 layers and ration 1.5.

Design Scenario Results

No data available.

Sensor Results

No data available.

Reaction Forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Body	N	-0.192582	0.510009	1092.82	1092.82

Free-Body Forces

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Body	N	-0.000287302	0.000169065	-0.012429	0.0124334

Free-body Moments

Selection set	Units	Sum X	Sum Y	Sum Z	Resultant
Entire Body	N-m	0	0	0	1e-033

Bolt Forces

No data available.

Pin Forces

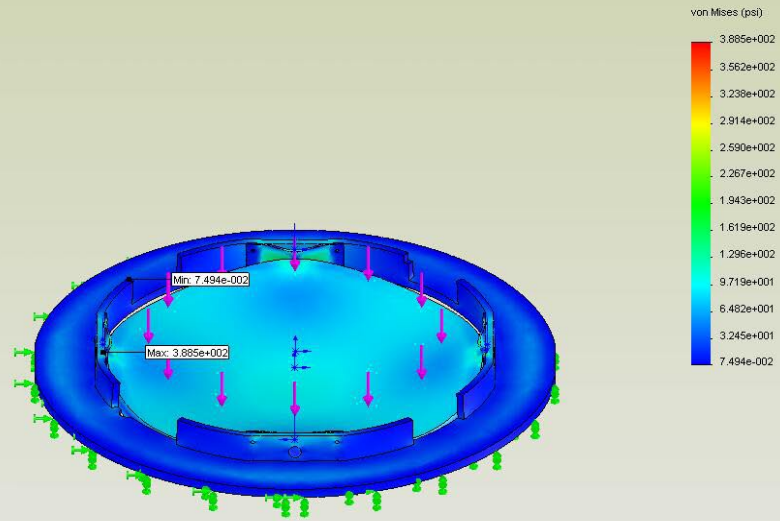
No data available.

Study Results

Default Results

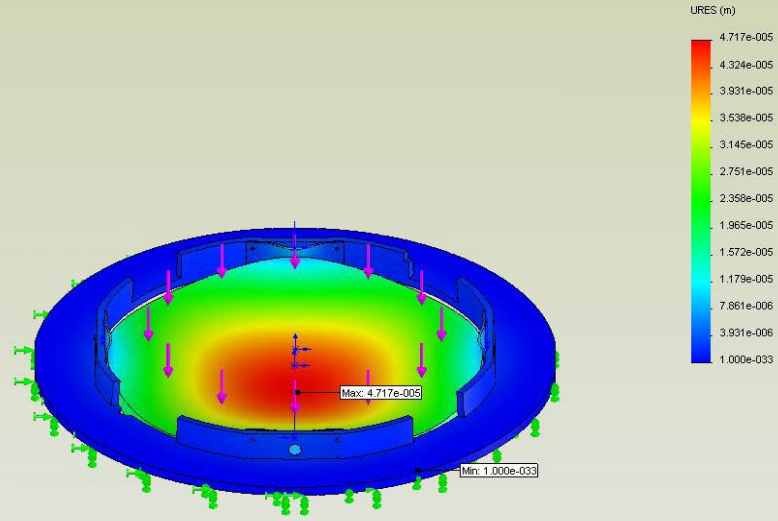
Name	Type	Min	Location	Max	Location
Stress1	VON: von Mises Stress	0.0749431 psi Node: 72274	(-13.3152 in, 9.50493 in, 1.28457 in)	388.526 psi Node: 50831	(-15.2757 in, 2.9873 in, -1.64543 in)
Displacement1	URES: Resultant Displacement	0 m Node: 54278	(9.55428 in, -16.4399 in, -1.66543 in)	4.71684e-005 m Node: 88451	(0.123122 in, 0.2394 in, 0 in)
Strain1	ESTRN: Equivalent Strain	1.54182e-008 Element: 47482	(-0.290344 in, 0.504142 in, 0 in)	8.62597e-005 Element: 27136	(-15.255 in, 2.95863 in, -1.61395 in)
Displacement2	UZ: Z Displacement	-4.71684e-005 m Node: 88451	(0.123122 in, 0.2394 in, 0 in)	1.60907e-008 m Node: 66815	(-20.5991 in, 0.231055 in, -0.915435 in)

Model name: deflection analysis flexure and obif
Study name: normal load
Plot type: Static node/ stress Stress1
Deformation scale: 2225.76



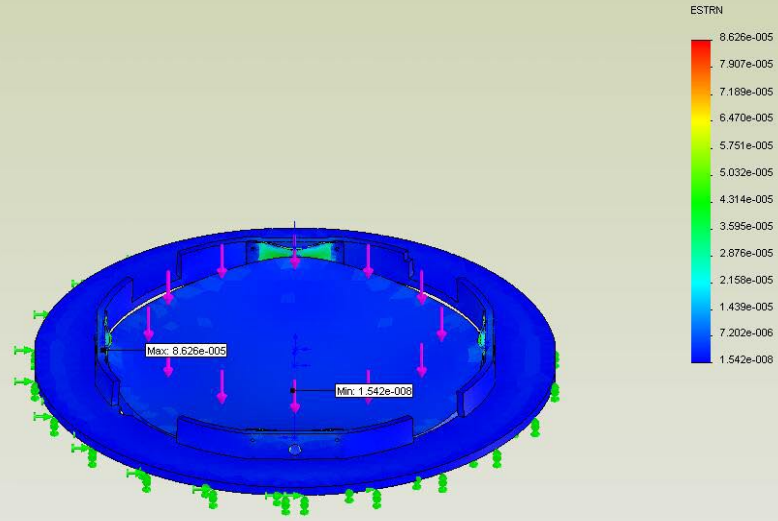
deflection analysis flexure and obif-normal load-Stress-Stress1

Model name: deflection analysis flexure and obif
Study name: normal load
Plot type: Static displacement Displacement1
Deformation scale: 2225.76



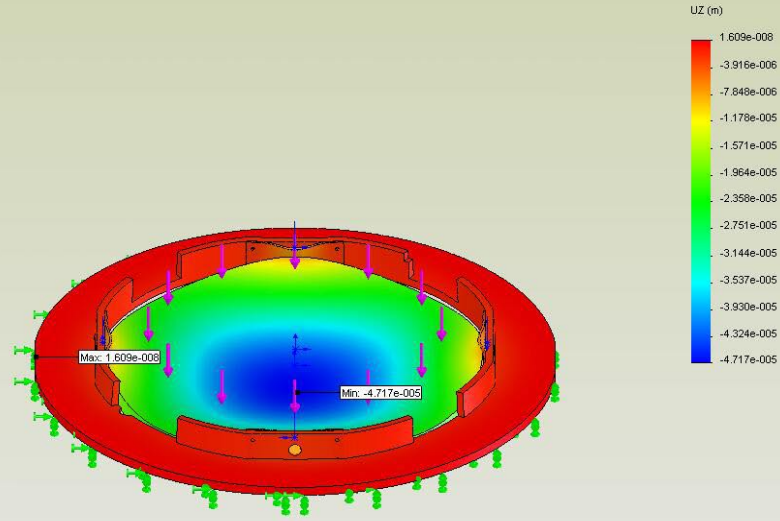
deflection analysis flexure and obif-normal load-Displacement-Displacement1

Model name: deflection analysis flexure and obif
Study name: normal load
Plot type: Static strain Strain1
Deformation scale: 2225.76



deflection analysis flexure and obif-normal load-Strain-Strain1

Model name: deflection analysis flexure and obif
Study name: normal load
Plot type: Static displacement Displacement2
Deformation scale: 2225.76



deflection analysis flexure and obif-normal load-Displacement-Displacement2

Conclusion