PistonAnalysis

MESH:

Entity	Size
Nodes	94791
Elements	418117

ELEMENT TYPE:

Connectivity	Statistics
TE4	418117 (100.00%)

ELEMENT QUALITY:

Criterion	Good	Poor	Bad	Worst	Average
Stretch	417957 (99.96%)	160 (0.04%)	0 (0.00%)	0.104	0.658
Aspect Ratio	409988 (98.06%)	8068 (1.93%)	61 (0.01%)	8.107	1.783

Materials.1

Material	Steel
Young's modulus	2e+011N_m2
Poisson's ratio	0.266
Density	7860kg_m3
Coefficient of thermal expansion	1.17e-005_Kdeg
Yield strength	2.5e+008N_m2

Static Case

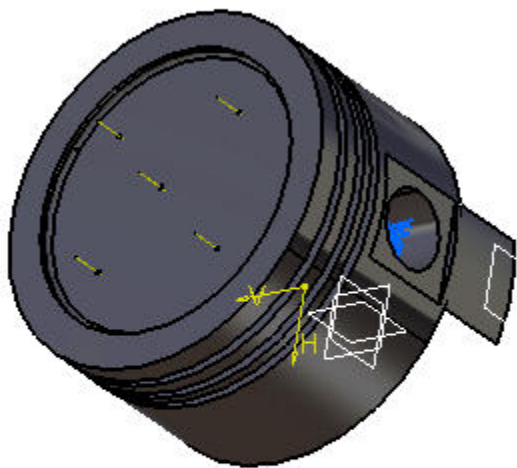## Boundary Conditions

Figure 1

STRUCTURE Computation

Number of nodes   :   94791
Number of elements   : 418117
Number of D.O.F.   : 284373
Number of Contact relations :   0
Number of Kinematic relations :   0

Linear tetrahedron : 418117

RESTRAINT Computation

Name: Restraints.1

Number of S.P.C : 27426

LOAD Computation

Name: Loads.1

Applied load resultant :

Fx = $0.000e+000$ N
Fy = $0.000e+000$ N
Fz = $-3.516e+005$ N
Mx = $2.341e-002$ Nxm
My = $4.400e-003$ Nxm
Mz = $0.000e+000$ Nxm

STIFFNESS Computation

Number of lines	: 284373
Number of coefficients	: 5576625
Number of blocks	: 12
Maximum number of coefficients per bloc	: 499998
Total matrix size	: 64.90 Mb

SINGULARITY Computation

Restraint: Restraints.1

Number of local singularities	: 0
Number of singularities in translation	: 0
Number of singularities in rotation	: 0
Generated constraint type	: MPC

CONSTRAINT Computation

Restraint: Restraints.1

Number of constraints	: 27426
Number of coefficients	: 0

Number of factorized constraints : 27426
Number of coefficients   :   0
Number of deferred constraints   :   0

FACTORIZED Computation

Method   :   SPARSE
Number of factorized degrees   :   256947
Number of supernodes   :   7399
Number of overhead indices   :   1156356
Number of coefficients   : 131578935
Maximum front width   :   4941
Maximum front size   :   12209211
Size of the factorized matrix (Mb) :   1003 . 87
Number of blocks   :   66
Number of Mflops for factorization : $2 . 685e+005$
Number of Mflops for solve   : $5 . 276e+002$
Minimum relative pivot   : $7 . 115e-003$

Minimum and maximum pivot

Value	Dof	Node	x (mm)	y (mm)	z (mm)
$1.6568e+006$	Ty	76838	$1.8065e+001$	$-2.8105e+001$	$3.6642e+001$
$3.2657e+009$	Ty	29221	$-7.0046e+000$	$9.0884e+000$	$5.3000e+001$

Minimum pivot

Value	Dof	Node	x (mm)	y (mm)	z (mm)
$2.1004e+006$	Ty	29547	$3.7870e+000$	$-2.5199e+001$	$5.3000e+001$
$2.2844e+006$	Ty	76265	$7.8565e+000$	$-2.5251e+001$	$1.8839e+001$
$3.3130e+006$	Ty	76599	$2.1889e+001$	$-2.4028e+001$	$3.7436e+001$
$3.3419e+006$	Ty	76618	$2.2510e+001$	$-2.0118e+001$	$3.9457e+001$
$3.5345e+006$	Ty	29094	$-2.0000e+001$	$7.0000e+000$	$5.3000e+001$
$3.5419e+006$	Ty	29071	$-1.5931e+001$	$-1.0538e+000$	$5.3000e+001$
$3.7814e+006$	Ty	28807	$-1.6945e+001$	$2.1452e+001$	$5.3650e+001$
$4.7281e+006$	Ty	28971	$-2.5775e+001$	$1.6755e-001$	$5.3000e+001$

| 5.6183e+006 | Ty | 76462 | 2.9333e+001 | -1.4566e+001 | 3.1001e+001 |

Translational pivot distribution

Value	Percentage
10.E6 --> 10.E7	5.8378e-003
10.E7 --> 10.E8	9.9164e-001
10.E8 --> 10.E9	9.7599e+001
10.E9 --> 10.E10	1.4034e+000

DIRECT METHOD Computation

Name: Static Case Solution.1

Restraint: Restraints.1

Load: Loads.1

Strain Energy : 2.312e+001 J

Equilibrium

| Components	Applied Forces	Reactions	Residual	Relative Magnitude Error
Fx (N)	0.0000e+000	1.4846e-009	1.4846e-009	2.5919e-012
Fy (N)	0.0000e+000	-6.5086e-010	-6.5086e-010	1.1363e-012
Fz (N)	-3.5157e+005	3.5157e+005	6.3446e-009	1.1077e-011
Mx (Nxm)	2.3405e-002	-2.3405e-002	1.2992e-010	4.1242e-012
My (Nxm)	4.3996e-003	-4.3996e-003	-1.2750e-010	4.0474e-012
Mz (Nxm)	0.0000e+000	-4.6759e-011	-4.6759e-011	1.4843e-012

Static Case Solution.1 - Deformed mesh.1

Figure 2

On deformed mesh ---- On boundary ---- Over all the model

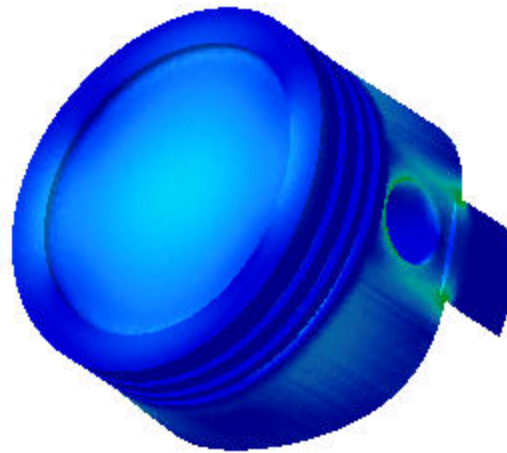**Static Case Solution.1 - Von Mises stress (nodal values).2**
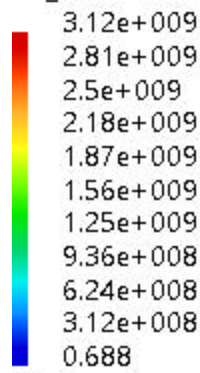
Figure 3

3D elements: : Components: : All

On deformed mesh ---- On boundary ---- Over all the model

Global Sensors

Sensor Name	Sensor Value
Energy	23.123J