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Stress Analysis Of Lpg Cylinder Using Ansys Software

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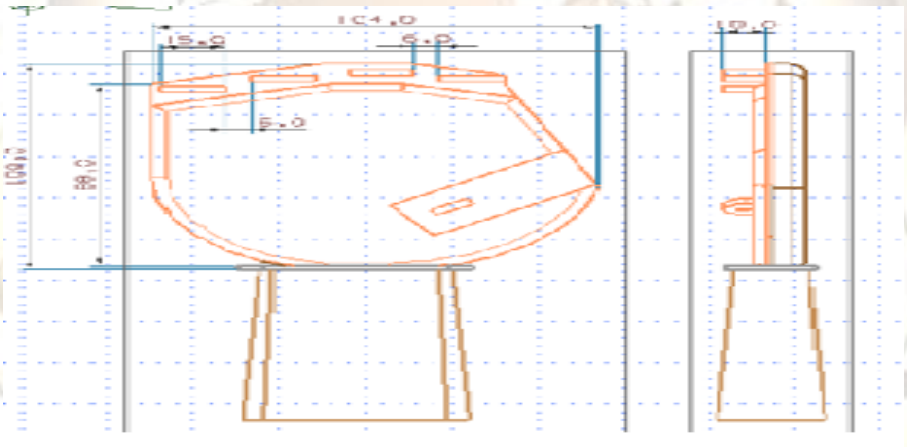
ABSTRACT:

Analysis of the robot hand was analyzed using dedicated software for FEM analysis. The model was exported to FEM processor i.e. in ANSYS, the geometry was updated and the structure meshed using 3D elements. Finite element analysis is a method to computationally model reality in a mathematical form to better understand a highly complex problem. In the real world, everything that occurs results from the interaction between atoms (and sub-particles of those atoms). Billions and billions and billions of them. If we were to simulate the world in a computer, we would have to simulate this interaction based on the simple laws of physics. However, no computer can process the near infinite number of atoms in objects, so instead we model 'finite' groups of them.

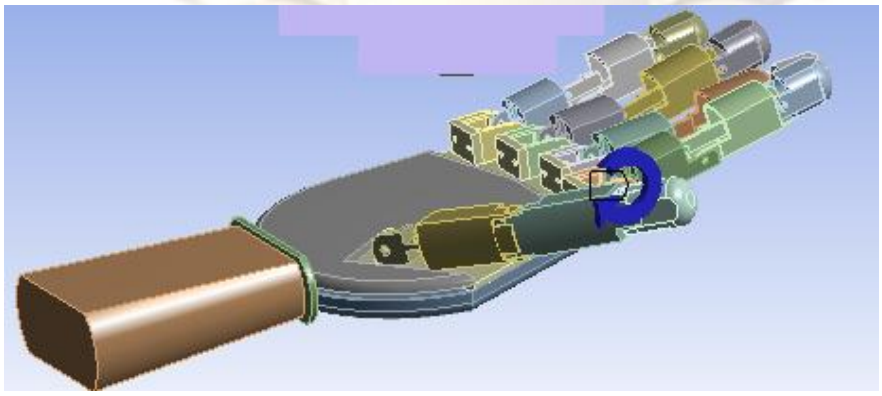
Keywords: robot hand, Robotics, Robot Finger, Finger joints, FEA modeling.

INTRODUCTION

One may define it as a numerical method for solving engineering problem and physics, or a method to computationally model reality in a mathematical form; either one is acceptable indeed. However, for more complete definition of FEM, it may define as. "A continuum is discredited into simple geometric shapes called finite elements; constitutive relations, loading and constraints are defined over these elements; assembly of elements results set of equations; solution of these equations gives the approximate behavior of the continuum."



FIG(1)



FIG(2)

7.3 MATERIAL PROPERTIES OF STRUCTURAL STEEL

Properties of Structural steel are

- Modulus of elasticity in tension and compression, E = 200 X 103 Mpa
- Modulus of elasticity in shear, G = 80 X 103 Mpa
- Ultimate tensile Strength, Sut = 435 Mpa
- Yield strength in tension & compression, Syt / Syc = 246 Mpa
- Yield strength in Shear, Sys = 154 Mpa
- Percentage elongation, e = 30 %
- Specific gravity = 7.8
- Possions Ratio, υ= 0.292
- Endurance limit in reversed bending, Seb = 183 Mpa

ANSYS PROCEDURE FOR F.E. ANALYSIS

- Model
- Geometry- Imported from PROE in ".iges" format
1. Solid- generated ansys geometry.
- Mesh- tetrahedral element selection
- Supply model parameters
- Material properties and determine the constraints.
- Display of results.

LOADS AND INPUT DATA

Analysis of the robot hand has been done to check the overall deformation required to robot fingers to grip an object.

Object is kept exactly over the robot palm at the center of hand. Object is spherical shape of 80mm diameter. (Fig 3).maximum deformation takes place for thumb joint of 124.25mm while it very for remaining four fingers. Maximum 700angle required for base joint of the thumb. Torque required at base joint of all fingers including thumb, is found different.

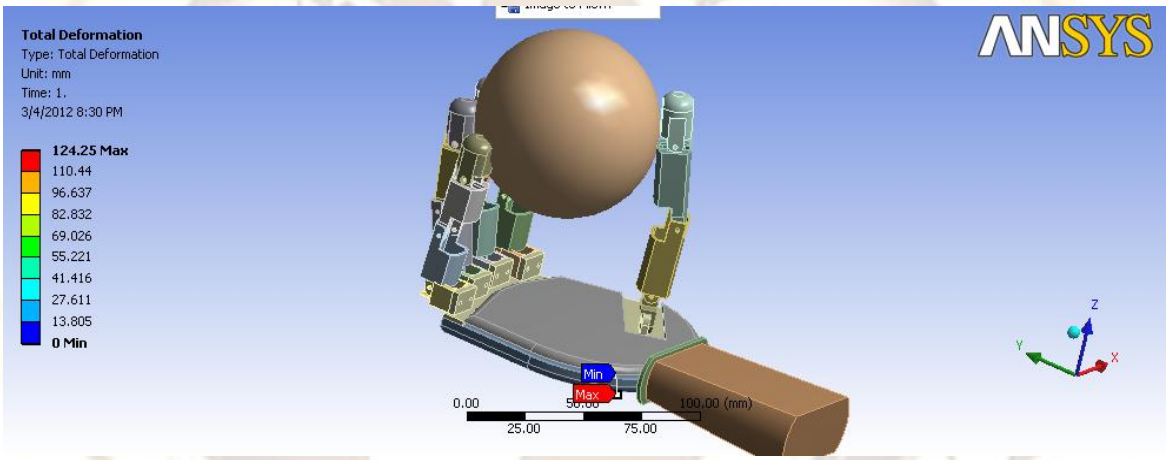


FIG (3)

Maximum torque is at thumb joint of 1.5 N-mm because of its self weight while torque at remaining four fingers very form 0.45N-mm to 0.6N-mm as per its respective deformation. (fig 3)

For the input data and loading scheme, the gravitational and inertial forces were introduced in the current model with the maximum values required by the application. The palm of robot hand is fixed. A normal temperature distribution of 22° C was considered and it was assumed that no other conditions influence the environment

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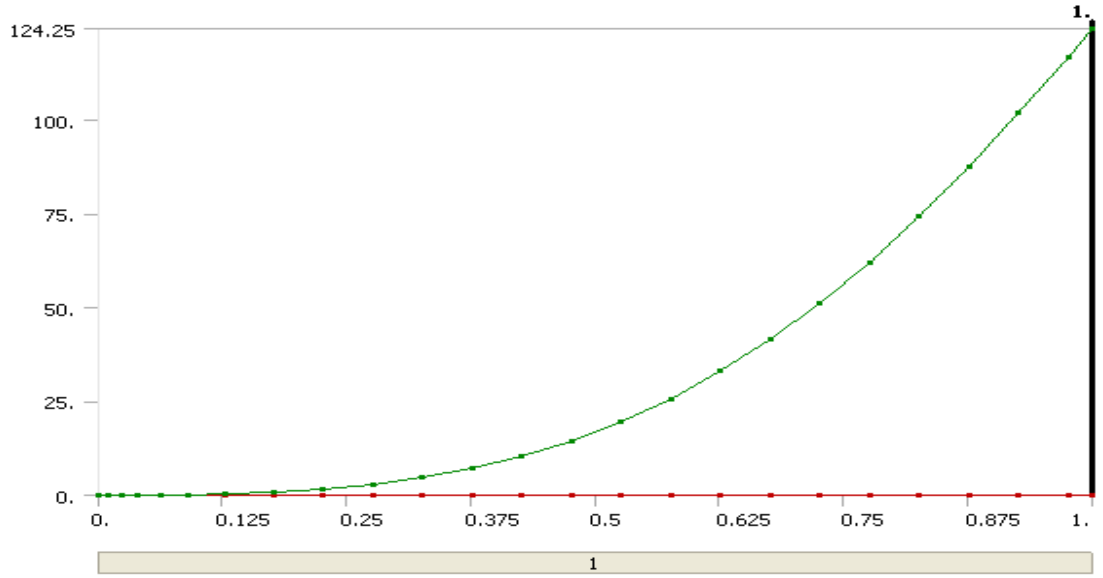


FIG(4)

STATIC STRUCTURAL ANALYSIS OF ROBOT HAND

The static analysis comprises an assessment of the total deformation, equivalent (von Misses) stress under the loads mentioned above, max shear stress and the fatigue tool i.e. for life and damage and safety factor. An analysis of non operational robot was done only considering the gravitational forces. The inertial forces were introduced as well, to show a complete static analysis of the operational robot.

DISTRIBUTION OF STRESSES ALONG THE FINGER TIPS ALONG THE THREE AXES

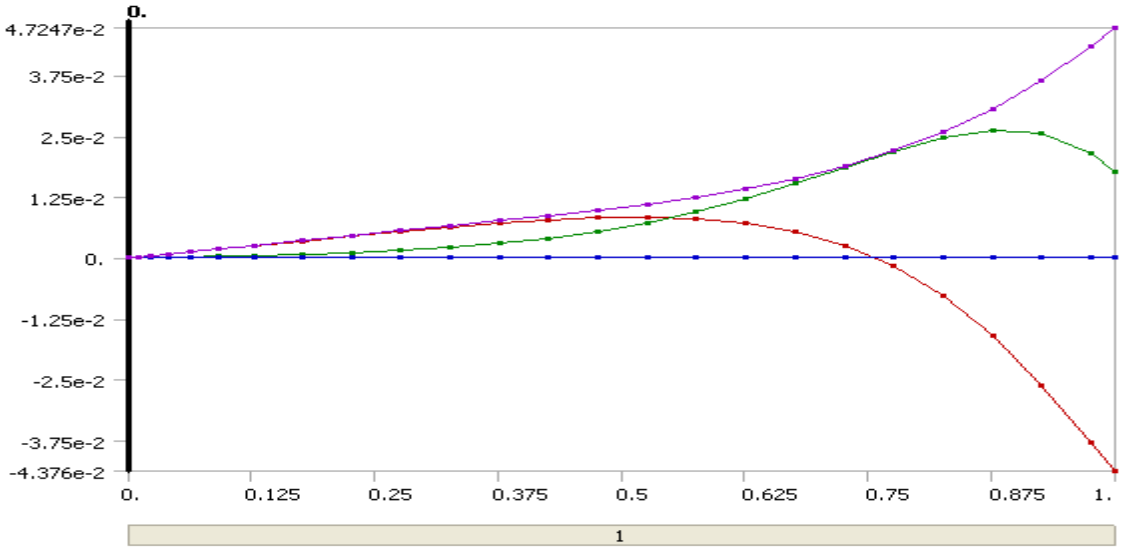
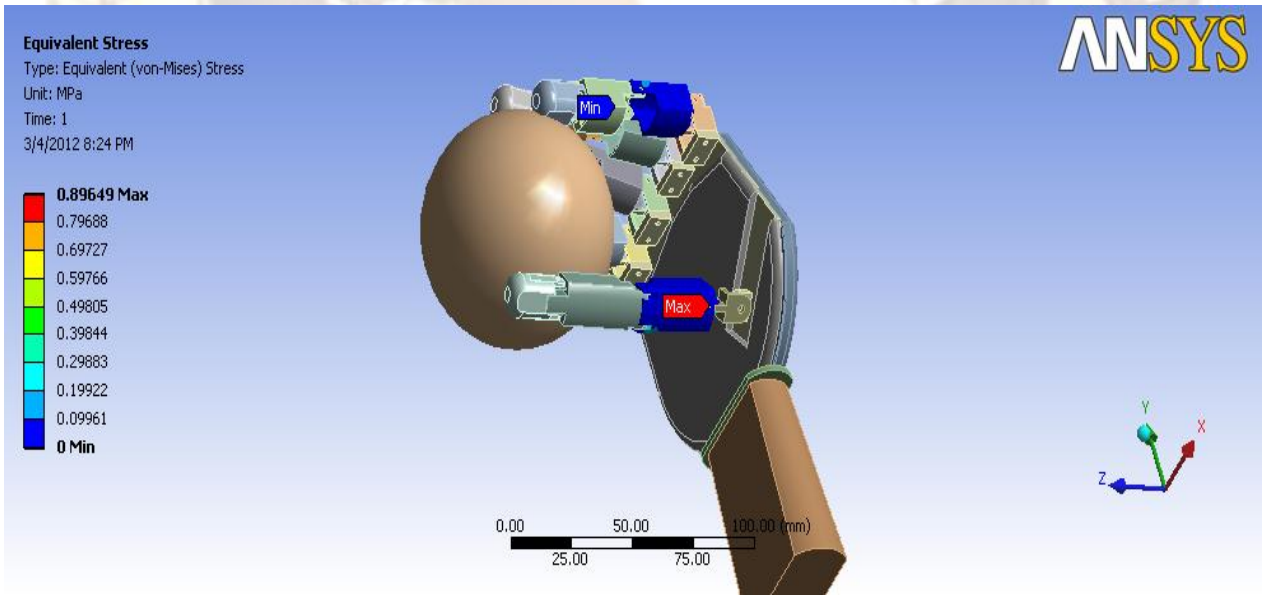


FIG (5)

Object Name	*Joint Probe*
State	Solved
Definition	
Type	Joint Probe
Boundary Condition	Revolute - Solid To Solid
Orientation Method	Joint Reference System
Orientation	Reference Coordinate System
Options	
Result Type	Force
Result Selection	All
Display	All Time Points
Maximum Value Over Time	
X Axis	8.375e-003 N
Y Axis	2.6212e-002 N
Z Axis	3.4694e-018 N
Total	4.7247e-002 N
Minimum Value Over Time	
X Axis	-4.376e-002 N
Y Axis	0. N
Z Axis	-1.7347e-018 N
Total	0. N

VON-MISES STRESS DISTRIBUTION

A material is said to start yielding when its von Misses stress reaches a critical value known as the yield strength, S_y. The von Misses stress is used to predict yielding of materials under any loading condition from results of simple uniaxial tensile tests.



FIG(6)

CONCLUSION

modeling & structural analysis of five fingered robot hand is carried out. The modeling is carried by using the Pro – E software. The volume of each link of finger is kept approximately 1214.8 mm^3. The CAD model of robot hand in Pro – E is imported in the ansys software for the analysis. The coarse mesh is generated for the whole assembly. **TORQUE ACTING** thumb -1.5 n mm while torque at remaining four fingers very form 0.45N-mm to 0.6N-mm as per its respective deformation.
Overall movement at thumb of 124.25mm
VON-MISES STRESS DISTRIBUTION 0.89649 mpa

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