Structural Static Analysis of Connecting Rod

Sangamesh B. Herakal
Asst. Professor,
Dept. of Mechanical Engineering
Holy Mary Institute of Technology & Science
Hyderabad-501301
Email id-sachin.herakal@gmail.com

Dr.ChakradharGoud
Prof and Principal
Dept. of Mechanical Engineering
Sri Sarada Institute of Science and Technology
Hyderabad-508116
Email Id-**cgsakki@yahoo.com**

Abstract-

The principal of connecting rod is to convert linear motion of piston to reciprocating motion of crankshaft. It is the main component of internal combustion (IC) engine. The connecting rod takes more maximum stress compare to other components. so stress analysis in Connecting rod is Very important. In this study, detailed load analysis was performed on connecting rod, followed by finite element method in hypermesh and abaqus medium. The maximum stresses in different parts of connecting rod were determined by abaqus.in this work we are investigated the stress, strain deformation.

I.INTRODUCTION

The main purpose of connecting rod is to convert linear motion of piston to reciprocating motion of crankshaft. It is the main component of internal combustion (IC) engine. During its operation different stresses are acting on connecting rod. Basically the Connecting rod is the link between the piston and the crank. And is responsible to transmit the tension and compression from the piston pin to crank pin, thus converting the reciprocating motion of the piston to rotary motion of the crank.This tendency in vehicle construction led the invention and implementation of quite new materials which are light and meet design requirements.

There are various types of materials and production methods used in the creation of connecting rods. The most common types of connecting rods are aluminum and steel. The most common type of manufacturing processes is powder metallurgy, casting, forging. Connecting rod is among large volume production component in the I.C engine. They are different types of materials and production methods used in the creation of connecting rods. The major stresses induced in the connecting rod are of axial and bending stresses in operation. The axial stresses are produced due to pressure (compressive only) and the inertia force arising in account of reciprocating (both tensile as well as compressive), whereas bending stresses are produced due to the centrifugal effects. It consists of a long shank, a small end and a big end. Connecting rod is subjected to a complex state of loading. The influence of compressive stress is more in connecting rod due to gas pressure and whipping stress. As improving a method for providing high productivity with a lower production cost, generally as the forces generated on the connected rod are by weight andcombustion of fuel insidecylinder acts upon piston and then on the connecting rod, which results in both the bending and axial stresses.

Fig 1. Schematic model of master connecting rod.

II. METHODOLOGY

Connecting rods are used in numerous situations, most commonly in the engines of automobiles. The purpose of a connection rod is to provide fluid movement between pistons and a crankshaft. Connection rods are widely used in vehicles that are powered by internal combustion engines. All automobiles that use this type of engine employ the use of connecting rods. Even construction equipment like bulldozers use internal combustion engines, thus requiring connecting rods.

Master connecting rod carries one or more ring pins to which are bolted and much smaller big of end of slave rod on other cylinder. Advantage of this is, it is having strokes larger than the normal connecting rod.

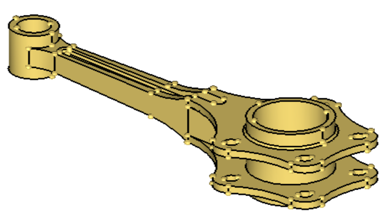


Fig 2.3D model of master connecting rod

Meshing of MCR is carried out in HYPERMESH. Here we are going to make solid mesh with the element size 3mm.

A. Material Properties for Master Connecting Rod

Table 1. Properties of materials.

Sl .no	Material property	values
1	Density	7.89e-9 N/mm^2
2	Young's modulus	2.1e5 N/mm^2
3	Poisson's ratio	0.3

B. Boundary Conditions

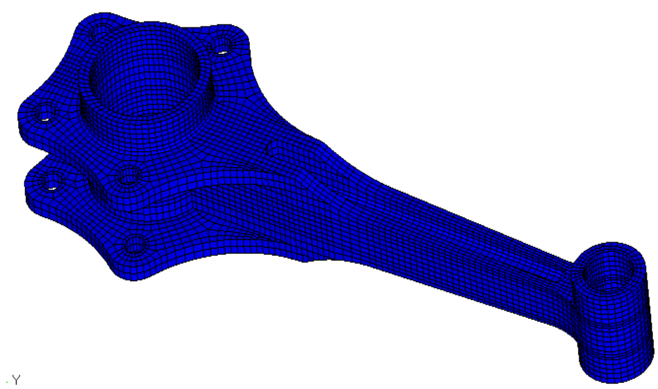


Fig 3. Meshed model of MCR

- Quality checks
  - ✓ Warpage=30
  - quad faces
  - ✓ Min angle=45
  - ✓ Max angle=155

- ✓ Jacobian=0.5
- ➢ Tria faces
- ✓ Min angle=11
- ✓ Max angle=125

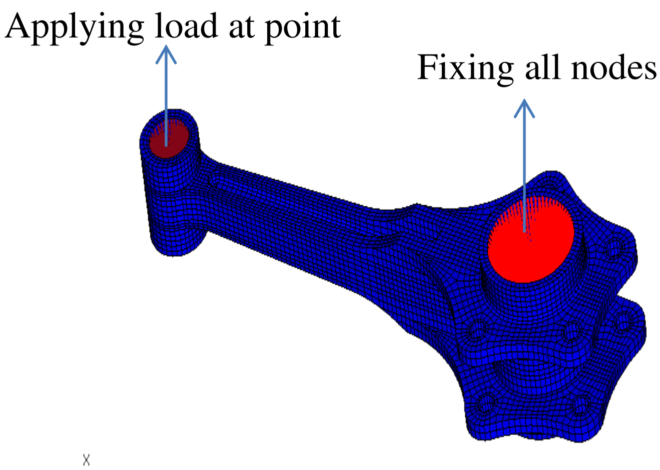
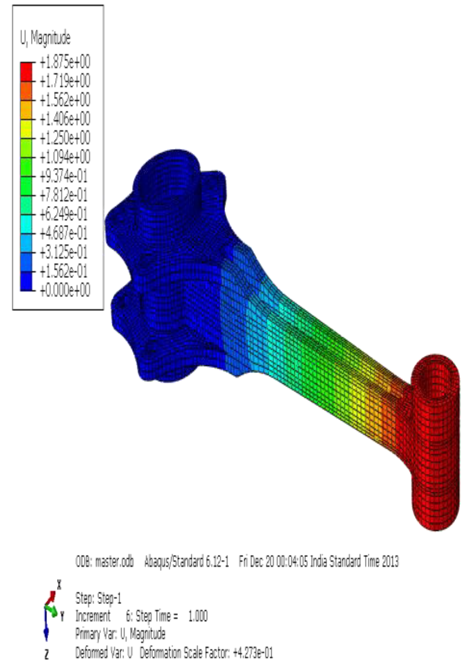


Fig 4. Applied boundary condition

III. RESULTS AND DISCUSSIONS

1. Deformation Result



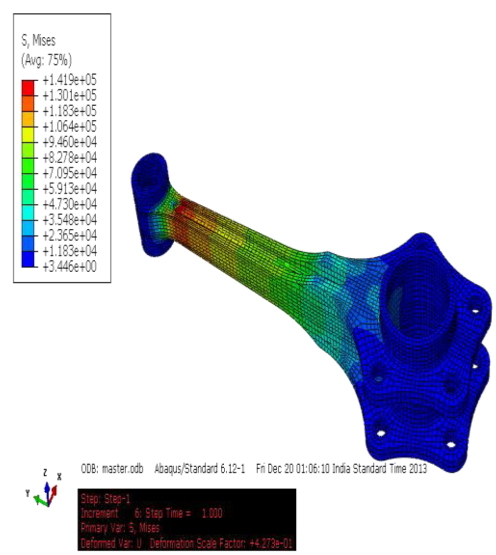
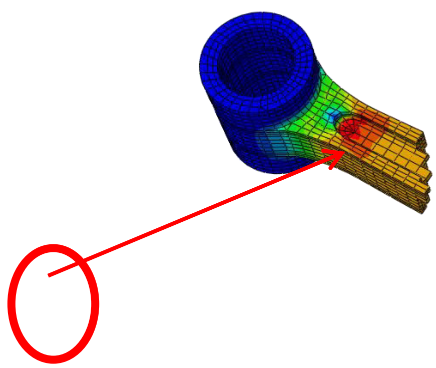


Fig 5. Deformation result

2. Stress Results



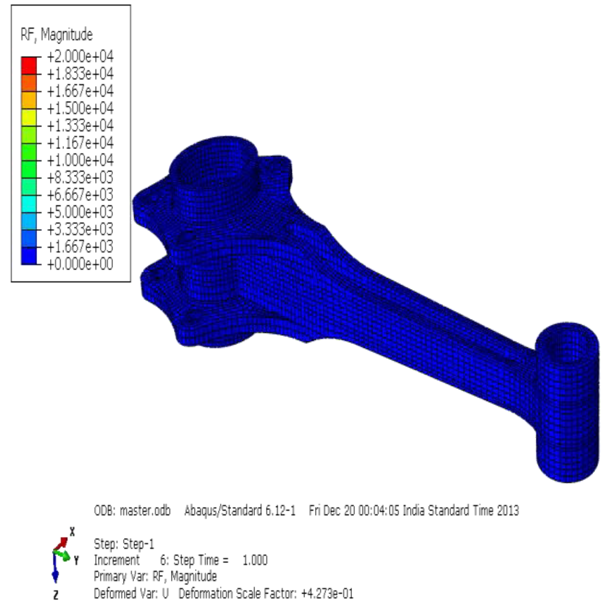
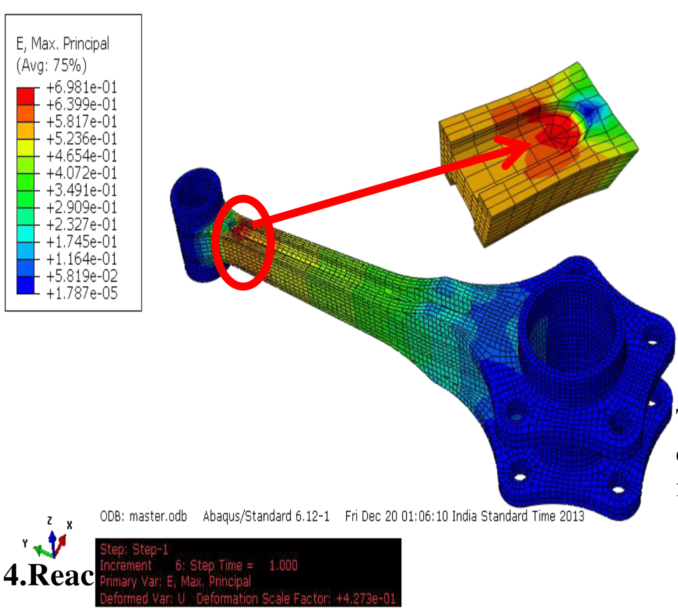
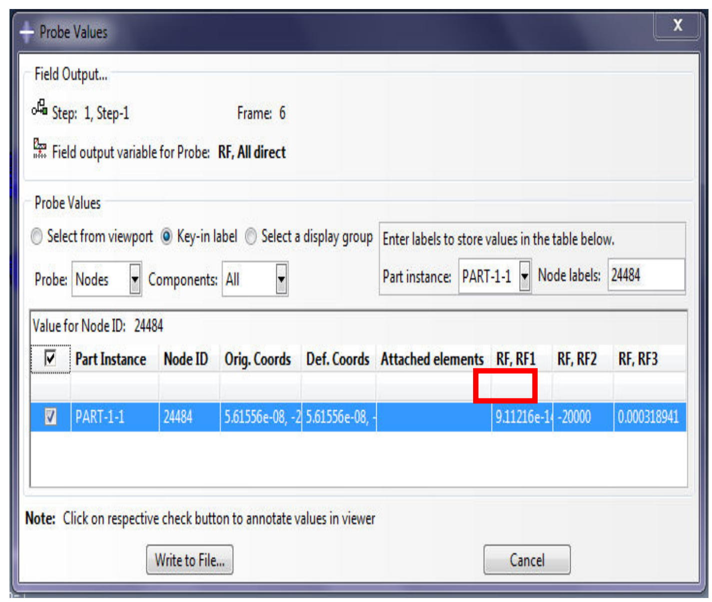


Fig 6. Stress Results

3.Strain Results



4.Reac



The above picture shows that reaction force is equal to applied force but in the opposite sign, i.e Newton's third law.

Fig 6.Reaction Results.

IV. Conclusions

From this analysis of connecting rod we come to know the conclusion that,

1. Connecting rod is subjected to tensile load.
2. Stress and strain are more at small end of connecting rod.
3. Stress value crossing tensile strength so that design is not safe, we have to increase the dimension of connecting rod.

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