

A Review on FEA of Connecting Rod of I.C Engine

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ABSTRACT: In automobile engine connecting rod is a high volume production, critical component. Connecting rod is the Central link between the piston and the crank. We all know that the purpose of the connecting rod is to transfer the reciprocating motion of the piston into rotary motion of the crankshaft. & transmitting the thrust of the piston to the crankshaft. Every vehicle that uses an internal combustion engine. They require at least one connecting rod & no of connecting rod depending upon the number of cylinders in the engine. Connecting rods are mainly manufactured by forging from either wrought steel or powdered metal. They could also be cast. Anyhow, castings could have blow holes which are detrimental from durability and fatigue points of view. The fact of forgings, it's produce blow-hole-free and better rods gives them an advantage over cast rods.

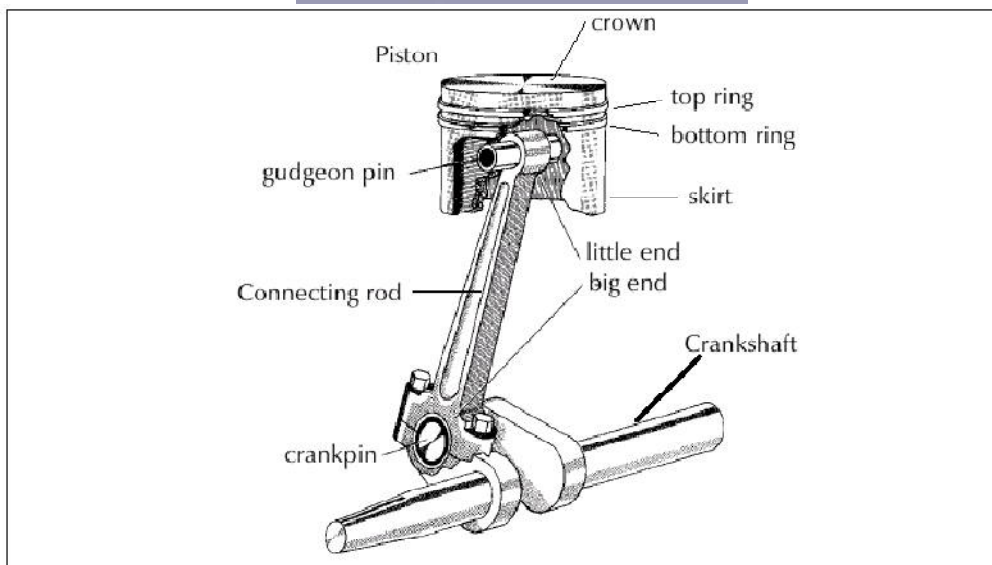
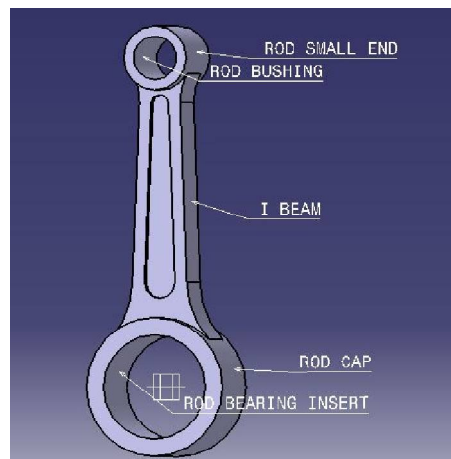
some year ago connecting rods are manufactured using carbon steel and in recent days aluminium alloys are finding its application in connecting rod, because Carbon steel as a connecting rod material is less stiff and having more weight than aluminum.

In this investigation an attempt is made to find the best material of connecting rod & optimization of connecting rod for reduce weight, Stress, Strain, Displacement while increasing or maintaining strength of Connecting rod. Analysis of the connecting rod is one of the method in which complete structure as well as working performance of the connecting rod has been done respectively. We will be doing various analysis like static analysis and thermal analysis by using FEA method.

KEYWORDS: Connecting rod, rotating crankshaft, optimum design, Analysis.

I. INTRODUCTION

Connecting rod is the intermediate link between the piston and the crank. And is responsible to transmit the push and pull from the piston pin to crank pin, thus converting the reciprocating motion of the piston to rotary motion of the crank. Connecting rod, automotive should be lighter and lighter, should consume less fuel and at the same time they should provide comfort and safety to passengers, that unfortunately leads to increase in weight of the vehicle. Lighter connecting rods help to decrease lead caused by forces of inertia in engine as it does not require big balancing weight on crankshaft. Application of metal matrix composite enables safety increase and advances that leads to effective use of fuel and to obtain high engine power. This tendency in vehicle construction led the invention and implementation of quite new materials which are light and meet design requirements.



II. MATERIAL OF CONNECTING ROD:

-The connecting rod is one of the most heavily stressed parts in I.C engine. It is subjected to fluctuating stresses. Most of the connecting rods are manufactured by the drop forging.

-The material used for connecting rod should have fatigue strength & resilience.

-some year ago medium carbon steels & alloy steels are widely use as a material of connecting rod. The medium carbon steels like 40c8 or 45c8, having ultimate tensile strength of 600 to 700 N / mm^2 , are use for low speed & light duty engines. The alloy steel like: 40Cr,40Ni3,30Ni4Cr1, having ultimate strengths of 700 to 1500 N / mm^2 are used for high speed & heavy duty engines. But now a day aluminum alloy & titanium are more preferable as a material of the connecting rod. Aluminum alloy is the material consist of better thermal conductivity and lighter in weight. Aluminum alloy is having good heat transfer rate so is suitable for I.C. engine. Titanium is also best material selected for I.C engine having good thermal conductivity an is easily available.

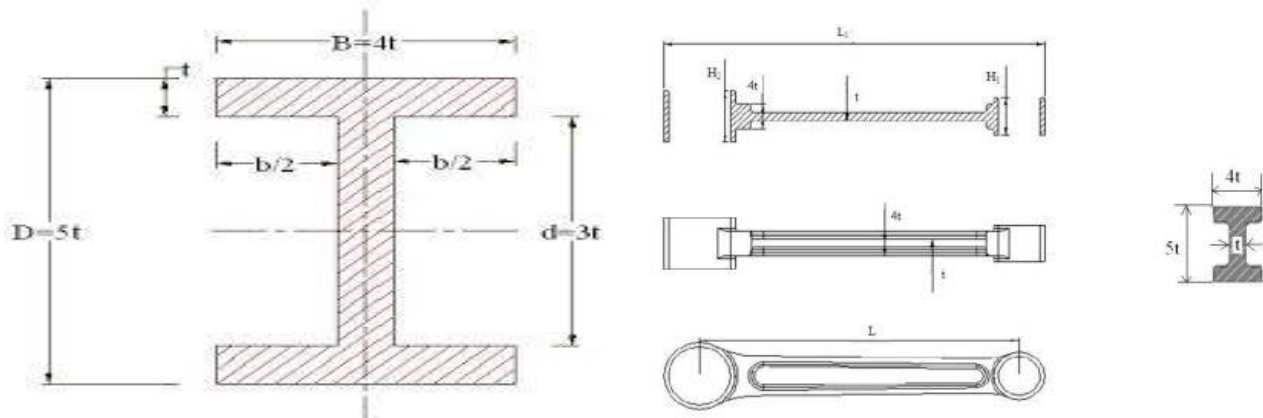
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III. DESIGN



Standard dimension of I-section

Flange thickness = t

Web Thickness = t

Width of Flange $B = 4t$

Depth of section $H = 5t$

In Previous semester we referred many research papers

IV. REVIEW PAPERS

1) **DR.B.K. Royet *al*^[1]**, In this research paper inventor **DR.B.K. Roy** analysis the connecting rod & optimization of various parameters of connecting rod. The analyses in ANSYS 12.0 workbench. After analysis they find out various result & compared with existing result. It has been found out that the study presented here has came up with better results as well as safe design of connecting rod under permissible limits of various parameters and safe stresses.

2) **Prof. N.P. Doshiet *al*^[2]**, In this research paper they select connecting rod of TATA motors which currently launched in market. They analysis in ANSYS software & found out how many stress develop in connecting rod when applied load.& they also found that there is possibility of further reduction in mass of connecting rod.

3) **Christy V Vazhappillyet *al*^[3]**, The main object to study this research paper is reduce weight & cost of connecting rod. This can be achieved by performing a detailed load analysis. Reduction in machining operations, achieved due to change in material & it's a useful factor which help in cost reduction. The fatigue strength is the most critical factor in the process.in this research paper inventor design connecting rod & analysis under load range tensile load analogous to various degree crank angle at the maximum engine speed as one extreme load, and compressive load analogous to the peak gas pressure as the other extreme load. Moreover, they change material of connecting rod the existing connecting rod material can be replaced with a new composite material.

4) **Kuldeep Bet *al*^[4]**, In this research paper inventor invent new material for manufactured connecting rod replace by composite material reinforced with silicon carbide and fly ash. After manufactured connecting rod by this new composite material they compare them & in result is reduction of 43.48% of weight, with 75% reduction in displacement.

5) **LeelaKrishna Vegiet *al*^[5]**, In this research paper Finite element analysis of connecting rod is done by considering the materials Forged steel. The best combination of parameters like Von Misses Stress and strain, Deformation, Factor

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of safety and weight reduction for two wheeler piston were done in ANSYS software. Forged steel has more factor of safety, light in weight, increase the stiffness and reduce the stress and stiffer than other material like carbon steel.

6) Prof. Vivek C. Pathade , Dr. Dilip S. Ingole ^[6], Here the paper deal with stress analysis of connecting rod by FEA method using ANSYS WORKBENCH 11.0 Software. The y also compare that result to experimental by method of photo elasticity.

7) Digvijay, Mohd.Ahmad, Ajay Mishra, Karunakar Mishra,AlokPanday, ShyamBihary Lal ^[7]
Connecting rod is an intermediate link between piston & crank. it's responsible to transmit the push & pull motion from the piston pin & crank pin. they also converting reciprocating motion of the piston to rotary motion of the crank. The main objective of this work is to weight reduction opportunities in the connecting rod of an I. C. engine by examining various materials such as steel alloy, cost Iron, Structural steel. The objective of the present work is to design & analyses of connecting rod made of structural steel.
In this project the material of connecting rod as a steel alloy replaced with structural steel & after analysis in ANSYS.

8) Sushant, Victor Gambhir ^[8],In this paper, a connecting rod for two wheelers was designed by analytical method. With the use of FEA von-mises stress, shear stress, strain and bending stress were calculatedfor a particular loading conditions with help of ANSYS workbench. After analysis they find final result & in result they see Aluminium 7068 connecting rod was better than Carbon 70 steel connecting rod in terms of von-mises stress, shear stress, and bending stress, with considerable reduction in mass.

9) A.Premkumar ^[9],In this research paper connecting rod is replaced by aluminium based composite material reinforced with Boron carbide & also done the modelling and analysis of connecting rod.

10) Puran Singh, DebashisPramanik, Ran Vijay Singh ^[10],This analysis shows the importance of the solution of the connecting rod big end distortions in view of the changes in the bearing clearance at the most important variants of the stress This variant is frequently overlooked & show the design status of connecting rod rather is safe or not.

V. CONCLUSION

From referred the above literature reviews we have concluded that the basic study and research work is done in improving in material of connecting rod. We will not be changing dimensions of connecting rod but change the material or find new liter material for improve efficiency of the I.C engine. then after conclude various analysis in ANSYS software & found out how many stress develop in connecting rod when applied load & they also found that there is possibility of further reduction in mass of connecting rod and also connecting rod have been analysed which is use modern days & select I section connecting rod for design

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