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A Review Study on Simulation Analysis of Connecting Rod of Engine

PG Scholar Sudheer Singh Kushwah, Prof. C. S. Koli, Prof. Amit Agrawal
Dept. of Mechanical Engg.
Shri Ram College of Engineering and Management,, Gwalior (M.P.), India

Abstract- In the previous literature survey, this study explains components such as connecting rod of the inner combustion engine. The rod used to transfer the piston's reciprocal motion to a rotary crankshaft motion. The piston thrust is passed to the crankshaft. All vehicles using an internal combustion engine. Depending on the number of motor cylinders, they need at least one connecting rod & no connection wire. Connecting rods are typically made from either steel or metal coated. They might be cast, as well. Nevertheless, castings could have blown holes that are harmful from the viewpoint of toughness and fatigue. The fact that it is blow hole free and better rods made gives it an advantage in comparison to casting rods.

Keywords: - Connecting rod, rotating crankshaft, automobile engine, optimum design, Analysis.

I. INTRODUCTION

The intermediate component is known as the reinforced rod between the crank and piston. The purpose of the connecting rod is to push and pull the piston pin through the pin and to transform the reciprocal piston motion into a rotary crank movement. The components are large shanks, a small end and a big end. Stick relation, the car should be lighter and lighter, use less fuel and, at the same time, provide passengers with comfort and safety, which inevitably leads to an increase in vehicle weight. Lighter connecting rods tend to reduce the lead induced by engine inertia forces because the crankshaft does not need a large balance.

Application of metal matrix composite allows for increased safety and improvement which contributes to efficient fuel use and high motor strength. The engine consists mainly of the cylinders, pistons, rod connectors and crankshafts. One of the important parts of a motor is the Connecting Cord. It works to transfer to the other part of engine called Crank, the thrust of the piston from the piston pin, produced by the burnt gas pressure. A crank-pin joints the wide end and a piston connects the piston to a piston by the piston pin the small end. It transforms rotating movements into rotating movements of the crankshaft through reciprocal movement of the piston. The connecting rod should be so that the maximum load can be resisted during high cycle fatigue operation without any failure. The strength of the fracture should also not be below a minimum limit. Furthermore, during service, the connecting rod should not buckle. Such specifications are used to choose a suitable cross-section and the connecting rod material is the intermediate contact between piston and cabinet. The push and the pull from the piston pin to the crank pin is passed by translating the reciprocal motion of the piston to rotating movement of the crank. The connecting rod should be lighter and lighter and less fuel should be used, while providing passengers with comfort and safety, sadly resulting in an increase in vehicle weight. This development has led to the invention and implementation of completely new light weight materials that comply with the design requirements.

II. CONNECTING ROD

The intermediate component is known as the rod connector between crank and piston. The goal of C.R. is the push & pulls of the piston pin to the pin and then converts the reciprocal piston motion in a revolving crank movement. The components are huge, a small end and a wide end. It is the most important part of the internal combustion motor. The small end of the rod is equal to the base. With the crankpin the big end revolves. These dynamic movements allow the connecting rod to be kept as light as possible while maintaining a rigid beam section. The rectangular, oval, tubular, I-section,+-or ellipsoidal segment of the shank cross-section can be. It maintains the force produced by combustion of mass and fuel. Due to the eccentricity, crankshaft, case wall distortion, and rotational weight, the resulting bending stresses arise. The FEA approach covers structural analysis and various parameters that impact on their operation and identify the best solution for overcoming the barriers.

Fig 1. Different parts of connecting rod.

1. Small end and big end of connecting rod:
The small end connects to the piston pin, pin or wrist pin which usually fits most into the attachment rod but can move in the piston, a "floating pin." In most engines running on alternative lowering shells that are accessible through the connecting rod bolts which keep the loading cap on the large end, the large end attaches to the locking journal on the crank throw. Normally the bearing and the big end of the connecting rod have a flash gap so that pressurized oil from the engine squirts on the side of the cylindrical wall to lubricate the piston and piston rings moves. The need for a pumped lubrication system instead is avoided by use of a rolling element bearing, most of the little two-stroke engines and some single-cylinder four-stroke engines however, the shell has got ta be pressed apart and again to replace a connecting shaft.

III. LITERATURE REVIEW

Aditya A. Lotake et. Al. (2019) The two-wheeler rod is modeled in this work using the code CATIA v5 R21. It is made available for ANSYS review after modeling the connecting pin. A static analysis is carried out in the ANSYS workbench of the connection rod. Testing of various materials is conducted to determine whether they have strain on the connecting point, e.g. cast iron and copper alloys, silicon anisotrope, structural steel and titanium alloy. From above, the most suitable materials for the connecting rod are titanium alloy. For different materials, including Cast iron, Copper alloy, Silicon Anisotropic, Structural Stahl, and Titanium alloy, the static study of the two-wheeler connecting rod is performed. Analysis above shows that the Titanium alloy produces lower stress than the above-mentioned material, which is 1.4631e8 Pa. The titanium alloy is the best material to attach the two-wheeler chain.

Arun Kumar et. al. (2019) The project's main goal is to analyze the linkage rod with standard composite material. The joining rods are normally used in internal combustion engines, subjects to countless various pressure cycles resulting in failures to fatigue. Nevertheless, they tend to make the rod typical of composition (LM 25 Aluminum MMC, KELER CNTMMC, CVI-C / SIC and 25Si3N4-MGMC) (Al 7175-T66, C70S6, AISI41 40 and TI-6AL-4V) by manipulating them. We continue to use the CATIA V5 Computer Code for rod modeling and we prefer to use NX NASTRAN computer code to simulate rods of any normal or composite content. We tend to suggest the simplest stroke product for having pressure, strain and displacement results.

M Frătița et. al. (2019) The aim of this study was to compare the results with Ansys's software of steel pistons and bimetal pistons. The layout of the reinforcement of the piston pin boss must be taken into account in order to reduce the strain concentrations, according to the static structural analysis. In the examined piston, the weight of the bimetal piston is also lower by 299 grams. Due to the lower coefficient for the heat conductivity of the metal, a lower tolerance can be used at the piston crown and the output at a hot motor start is much higher. Because the bimetal pistons only have the column crown, high level steel use can be saved.

Tara Mohan et. al. (2019) The design of the IC engine rod by analytical method in this study. A physical model in CATIA V5 is built on this basis. FEA has been used to analyze the structural analysis of the connecting wire. For FEA specific loading conditions FEA applications ANSYS WORKBENCH 14.5 is adjusted to various stresses. Structural and thermal testing on various materials (ALSIC and C70 steel). Based upon the results, the material for connecting the rod has been determined and compared to the various performances (stresses, shear stress, full deformance, pressure, temperature distributor, heat flux).

Boga Sudha et. al. (2018) The best product for Carbon Steel &Aluminum alloy is compared in this report. The connecting rod is built in the expertise of Solid in 3D modeling software. Then the models for thermal analysis are transported. In software called Ansys, this thermic analysis is done. We can obtain the heat flux value from thermal analysis and choose the best material for the rod connection. Materials of different temperatures to the connected rod, analyze the heat flux of the two materials at various temperatures and perform the connection rod analysis. By that results, the carbon steel better than aluminum alloy has been concluded.

Nageswara Rao et. al. (2018) The main goal is to optimize components of the gas / petrol engine. In the initial study, a 3D piston template, a connecting rod, a crankshaft and a Finite-element (Structural) analysis were developed throughout solid structures. The assembly of engine parts was performed by FEA (Structural) and was compared to the YamahaFZ-16 for optimization. In our final study (weight analysis), the optimized mounting of engine components reduced by 13,76%.

Achyut Chauhan et. al. (2017) This study attempts to find the best material for the connection of rod for the weight, tension, strain, displacement of connection rod and the optimization of connection rod, thus increasing or preserving connecting rod strength. Connecting rod analysis is a method where complete structure and working performance of the connecting rod respectively have been performed. Then, after the completion of several analyses with the software ANSYS, it was discovered how many stresses in connecting rods develop in applied load, and that the mass of the connecting rod and connecting rod can be further reduced using modern days & select I for design.

Bodige Mahesh et. al. (2017) This research aims to examine the crank end of the connecting rod for charge, strain and pressure of various materials. The connecting rod made up of solid steel and aluminum alloy shall be matched by a high-strength carbon fiber connecting chain. The results can be used to optimize the weight loss and to modify the plugs design. Pro-E software is used to model and analysis in ANSYS software is carried out. The archived findings can also help us to identify the spot or section where stress-induced failure is high. The obtained results can also be used to change existing designs to store better performance and longer life cycle.

Soorya Prabakaran et. al. (2017) The goal is to determine the use of Aluminium boron carbide in the composite rod attachment material. For internal combustion engines, the rods are widely used and suffer from millions of different pressure cycles leading to fatigue failure. Whilst the composite rods are lighter than traditional and have a good compressive strength, rigidity and fatigue strength, their development remains an important technical problem. Modelled by the Pro-E (Creo) connector ring. The generic link bar and composite connector rod are analyzed with the methods of finite elements.

G Gopal et. al. (2017) The study examines the assembling of the four-wheel petrol engine piston, connecting rod, and crank shaft. The assembly elements must be rigid and the assembly must be shifted. Therefore, a rigid-body analysis and flexible-body analysis should be needed. Therefore, the forces of components as the motor are reciprocal and these forces are utilized to measure the dynamic stresses in the unit of interest, i.e. connecting rod. It is proposed to replace with two new sets of materials for the components of the assembly and check the parameters by performing the static, dynamic and thermal analysis.

Kumbha Sambaiah et. al. (2017) The optimization analysis was defined by using two separate matrixes such as forged steel and the link rod C-70 in order to connect an internal combustion drive. Two types of material are used to determine the quality of the connecting wire. The main objective of this paper is therefore a comparative study of the two fatigue charging materials. The design in Pro / E wildfire 5.0 was built. The variations between the actual and working conditions are determined by stress intensity factors. The most critical area of the connecting rod is near the piston pin end where

10E8 and 10E6 for C-70 and Forged steel have been obtained for the allowable force work cycles with a fully reverse charge.

M. Zgoulet. al. (2017) There have been experial studies on the injection of biodiesel into a diesel engine and on the use of appropriate measuring equipment to track the strength and torque values. A study on the equivalent stress reveals that the total equivalent pressure for diesel and biodiesel was at the tip of the surface of the piston. There was a gradual reduction of tension along the axis of the connecting wire. Results showed that the use of biodiesel fuel both increases the mechanical and thermal pressure on the piston and the connecting rod in the earlier stages of the engine stroke due to biodiesel characteristics in comparison with diesel fuels, reducing the piston life and the connecting rod that impacts the engine over the long term.

IV. CONCLUSION

We concluded from the above literary reviews that the fundamental study and research is carried out in the improvement of connecting rod material. After concluding several analyzes in ANSYS software and finding out how many load stresses in a connecting rod develop when load is applied, it also found that there is the option of further reduction of the connection rod mass and also the connecting rod that is used today.

In the case of failure to attach the wire, the design improved, or the material quality improved, or both parameters improved. By changing the material composition, the performance of the connecting rod can be increased. Various materials have various qualities and the desired properties can be obtained by alloying materials.

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