Design and Analysis of Connecting Rod for Different Materials Using Ansys

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***Abstract*- connecting rod is a major link inside of a combustion engine. It connects the piston to the crankshaft and is responsible for transferring power from the piston to the crankshaft and sending it to the transmission. There are different types of materials and production methods used in the creation of connecting rods. The most common types of materials used for connecting rods are steel and aluminum. Connecting rods are widely used in variety of engines such as, in-line engines, V-engine, opposed cylinder engines, radial engines and oppose-piston engines.**

Index Terms- Connecting rod, Transmission, Opposed Cylinder Engine, Crankshaft.

1. INTRODUCTION

Several typical and uncommon failure modes in con-rods for internal combustion engines are commented from the stress level viewpoint. The interpretation of the fractures is supported with traditional calculations, with more advanced analytical models, and with Finite Element (FE) predictions. The repertoire of failures in a con-rod is presented by separately addressing the parts composing the con-rod itself, namely the shank, and the small and big ends. The main objective of this study was to explore weight and cost reduction opportunities for a production forged steel connecting rod. This has entailed performing a detailed load analysis. Therefore, this study has dealt with two subjects, first, dynamic load and quasi-dynamic stress analysis of the connecting rod, and second, optimization for weight and cost. In the first part of the study, the loads acting on the connecting rod as a function of time were obtained. The relations for obtaining the loads and accelerations for the connecting rod at a given constant speed of the crankshaft were also determined. Quasi dynamic finite element analysis was performed at several crank angles. The stress-time history for a few locations was obtained. The difference between the static FEA, quasi dynamic FEA was studied. Based on the observations of the quasi-dynamic FEA, static FEA and the load analysis results, the load for the optimization study was selected. The results were also used to determine the variation of R-ratio, degree of stress multiaxiality, and the fatigue model to be used for analyzing the fatigue strength. The component was optimized for weight and cost subject to fatigue life and space constraints and manufacturability.

II. LITERATURE SURVEY

A. A repertoire of failures in connecting rods for internal combustion engines and indications on traditional and advanced design method by A. Strozzi, A. Baldini, M. Giacopini, E. Bertocchi, S. Mantovani

Several typical and uncommon failure modes in con-rods for internal combustion engines are commented from the stress level viewpoint. The interpretation of the fractures is supported with traditional calculations, with more advanced analytical models, and with Finite Element (FE) predictions. The repertoire of failures in a con-rod is presented by separately addressing the parts composing the con-rod itself, namely the shank, and the small and big ends.

B. Dynamic Load Analysis and Optimization of Connecting Rod by Pravardhan S. Shenoy

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C. Design and Analysis of Connecting Rod for Different Material Using Ansys Workbench 16.2 by Vikas Singh, Sumit Kr. Verma, Harish Chandra Ray, Vishal Kr. Bharti, Abhinesh Bhaskar.

Connecting rods are practically generally used in all varieties of automobile engines. Connecting rod acting as a converting intermediate link between the piston and the crankshaft of the engine, by the reciprocating motion of the piston to the rotary motion of crankshaft. Thus, this study aims to carry out for the load strain, stress, total deformation and analysis of factor of safety of pin end of the connecting rod of different materials. Generally connecting rods are manufactured using carbon steel and in recent days aluminum alloys are used for manufactured the connecting rods. In this work existing connecting rod material are replaced by beryllium alloy and magnesium alloy. FEA analysis was carried out by considering five material aluminum 360, forged steel, titanium alloy, ti-13v-11cr-3al, magnesium alloy, beryllium (alloy 25). In this study a solid 3d model of connecting rod was developed using solid works-2016 software and analysis was carried out by ansys 16.2 software and useful factors like stress, strain etc.

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