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Finite Element Analysis of Connecting Rod

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Abstract : The connecting rod transmits the piston load to the crank causing the latter to turn, thus converting the reciprocating motion of the piston into a rotary motion of the crankshaft. Connecting rods are subjected to forces generated by mass and fuel combustion. This study investigates and compares the fatigue behavior of forged steel, powder forged and ASTM a 514 steel cold quenched connecting rods. The objective is to suggest for a new material with reduced weight and cost with the increased fatigue life. This has entailed performing a detailed load analysis. Therefore, this study has dealt with two subjects: first, dynamic load and stress analysis of the connecting rod, and second, optimization for material, weight and cost. In the first part of the study, the loads acting on the connecting rod as a function of time were obtained. Based on the observations of the dynamic FEA, static FEA, and the load analysis results, the load for the optimization study was selected. It is the conclusion of this study that the connecting rod can be designed and optimized under a load range comprising tensile load and compressive load. Tensile load corresponds to 360^o crank angle at the maximum engine speed. The compressive load is corresponding to the peak gas pressure. Furthermore, the existing connecting rod can be replaced with a new connecting rod made of ASTM a 514 steel cold quenched that is 12% lighter and 28% cheaper.

Keywords : connecting rod, ASTM a514 cold quenched material, static analysis, fatigue analysis, stress life approach
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