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### Analysis of Mechanical And Thermal Fatigue Failures of Piston Heads And Other Critical Parts of IC Engines – Issues and Challenges

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**Abstract** - Piston head is the most crucial components of an automobile engine. Lot of research work was reported in the literature on the design of piston head, materials and manufacturing of piston heads, temperature distribution over the surfaces of the piston head etc. A detailed damage analysis of engine parts was also reported in the literature. The damage mechanism includes, wear, temperature, and fatigue failures. Extensive work was reported in the literature on the wear and wear mechanism on pistons. However, there were only discrete references in the literature on the fatigue strength analysis of piston heads. An attempt is made in the proposed work to study fatigue strength analysis of piston heads and to optimize the design of piston head from fatigue strength considerations. The two important fatigue failures of piston heads are thermal fatigue failure either at room temperature or at elevated temperatures and mechanical fatigue failure. The research work includes analysis of fatigue damaged pistons. The damages initiated at the crown, ring grooves, pin holes are considered. The operating temperatures during working stroke and the thermal fatigue failure are considered. The operating stresses on the piston are considered for mechanical fatigue strength of the piston. The stress distribution over the piston surfaces during combustion is made through suitable analysis. Stresses at the piston crown, pin holes, grooves are also considered. The major contribution of the present work will be to make systematic literature review on the fatigue failure of piston heads and other critical parts of IC engines. This work is expected to pave way for fixing the various parameters for long life of critical components of IC engines.