Static Analysis of Master Connecting Rod

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Abstract- *Radial engine is a reciprocating type internal engine configuration, in which the piston moves upward & downward direction outward from a central crankshaft, radial engine commonly used for aircrafts before they started using turbine engines. In radial engine the pistons are connected for the crankshaft of master and slave (articulating) rod assembly. The model is designed in CATIA V5 R20 and translated to Abaqus. The model is simplified in Abaqus by using the pre-processor.*

Keywords- ANSYS R 14.5, CATIA V5 R20, FEM, Master Rod, Structural Steel.

I. INTRODUCTION

Radial Engine is an interconnecting motor design with the cylinders rising from a central crankshaft as well as from a wheel in the up and down direction. Since the use of turbine engines radial engines were typically used for a number of aircraft. In a radial motor the cylinders are connected with a master rod. One piston is connected to a master rod in which the crankshaft can be mounted directly. The other pistons are fixed to the rings around the end of the master chain. The reciprocal load described on the piston after the spread and even compressed by all rotations, the master stroke undergoes tremendous stress. The load raises to the 3rd power and the engine speed decreases. The failure of a connecting rod that is usually referred to as a "rod throw," is one of the most common reasons for the catastrophic failure of the engine in aero planes which frequently throws the damaged rod across a piston side and even makes the motor irreparably tired of the rod lubrication of failure of a bearing due to a body fatigue. have been published according to stress deformation. All the integrated factors were based to determine the effects and the variance of the static and dynamic stresses of the master rod used in the radial engine by combination impact research on static and dynamic analysis. When the modal analysis decides how the variance in the configuration from the analytics category is performable, the overall speeds, stresses, deviations from various loads, adjust the rotary speed and the speed imported for the master roll are calculated for structural steel material

II. LITERATURE SURVEY

R. Ravi, et.al [1] Paper offers with the study of exploring the load and price reduction but we've got taken the forged steel as the comparison for the material which is better and how to deal with substances in connecting rod. The paper has undergone detailed evaluation of joining pole through dynamic examination of linking bar considered. In the analysis of 1st part, it offers with the observe of static load analysis and materials which is chosen after which taken into account and by using maintaining the production as taken into account. Then in this paper it deals with layout of connecting rod through CATIA than the connecting rod is imported to ANSYS work-bench and analysis performed on this paper. Results are acquired by comparing experimental results.

Garima Chaudhary et.al [2] Radial motor displays have long been used in aviation where the radial motor uses very less energy compared to and inadequate output in contrast with other motors. Then utter engine output was transformed in the present turbine engines. They substitute the motor and its output with this paper. A 5-cylinder MOKI-S is tested and checked through the FEA project. The engine's construction is carried out using CATIAV5 and ANSYS obtains a safety factor.

Srikanth Kumar et.al [3] This illustrates the function and use of the radial engine with respect to the master rod, while the piston is mounted with a master rod with an instant crankshaft connection. The remaining pistons are connected to the bottom of the master round by their connecting rods. 4-stroke radials have an unusual number of cylinder rows per row, so that the order of the fire piston can be preserved in a consistent way, so as to promote activity as the different documents the layout is built in PRO-E, the study in Abaqus is done

III. METHODOLOGY

The sequence of methodology is listed below:

1. Problem formulation and identification through literature survey from various ASME journal, Wikipedia and websites collected towards the present research topic.

2. Understanding the working principle of the master rod used in radial engine and reasons for its failure.
3. Modelling of master rod of different geometry in CATIA V5 R20.
4. Static structural analysis in Abaqus workbench carried out to determine structural strength of the master rod.
5. Master connecting rod carries one or more ring pins to which are bolted and much smaller big of end of slave rod on other cylinder. Advantage of this is, it is having strokes larger than the normal connecting rod.

IV. BOUNDARY CONDITIONS AND MATERIAL PROPERTY

Here we are fixing all DOF at the big rod end and applying load of 5000N at the small rod end, to check deformation, stress and strain. Material we are using is steel having property as,

SL NO.	MATERIAL PROPERTY	VALUE
1	Density	7.89e-9 Kg/mm^3
2	Young's modules	2.1e5 N/mm^2
3	Poisons ratio	0.3

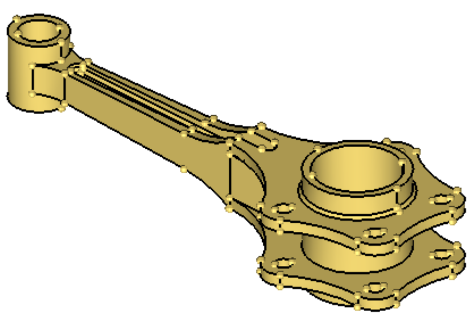

Fig 1: 3D Model of connecting rod

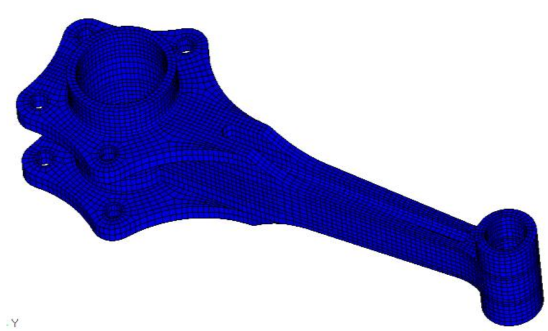

Fig 2: Meshed Model of connecting rod

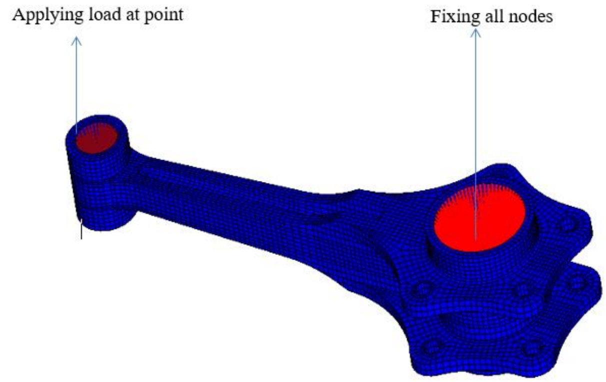

Fig3: Boundary condition for connecting rod

V. RESULTS

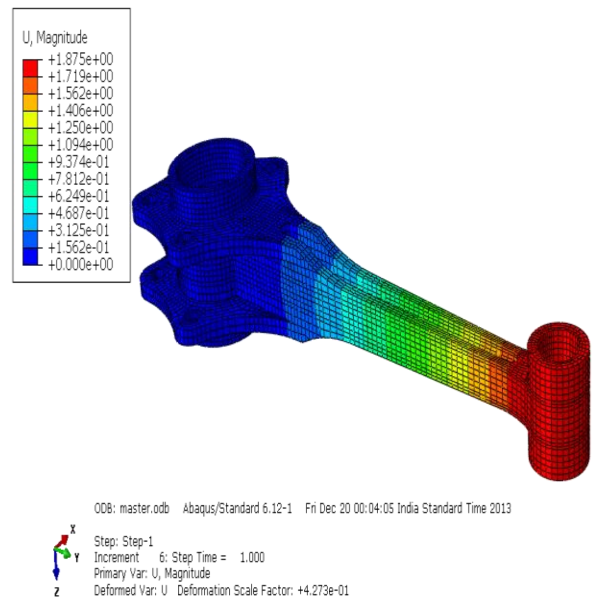

Fig 4:Deformation Result

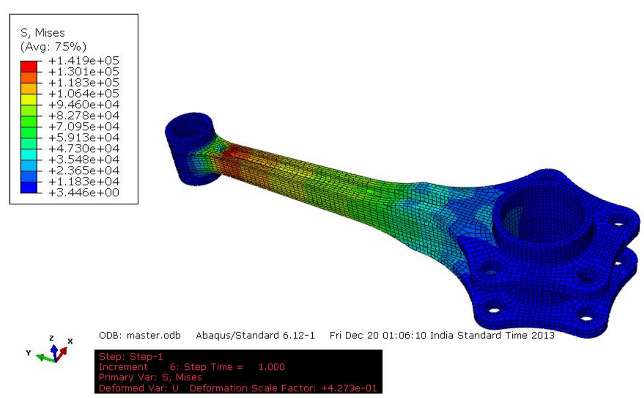

Fig 5: Stress Results

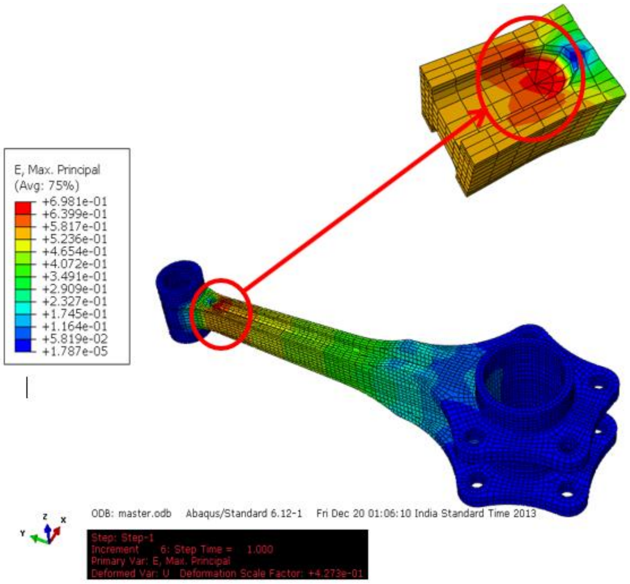

Fig 6: Strain Result

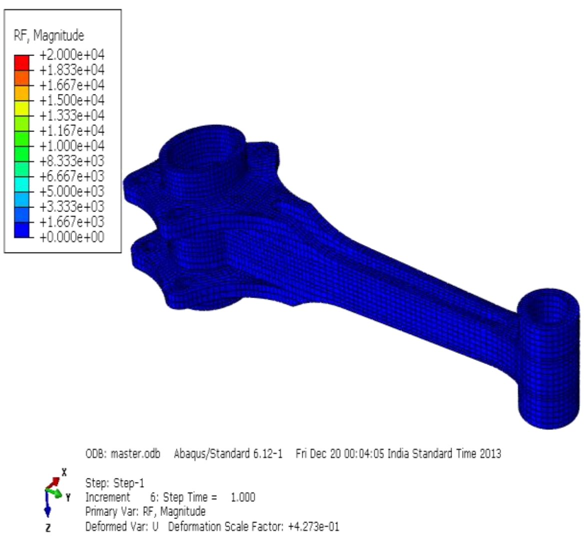

Fig 7: Reaction Results

VI. CONCLUSION

Static analysis of MCR is carried out for 20,000N and we observed following,

1. Stress is maximum at the small end of rod.
2. Stress value crossing the tensile strength so design is not safe, hence we have to increase dimensions of component.

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