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"THERMAL ANALYSIS ON TWO WHEELER CRANKSHAFT USING THERMAL TRANSIENT ANALYSIS"

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ABSTRACT

The modal analysis of a One-cylinder, two wheeler bike crankshaft is discussed using finite element method in this paper. The analysis is done on three different materials which are based on their composition. Three-dimension models of petrol engine crankshaft were created using Solid edge software. The finite element analysis (FEM) software ANSYS was used to analyze the thermal transient analysis of the crankshaft. The maximum stress point and dangerous areas are found by the deformation analysis of crankshaft. The relationship between the temperature, thermal stresses, heat flux and deformation is explained by the thermal transient analysis of crankshaft. The results would provide a valuable theoretical foundation for the optimization and improvement of engine design.

Key Words: *Crankshaft, Finite Element Analysis; Optimization; Thermal analysis , ANSYS.*

I. INTRODUCTION

Crankshaft is the core of an Internal Combustion Engine. The reciprocating movement of Piston is changed over into revolving movement by crankshaft. Crankshafts are by and large exposed to torsional stress and bowing worry because of self-weight or loads of segments or conceivable misalignment between diary heading. Crankshaft disappointments might be come about because of by a few causes which are oil nonattendance, faulty grease on diaries, high working oil temperature, misalignments, ill-advised diary orientation or inappropriate leeway among diaries and course, vibration, high pressure fixations, ill-advised pounding, high surface harshness, and fixing tasks. The crankshaft shortcomings caused staggering expense of upkeep in car industry.

Crankshaft is a standout amongst the most imperative moving parts in interior combustion engine. It must be sufficiently able to take the descending power of the power stroked without over the top bowing. So the unwavering quality and life of inward combustion engine rely upon the quality of the crankshaft to a great extent. Furthermore, as the engine runs, the power motivations hit the crankshaft in one place and after that another. The torsional vibration shows up when a power drive hits a crankpin toward the front of the engine and the power stroke closes. If not controlled, it can break the crankshaft. Quality estimation of crankshaft turns into a key factor to guarantee the life of engine. Shaft and space outline display were utilized to figure the worry of crankshaft for the most part previously. Be that as it may, the quantity of hub is restricted in these models. With the improvement of PC, increasingly more design of crankshaft has been used limited component strategy (FME) to ascertain the worry of crankshaft. The utilization of numerical reproduction for the designing crankshaft helped engineers to productively enhance the procedure improvement maintaining a strategic distance from the expense and restrictions of arranging a database of genuine parts. Limited component examination permits an economical investigation of self-assertive blends of information parameters including design parameters and process conditions to be researched. Crankshaft is an entangled constant structure. The vibration execution of crankshaft has critical impact to engine. The figuring of crankshaft vibration execution is troublesome in light of the unpredictability of crankshaft structure, the troublesome determinacy of limit condition.

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Fig 1.1 Crankshaft

1.1 CRANKSHAFT PARTS

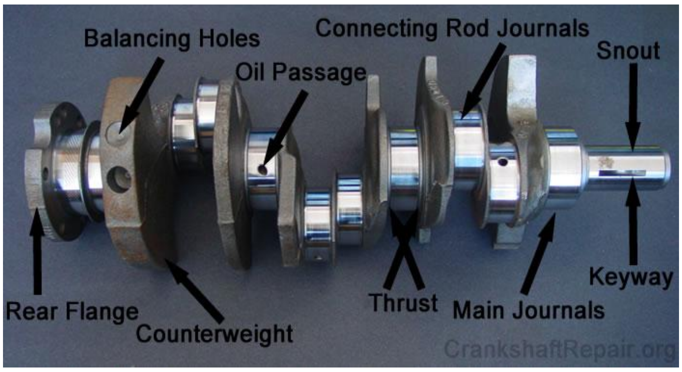

Fig 1.2 Crankshaft terminology

1.2 PROBLEM STATEMENT

Crankpin is characterized as a machine component having a short tube shaped bearing fitted between two arms of a wrench and set parallel to the fundamental shaft of the crankshaft. It is one of the key parts or segments in the engines of car and different vehicles. The essential capacity of the crankpin is to transmit the power and movement to the crankshaft which originates from the cylinder with the assistance of associating pole.

1.3 REASONS FOR CRANKPIN (CRANKSHAFT) FAILURE

At the point when the engine was running, It was accounted for that anomalous sound was heard in crankshaft while in task and distinguished as disappointment of crankshaft. Extreme wear has been seen at crankpin bearing area where the oil opening is given and this is a direct result of the serious contact at the contact surface and in view of absence of oil, Crankpin is found as tempered.

II. OBJECTIVE

1. Reduce weight of crank shaft
2. Improve durability of crank pin
3. Better heat transfer capacity
4. Low cost of crank manufacturing

III. METHODOLOGY

FINITE ELEMENT METHOD

Dynamic matrix technique and dynamic sub auxiliary strategy joined with FME were utilized to ascertain the vibration of crankshaft. The technique for three-dimensional limited component was conveyed to break down dynamical normal for diesel crankshaft. In the paper, 3-D limited component examination are completed on the modular investigation of crankshaft and the warm investigation of crankshaft, And the FME programming ANSYS was utilized to mimic the modular investigation of the crankshaft. The aftereffects of common frequencies and mode shape were gotten. Also, twisting conveyances of crankpin were acquired by utilizing ANSYS programming. The outcomes are viewed as a hypothesis premise to enhance the design of crankshaft and warm examination of crankshaft.

The limited component strategy is numerical examination procedure for getting inexact answers for a wide assortment of engineering issues. In light of its assorted variety and adaptability as an examination device, it is accepting much consideration in engineering schools and ventures. In increasingly engineering circumstances today, we find that it is important to acquire inexact answers for issues as opposed to correct shut frame arrangement. It is unimaginable to expect to get systematic numerical answers for some engineering issues.

ENGINE SPECIFICATIONS

TABLE 3.1 ENGINE SPECIFICATION

Engine type	Air cooled 4 stroke single cylinder
Valve system	OHC, 2 valve
Cylinder bore	50 mm
Stroke	49 mm
Displacement	97.2 cm^3
Compressor ratio	9:9:1
Maximum power	6.15 kW (8.36 Ps) @ 8000 RPM
Maximum torque	0.82Kgm (8.05N-m) @5000 RPM

Simulation and Modeling

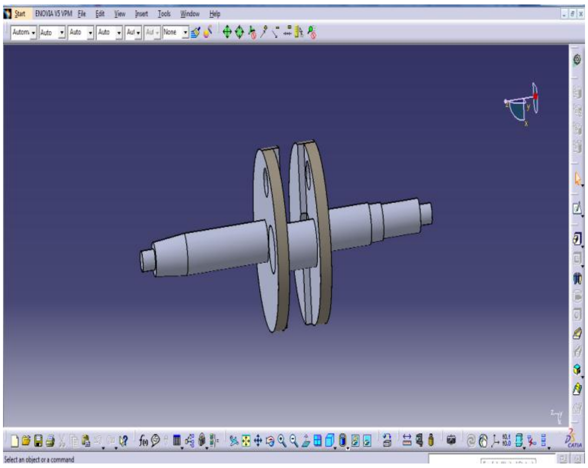

Fig.3.1 Crank model on CATIA

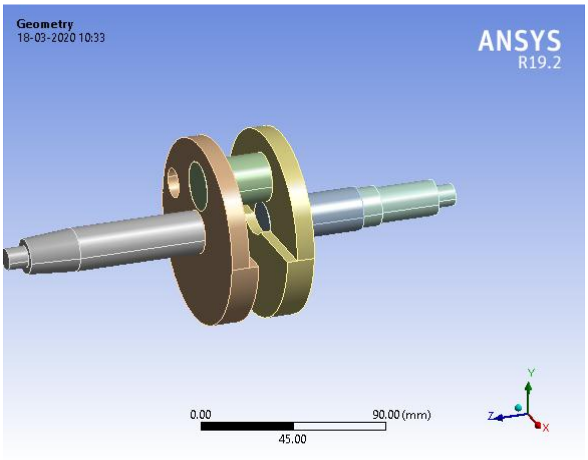

Fig.3.2 Crank model import to ANSYS

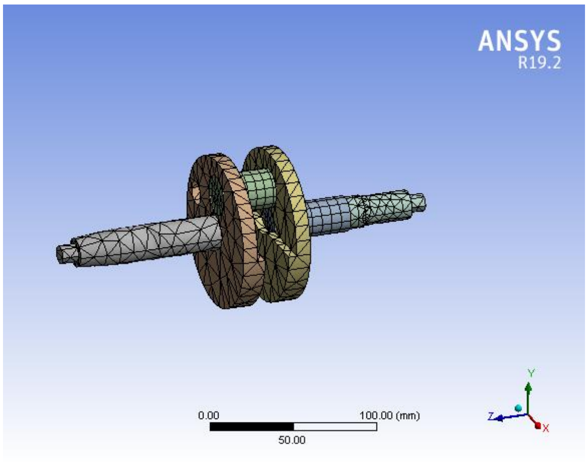

Fig.3.3 Crank model meshing

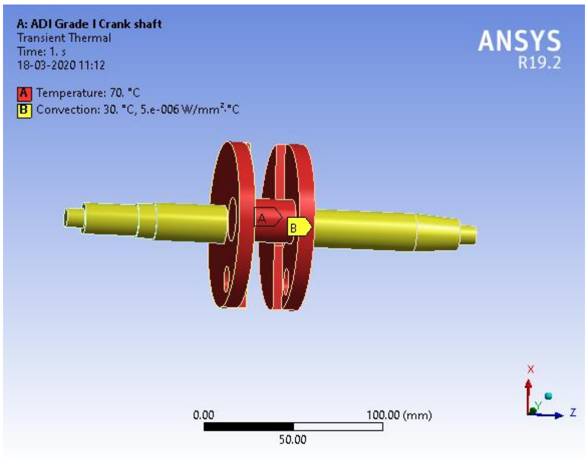

Fig.3.4 Crank model ADI material applied Thermal boundary conditions

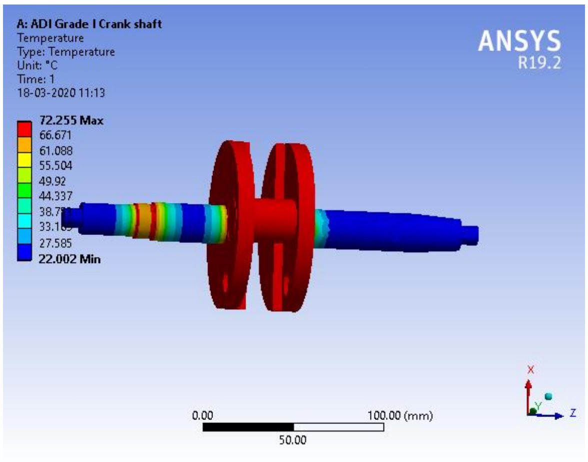

Fig.3.5 Crank model ADI material Temperature

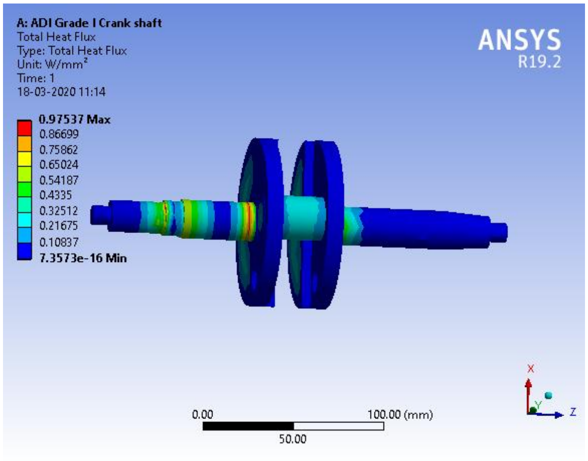

Fig.3.6 Crank model ADI material Heat Flux

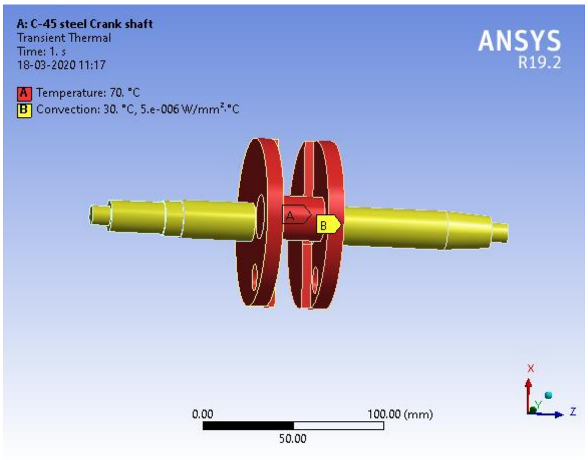

Fig.3.7 Crank model C-45 material applied thermal boundary condition

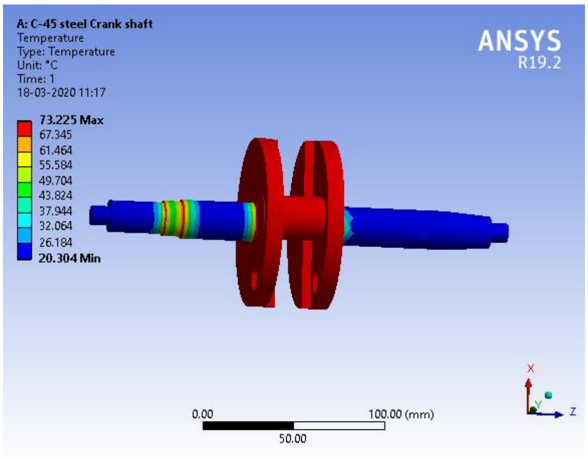

Fig.3.8 Crank model C-45 material Temperature

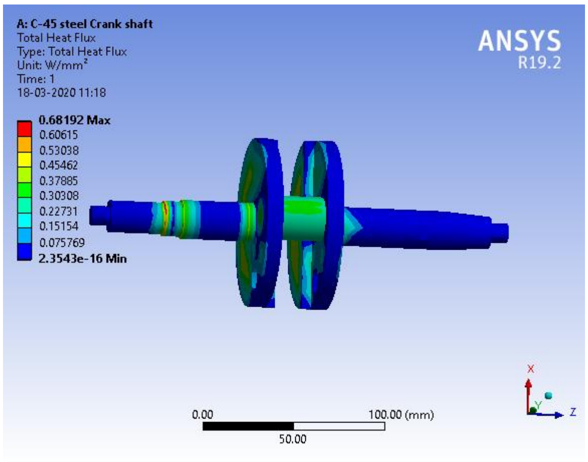

Fig.3.9 Crank model C-45 material Heat flux

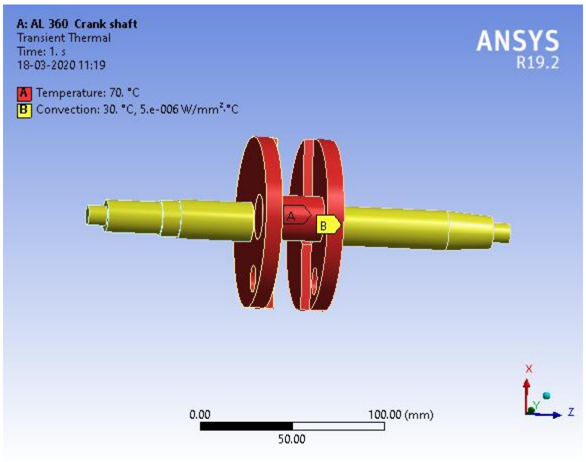

Fig.3.10Crank model AL 360 material applied thermal boundary condition

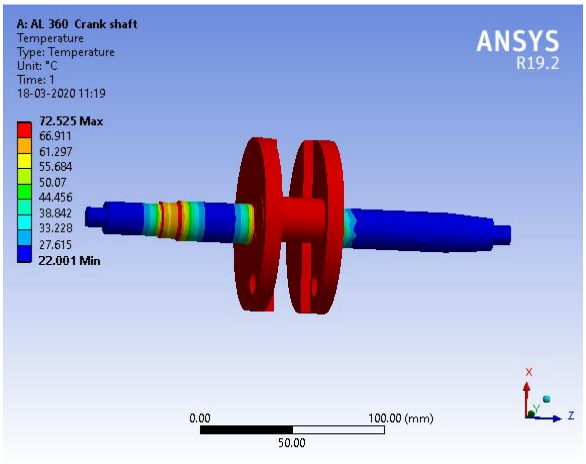

Fig.3.11 Crank model AL 360 material Temperature

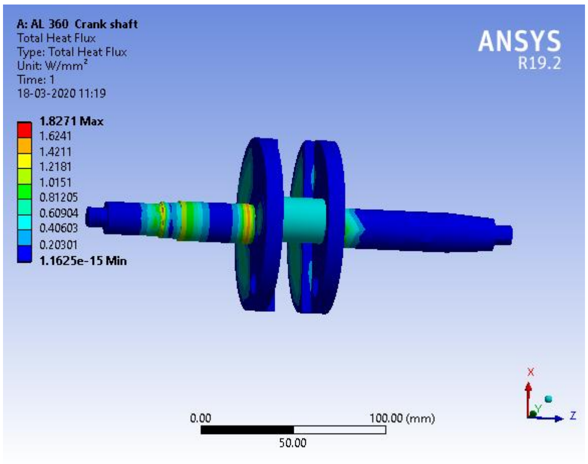

Fig.3.12 Crank model AL 360 material Heat flux

IV. RESULTS & DISCUSSION

- In this work we find value of vonmisses stresses ADI material , C-45 material and AL 360 are respectively **72.2** MPa **73.22**MPa and **72.5 MPa**
- Total deformation for these materials likes ADI material , C-45 material and AL 360 are respectively **0.005mm, 0.0046 and 0.0047mm**
- Temperature for these materials likes ADI material , C-45 material and AL 360 are respectively **72.2°C, 73.22°C and 72.5 °C**
- Heat flux for these materials likes ADI material , C-45 material and AL 360 are **0.97 (w/mm^2) 0.68 (w/mm^2) and 1.8 (w/mm^2)**

Table.4.1 Material comparison tables

Materials	**C-45**	**ADI**	**AL 360**
Heat Flux (w/mm^2)	**0.68**	**0.97**	**1.8**
Temperature (C)	**73.22**	**72.2**	**72.5**
Stresses (MPa)	**67.14**	**67.1**	**67.15**
Deformations (mm)	**0.0046**	**0.005**	**0.0047**

V. CONCLUSION

In this thesis, the crankshaft display is made by SOLID EDGE programming. At that point the model made by Solid edge was imported in to ANSYS 19.2 programming. The results of heat flux and temperature find out.

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