DEPARTMENT OF MECHANICAL ENGINEERING

K. D. K. COLLEGE OF ENGINEERING, NAGPUR

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CERTIFICATE

Certified that the project titled **MODELLING, ANALYSIS AND SIMULATION OF CRANKSHAFT** is bonafide work done under my guidance and is submitted to Rashtrasant Tukadogy Maharaj Nagpur University, Nagpur for the partial fulfillment of requirement for the award of post graduation degree, **Master of Technology (M.Tech.)** in Mechanical Engineering Design (M.E.D.)

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ABSTRACT

Crankshaft is a large component with a complex geometry in the engine, which converts the reciprocating displacement of the piston to a rotary motion.

In this project, Finite element analysis are carried out on the stress analysis of crankshaft. And the FME software ANSYS is used to simulate the crankshaft.

The main objective of this study was to investigate strain and cost reductionopportunities for a forged steel crankshaft. The need of load history in the FEM analysisnecessitates performing a detailed static load analysis. Therefore, this study consistsof three major sections: (1) static load analysis, (2) FEM and stress analysis, (3)cost reduction.In this study a static simulation was conducted on two crankshafts, cast ironand forged steel, from similar single cylinder four stroke engines. Finite element analysiswas performed to obtain the variation of stress magnitude at critical locations. Thepressure-volume diagram was used to calculate the load boundary condition in staticsimulation model, and other simulation inputs were taken from the engine specificationchart. The static analysis was done analytically and was verified by simulations inADAMS which resulted in the load spectrum applied to crankpin. This load wasthen applied to the FE model in ABAQUS, and boundary conditions were appliedaccording to the engine mounting conditions.

7.3.14 SHEAR ELASTIC STRAIN

FORGED STEEL

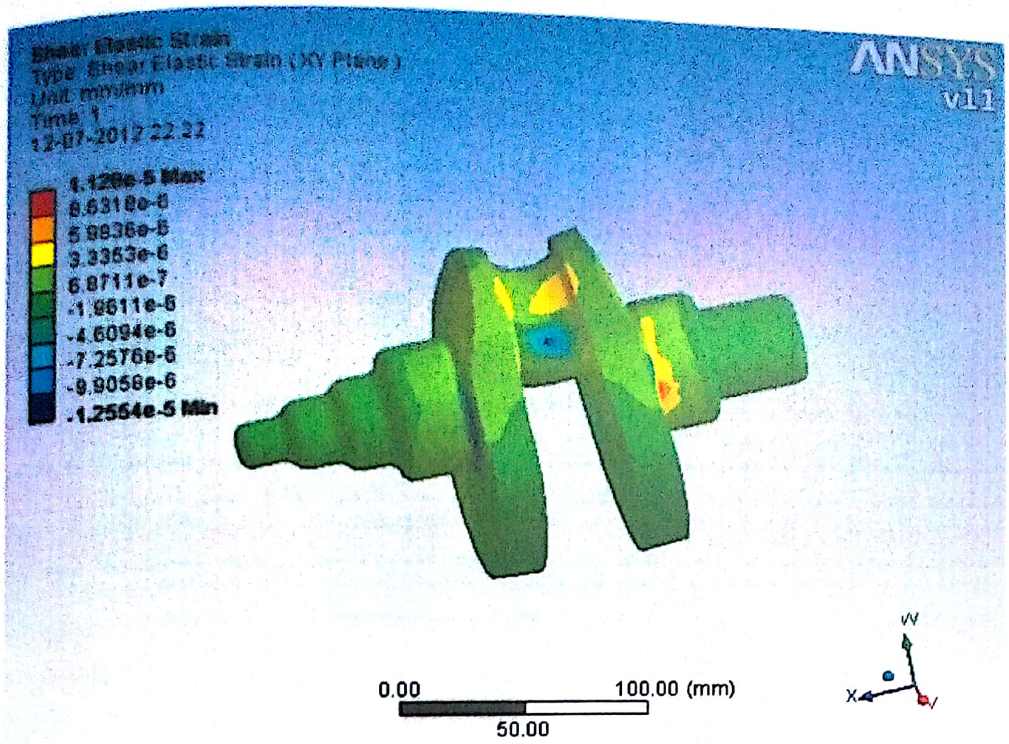

Figure 7.3.14.1 : Shear elastic strain of Forged Steel crankshaft

CAST IRON

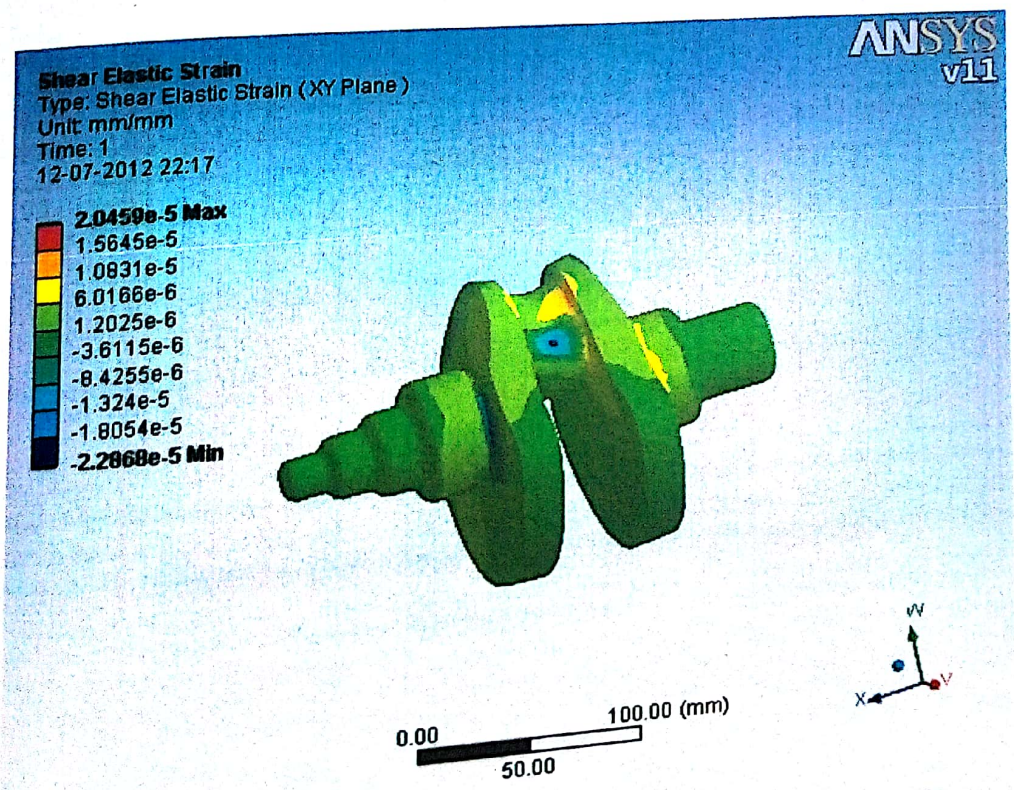

Figure 7.3.14.2 : Shear elastic strain of Cast Iron crankshaft

CONCLUSION

On the basis of the results and its analysis, following conclusion can be drawn:

1. In this project, the crankshaft model was created by Pro/ENGINEER software. Then for analysis purpose the model created by pro/Engineer was imported to ANSYS software. Analysis results from testing the crank shaft under static load containing the stresses and deflection are listed in the Table.
2. Maximum Equivalent (Von-Mises) elastic stress occurred on main shaft and crankpin and it cause Bending stress on it.
3. Because of twisting causes shear stress in between crankpin and web.
4. Due to shrinkage of the web onto the journals, compressive stresses are set up in journals & tensile stresses in the webs.
5. Forging is the best suitable method instead of molding for high production therefore for strain point of view we are compare the forge steel and cast iron crankshaft, and it is concluded that Strain of forged steel crank shaft is less than the cast iron crankshaft. Since the forged steel crankshaft is able to withstand the static load, it is concluded that there is no objection from strength point of view. Therefore the forged steel crank shaft is able for forging process.