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Flex Plate Analysis Using Fea Package

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Abstract— A flex plate is a metal disk that connects the output from an engine to the input of a torque converter in a car equipped with an automatic transmission. It takes the place of the flywheel found in a conventional manual transmission setup. It bolts to the end of the crankshaft and attaches to the converter of torque. There is also a large gear attached, used by the starter to crank the engine. Because perfect alignment of the engine and transmission are not possible, the flex plate can absorb the minute misalignment. As misalignment increases, the flex plate flexes more. This continual flexing eventually causes the metal to fatigue and the flex plate cracks.
In this present thesis we are designing the plate using design software and the reasons of the crack formation can be found out by Fea package and also we are changing the material properties with the design of the plate to increase the life of the plate.
Keywords: Crank shaft, design software, Flex plate, fea package.

I. INTRODUCTION

A flex plate connects an automatic transmissions torque converter to an engine's crankshaft. Flex plate take the position that a flywheel would on a manual transmission car. Vehicles with automatic transmissions have a flex plate. The flex plates connect the engine and transmission. Most flex plates are made of a thick piece of sheet metal with bolt holes for the torque converter and teeth for the starter. The job of a flex plate is to allow for expansion of the torque converter as engine RPM increases. The constant expansion and contraction of a flex plate over time can result cracks and/or shearing of the flex plate. A damaged flex plate can create serious (expensive) damage. Broken flex plates cannot be repaired, they must be replaced. ATP flex plates are made of high quality steel and contain the correct bolt hole spacing and ring gear teeth just like the original part to ensure long life and durability.

Flywheel

The flywheel is connected directly to the clutch, allowing torque to transfer between the transmission and the engine. The flywheel can dampen engine vibration and provide a surface for the clutch to contact.

Flex plate

The flex plate mounts the torque converter--which is a device that can multiply torque when there is a difference between rotational speeds--to the crankshaft.

Figure 1: Fly wheel

Figure 2: Flex plate

II. MODELING OF FLEX PLATE

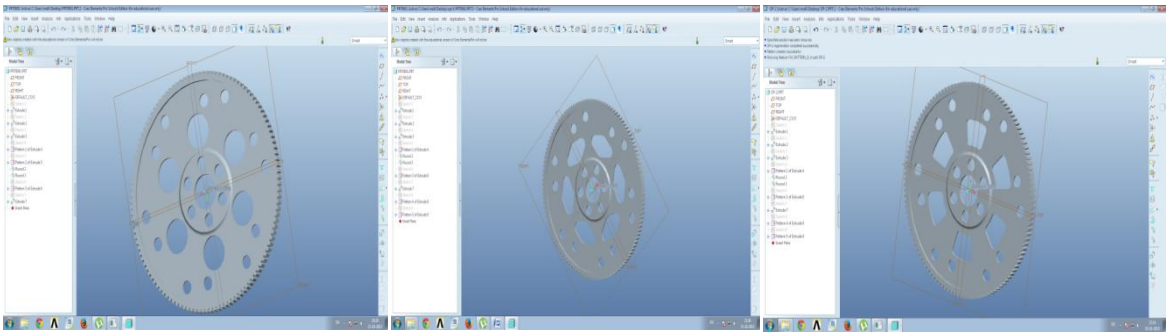

Figure 3: Actual flex plate **Figure 4:** Optimized flex plate -1 **Figure 5:** Optimized flex plate -2

III. ANALYSIS IN ANSYS

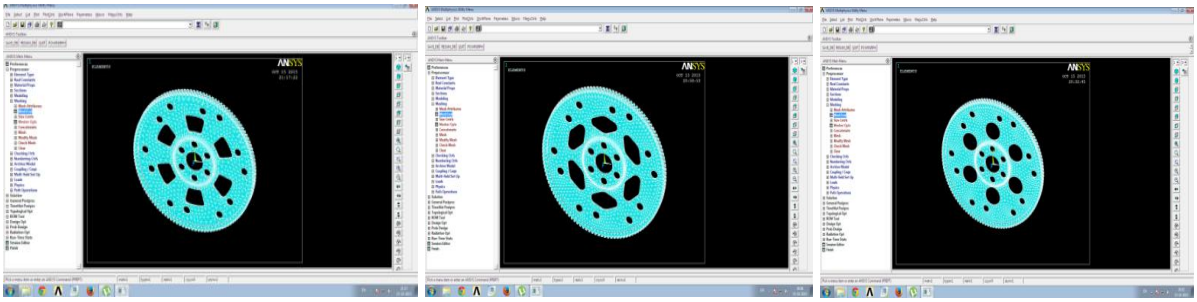

Figure 7: Meshed model of optimized flex plate-2 Figure 9: Meshed model of optimized flex plate-1 Figure 10: Meshed model of actual flex plate

IV. RESULTS & DISCUSSION

4.1 Actual model

- **Steel**

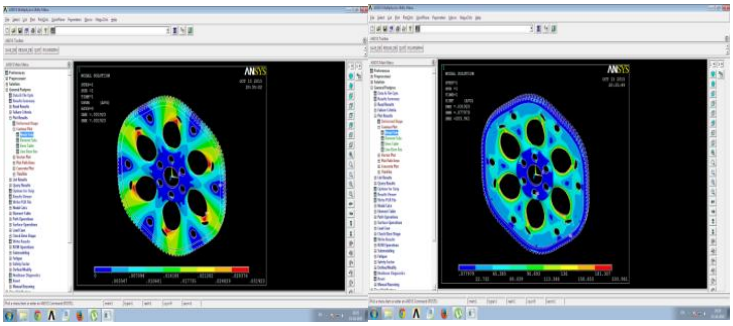

Figure 11: Total deformation Figure 12: Stress intensity

- **A 36 Steel**

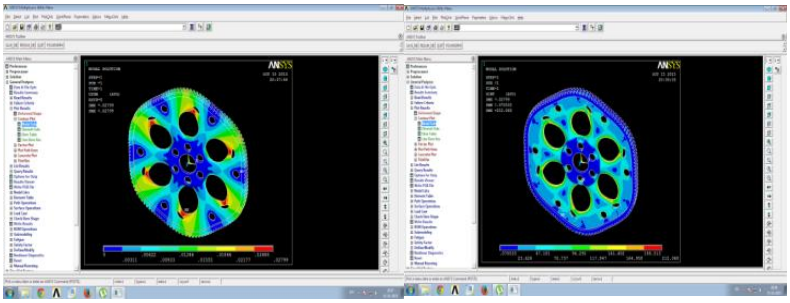

Figure 13: Total deformation Figure 14: Stress intensity

- **A514 Steel**

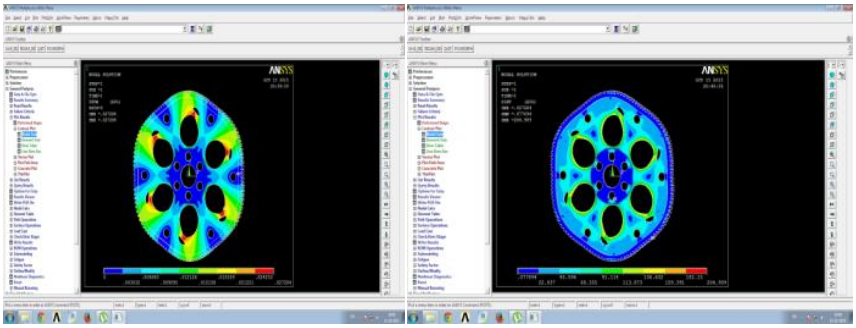

Figure 15: Total deformation Figure 16: Stress intensity

4.2 Optimized model -1

- **Steel**

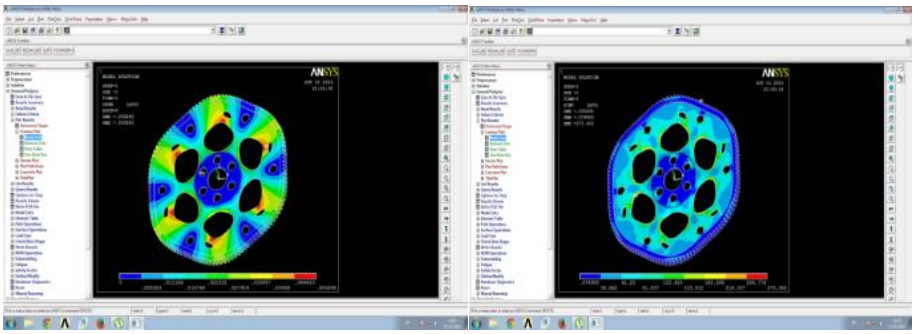

Figure 17: Total deformation Figure 18: Stress intensity

- **A 36 Steel**

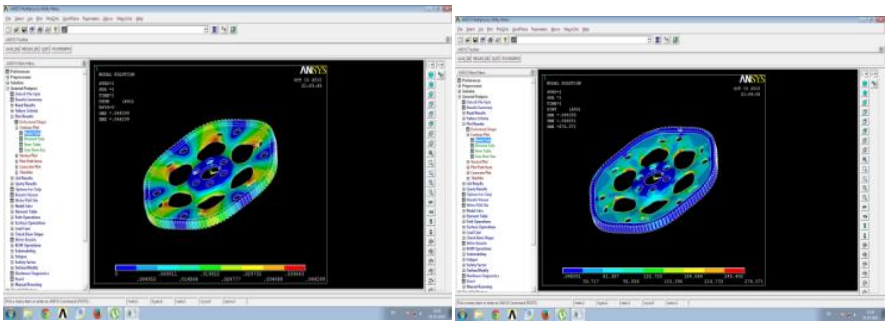

Figure 19: Total deformation Figure 20: Stress intensity

- **A 514 Steel**

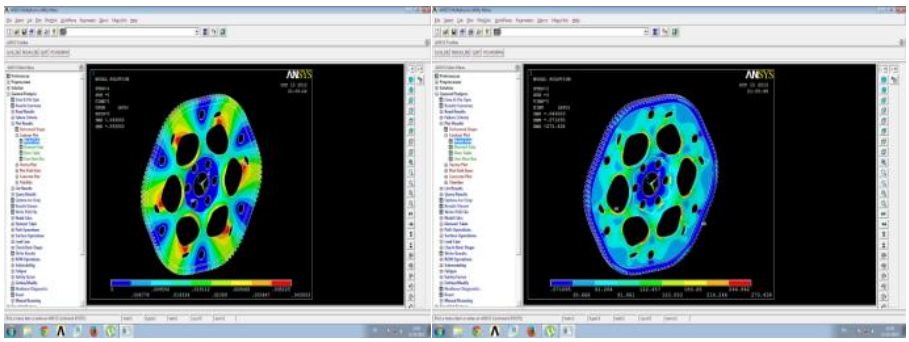

Figure 21: Total deformation Figure 22: Stress intensity

4.3 Optimized -2

- **Steel**

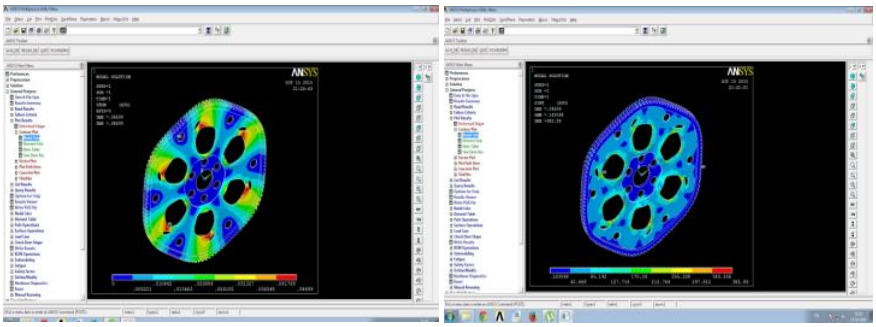

Figure 23: Total deformation Figure 24: Stress intensity

a) A 36 Steel

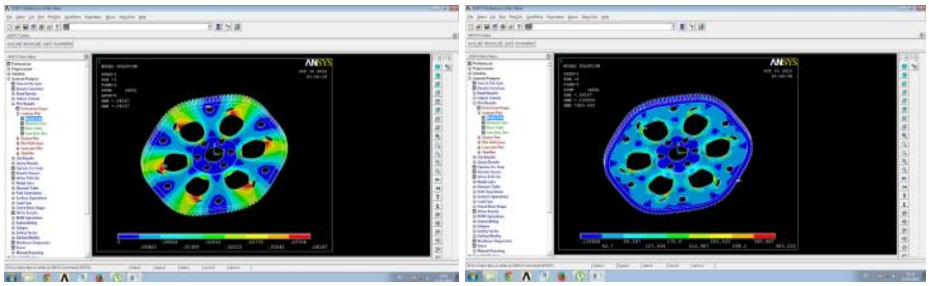

Figure 25: Total deformation **Figure 26:** Stress intensity

b) A 514 Steel

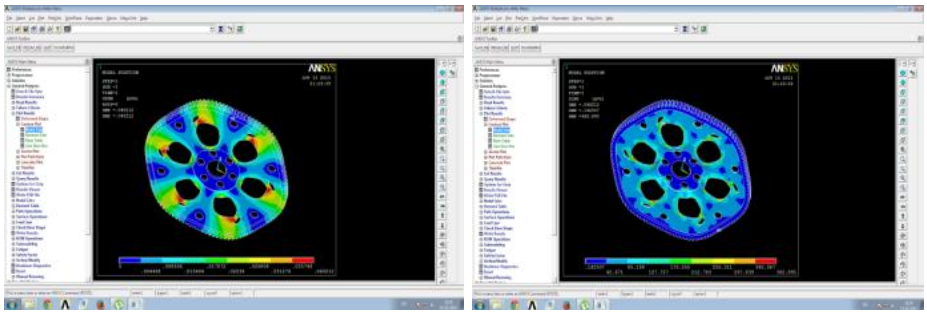

Figure 27: Total deformation **Figure 28:** Stress intensity

V. RESULTS COMPARISON

Sno	Material	Total deformation	Stress intensity
1	Steel	.031923	203.961
2	A 36 Steel	.02799	212.068
3	A514Steel	.027284	204.909

Table 1: Actual model of flex plate

S no	Material	Total deformation	Stress intensity
1	Steel	.050245	275.362
2	A 36 Steel	.044599	276.671
3	A514Steel	.043003	275.438

Table 2: Optimized model of flex plate-1

S no	Material	Total deformation	Stress intensity
1	Steel	.04699	382.86
2	A36Steel	.04167	383.233
3	A514Steel	.040212	382.895

Table 3: Optimized model of flex plate-2

VI. Conclusion

A **flex plate** is a metal disk that connects the output from an engine to the input of a converter of a torque in a car equipped with an automatic transmission.

In this thesis we designed a conventional model of flex plate and the optimized flex plates by using modeling software and analyzed by using fea package.

The analysis is done with 3 different materials like steel, a36 steel & a514 steel at uniform pressure load.

After the comparison of results we conclude that optimized model got the near values with the conventional actual model so optimized model is best for the flex plate and we suggest that the composite alloy steel is the best material for the manufacturing of the flex plate.

REFERENCES

[1.] Numerical Investigation of Flow In An Axial Flow Compressor Cascade by T. Suthakar, Akash, National Institute of Technology, Tiruchirappalli

[2.] Effect of Variations in Aspect Ratio on Single Stage Axial Flow Compressor Using Numerical Analysis by Kumbhar Anil H., Aashish Agarwal, PG Student, Asso. Professor, Technocrats Institute of Technology, Bhopal, M.P, India.

[3.] Numerical Simulation of an Axial Compressor with Non Axisymmetric Casing Treatment by N.Gourdain, M.Montagnac, J.F.Boussuge CERFACS, Computational Fluid Dynamics Team 31057 Toulouse, France

[4.] Stall Inception in Axial Flow Compressors by I. J. Day

[5.] Modeling of the double leakage and leakage spillage flows in axial flow compressors by Hui Du, Xianjun Yu, Baojie Liu

[6.] Frank Sieverding, Beat Ribi, Michael Casey, Michael Meyer (2004) Design of Industrial Axial Compressor Blade Sections for Optimal Range and Performance *J.*

[7.] S M Yahya (2003) Fundamentals of Compressible flow, 81-224-1468-0, Tata Mc-Graw Hill.

[8.] Philip G. Hill, Carl R. Peterson (2010), Mechanics and Thermodynamics of Propulsion, 0201146592, Addison-Wesley

[9.] Jack D. Mattingly (1996),Elements of Gas turbine Propulsion, 0-07-912196-9, Tata Mc-Graw Hill.

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