

CAM Shaft for Multi Cylinder of Automotive Engine

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ABSTRACT

The cam shaft and its related parts control the opening and closing of the two valves. The related parts are push rods, rocker arms, valve springs and tappets. It consists of a cylindrical rod walking over the duration of the cylinder bank with some of oblong lobes sticking out from it, one for each valve. The cam lobes pressure the valves open by means of urgent at the valve, or on a few intermediate mechanism as they rotate. This shaft additionally gives the pressure to the ignition device. The camshaft is driven via the crankshaft via timing gears cams are made as crucial parts of the camshaft and are designed in one of these manner to open and near the valves at the appropriate timing and to keep them open for the vital duration. A common example is the camshaft of an car, which takes the rotary movement of the engine and translates it in to the reciprocating motion important to operate the intake and exhaust valves of the cylinders. In this work, a camshaft is designed for multi cylinder engine and 3D-model of the camshaft is created the usage of modeling software seasoned/Engineer. The model created in seasoned/E is imported in to ANSYS. After finishing the element properties, meshing and constraints the hundreds are applied on camshaft for three exclusive materials particularly aluminium alloy 360, forged metal and cast iron. For that situation the results have been taken has displacement values and von misses stresses for the static nation of the camshaft. After taking the results of static evaluation, the version evaluation and harmonic analysis are finished separately. sooner or later, evaluating the 3 one of a kind substances the satisfactory suitable cloth is chosen for the cons

Keywords : Design; Analysis; Cam Shaft; Multi Cylinder Engine

I. INTRODUCTION

Cam is a mechanical member for transmitting a desired motion to a follower by means of direct contact. The driving force is referred to as cam and driven is referred to as follower. Cam mechanism is a case of a better pair with line touch. Camshaft is the mind of the engine ought to include cam lobes, bearing journals, and a thrust face to save you fore and after motion of the camshaft. Further camshaft can encompass a gear to pressure the distributor and an eccentric to power a gasoline pump. Camshaft is controlling the valve train operation. Camshaft is along with the crankshaft it determines firing order. Camshaft is at the side of the suction and exhaust systems it determines the useful rpm variety of the engine.

[1] Camshaft is used in the engine for transfers motion to inlet & exhaust valve. If transfer of motion isn't always proper then the stokes will not paintings in

right way. Additionally it consequences on performance of engine. To make work of camshaft in unique way. It is required a good way to layout a very good mechanism linkage, the dynamic conduct of the components need to be considered. This includes the gross kinematic motion and self-brought on vibration motion. Dynamic fashions had been created to gain insight into dynamic behavior of the system previous to manufacturing. Those models had been mathematical tools used to simulate and are expecting the behavior of bodily systems. They contain systems homes which might be loads, stiffness constants, and damping coefficients. The car sector has reached a very excessive manufacturing ability within the remaining a long time. Depending on this growing ability, its strong increase is predicted within the international economic system. The economic price of the work capacity within the car zone could be very large and this shows that the car region is the sixth economic quarter worldwide. The sector has an interrelationship with extra than 300 exceptional fields. So, if there is any malfunction in the primary or side

industries, the complete features of the produced vehicles are prompted. On the other hand, the failure evaluation is a unique subject of have a look at for substances and mechanical engineers. On one side, the substances engineer is intended to expand his/her observational and reasoning competencies for the understanding of interrelationship between observable capabilities and residences or performance. On the alternative side, the mechanical engineer research on the feasible failure locations and kinds and amount of the existent pressure ranges. Many studies had been performed on the car failure evaluation is that the normally failed elements are from engine and its components amongst the car failures. This is observed by the power teach screw ups. Many of the studies at the engine aspect screw ups, the prediction of fatigue failure in a camshaft using the crack-modeling approach.

[2] [A.S.Dhavale], [V.R.Muttagi] studied Modeling and Fracture Analysis of camshaft to design good mechanism linkages the dynamic behavior of the components must be considered, this includes the mathematical behavior of physical model. . In this case, introduction of two mass, single degree of freedom and multiple degree of freedom dynamic models of cam follower systems are studied. The failure is occurred as sudden fracture at very close to journal location, where there is a stress concentration. The main reason of the fracture is determined as a casting defect and the camshaft of vehicles manufactured from that particular series of camshaft should be replaced. Also, nondestructive testing procedures of the component supplier should also be improved as the defect can easily be detectable by standard nondestructive techniques.

[3] [R.Mahesh],[Mali1],[D.Prabhakar] presented Design Optimization of Cam & Follower Mechanism of an Internal Combustion Engine for Improving the Engine Efficiency. In this work an attempt is made to change the flat face of follower to a curved face follower, so that the required point contact can be achieved. As line contact between existing cam and follower mechanism results in high frictional losses which results in low mechanical efficiency. It is observed that the frequency of vibration in the existing and modified cam and follower mechanism remains almost same. This indicates change of the flat face of roller follower to a curved face roller follower mechanism results in low frictional losses due point

contact which results in improved in mechanical efficiency of internal combustion engine by 65% to 70%.

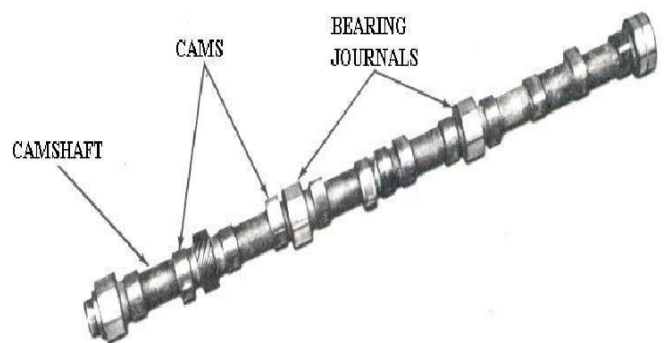


Figure 1: Cam and cam shaft

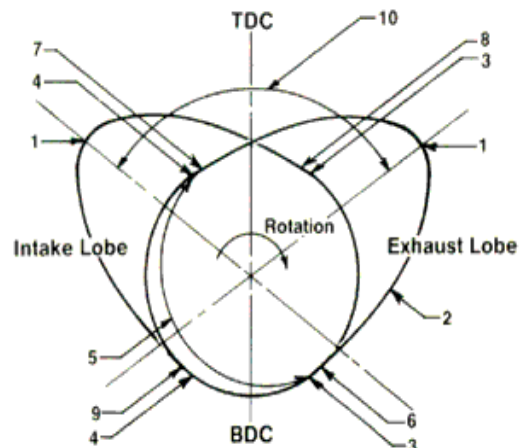


Figure 2: Cam specifications

1. Max lift or nose
2. Flank Opening clearance ramp
3. Closing clearance ramp
4. Base circle
5. Exhaust opening timing figure
6. Exhaust closing timing figure
7. Intake opening timing figure
8. Intake closing timing figure
9. Intake to exhaust lobe separation

II. MODELING OF CAM SHAFT

MODELING OF CAM SHAFT IN PART GESIGN MODEL

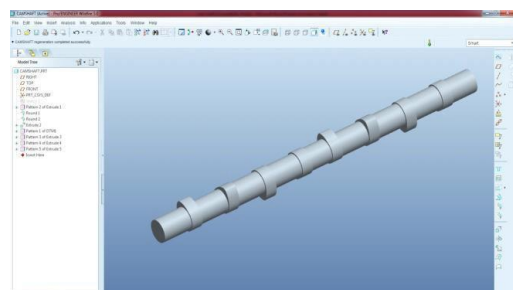


Figure 3: Pro/ Engineer modal of cam

2.1 STRUCTURAL ANALYSIS USING ALUMINIUM ALLOY A360

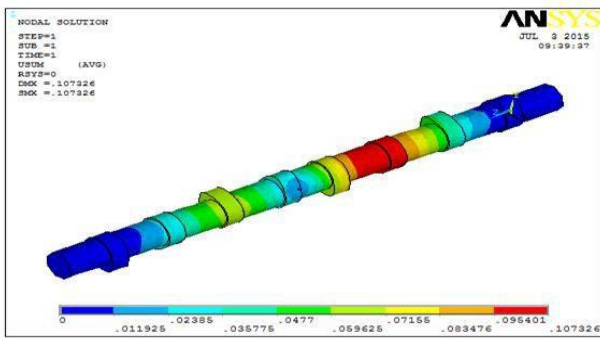


Figure 4: Displacement of cam

2.3 STRUCTURAL ANALYSIS USING FORGED STEEL

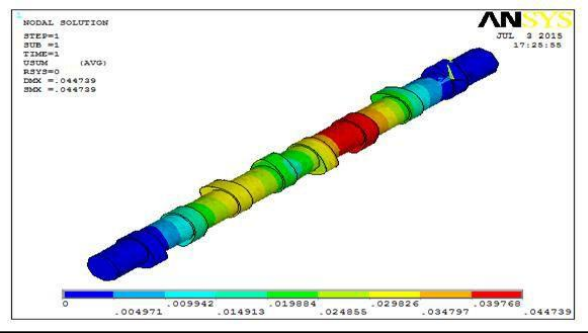


Figure 5: Displacement of cam

2.4 STRUCTURAL ANALYSIS USING CAST IRON

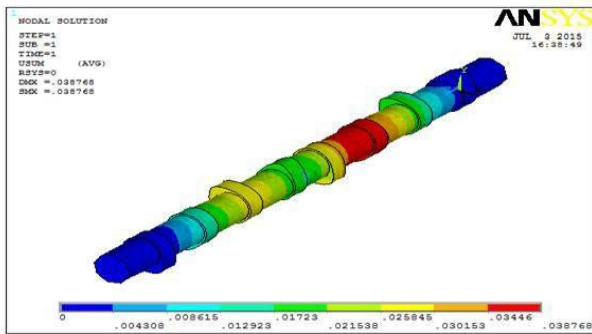


Figure 6: Displacement of cam

III. HARMONIC ANALYSIS

3.1 BY USING ALUMINIUM ALLOY A360

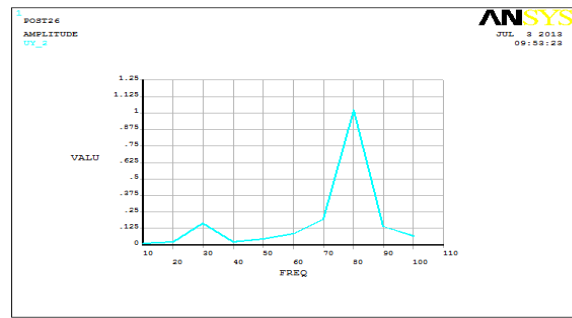


Chart -1: Natural frequencies of cam

3.2 BY USING FORGED STEEL

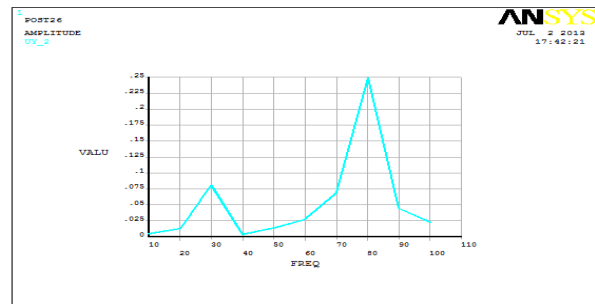


Chart -1: Natural frequencies of cam

IV. RESULTS AND DISCUSSION

Table-1. In static analysis the following is the displacement levels and stress levels attained for 3 materials

Material	Stress N/mm ²	In Displacement In mm
Aluminum Alloy 360	73.1475	0.107326
Forged steel	103.398	0.44739
Cast iron	102.939	0.38768

Table-2. Modal analysis is done to determine the natural frequencies under applied loads and five modes were drawn and noted frequencies and displacements for 3 material

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aluminum 360 (special grade for casting car elements) is the pleasant desire for camshaft manufacturing.

modes	aluminum alloy 360	forged steel	cast iron
mode1	29.1927	31.0061	28.9509
mode2	29.3719	31.4549	29.1224
mode3	77.9079	82.7244	77.3148
mode4	78.3563	83.9152	77.7416
mode5	129.954	138.713	130.980

Table-3.In Harmonic analysis the loading is carried at a frequency ranging from 0 to 100Hz and then the graphs were drawn for displacement and frequency. The following are the displacement levels attained for 3 materials

	Aluminum Alloy 360	Forged steel	Cast iron
Harmonic 10%	1.1	0.25	0.16
Harmonic 25%	0.52	0.13	0.1
Harmonic 50%	0.46	0.125	0.1

V. CONCLUSIONS

Theoretical calculations perform to layout the cam profile (using displacement drawing and cam profile drawing).evaluation was perform to assess the design the usage of conventional substances solid iron and forged steel. Fabric optimization turned into perform to update the traditional cloth with new composite alloys.

Static analysis is performed to find the displacement and strain due to loads and then modal analysis is accomplished to determine the frequency values because of its geometric shape and cloth belongings (herbal frequency's). The values of natural frequency have to match with conventional camshaft. After model analysis dynamic frequency evaluation become carried out to determine the displacements due to outside vibrations. in line with the results received from the evaluation

VI. REFERENCES

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