International Journal on Recent and Innovation Trends in Computing and Communication ISSN: 2321-8169
Volume: 4 Issue: 4 112 - 114

# Review on Experimental Analysis of CAM Roller of Petrol Engine by Change in Profile

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***Abstract*** **-** Over the long haul, there are numerous advances in Internal Combustion Engine, keeping in mind the end goal to increment mechanical effectiveness. The roller cam and supporter are significant parts of an IC Engine these are utilized to accomplish any self-assertively determined movement utilizing an adherent. The cam and supporter instruments utilized as a part of Internal Combustion motors have a line contact between them bringing about frictional misfortunes. Thus, the endeavors are taken to enhance the mechanical effectiveness by, changing roller cam and devotee's line contact profile to point contact profile. Thus, the roller cam and devotee of a Hero Honda enthusiasm were been changed by new direct contact profile toward check the execution tentatively.

***Index Terms***– *Cam; Follower; Line Contact; Profile; Performance;*

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## I. INTRODUCTION

The driving part is cam and driven parts are adherents. Cam is utilized to get any discretionary movement by utilizing adherent which is as a part of direct contact. Any unpredictable movement can be produced utilizing cam and devotee instrument. In IC motors, there are numerous adjustments are been done till now.

The 1/third of the fuel utilization is because of frictional misfortunes. The frictional misfortunes directly affect both fuel utilization and emanation.

All through the globe, numerous analysts are attempting to minimize the frictional misfortunes created in an IC motor. Diverse Experiments were been performed essentially (utilizing distinctive strategies) and basically (utilizing Finite Element Analysis).

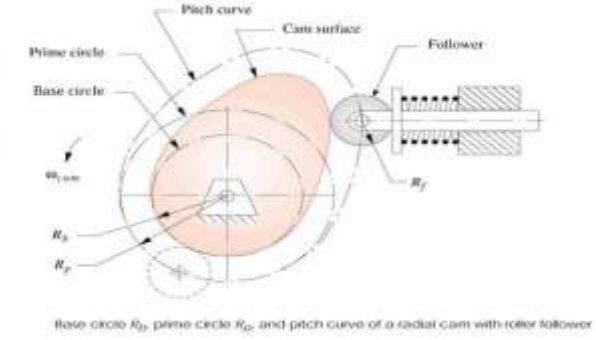



Fig.1 shows the terminologies diagrammatically of cam and follower mechanism.

## II. REVIEW OF RESEARCHERS

*2.1 Akkamahadevi G. Chanagond (Kalyankar) [2]: - In the paper the scientist has inspected the cam and supporter tentatively according to this they have chosen to change the state of the roller. The roller of the cam supporter is of the level sort which reaches the cam. The line contact was changed to point contact.*

- *The analyst attempted to keep up some conditions for roller:*
- *It ought to reach the cam of cam-devotee instrument.*
- *The estimations of hassles of a unique geometry and changed geometry ought to be inside the cut off.*
- *The estimation of frequencies of a unique geometry and adjusted geometry ought to be inside reach.*

The data according to which they had done their analysis is as follows:

| Material | 100cr6 |
|---|---|
| Young's Modulus | 2.1e5mPas |
| Poisson Ratio | 0.3 |
| Density | $7.850x10^{-6}$ Kg/mm$^3$ |
| Yield Strength | 410MPa |

2.1.1 *Experiment:* There was two test done

- Vibration Analysis
- Acoustics Analysis

The tests were done separately on the new and old profile of rollers.

*Vibration Analysis:* The accelerometer is first attached to the engine magnetically and then the sensor is held in front. The data is then collected in FFT analyzers.

*Acoustic analysis:* For this test noise sensing probe was held in front of the engine. The readings were been analyzed in FFT analyzer.

Fig.2 Vibration Analysis

Fig.3 Noise Analysis

2.1.2 RMS Value: -

| | New roller | Old roller |
|---|---|---|
| VIBRATION | 0.9331 | 1.0233 |
| ACOUSTIC | 13404 | 14624.2 |

*2.1.3 Result and Conclusion:-*

After the experiment the following result was obtained:

- With new point contact roller & old line contact roller a comparison shown that it reflects the change in the spectrum. It is observed from the amplitude of frequency has decreased considerably.
- With the comparison of time domain spectrum, it is observed that an RMS value was decreased by the use of new point contact roller in the engine of the motorcycle.

*Conclusion:*

- After studying the above result it is clear that after changing profile the losses were reduced considerably.
- The acoustic analysis is also based on the handheld distance between the probe and engine.

*2.2 Nitesh.S.Hirulkar [1]:* - The researcher has changed the profile from flat to curved .i.e., from line to point contact. They have used finite element analysis to inspect the stresses induced during the functioning of the old and new roller. The dynamic properties of the structure were studied under vibration.

For making 3D model CATIA V5 and then the model was imported to ANSYS 12.0 for further analysis.

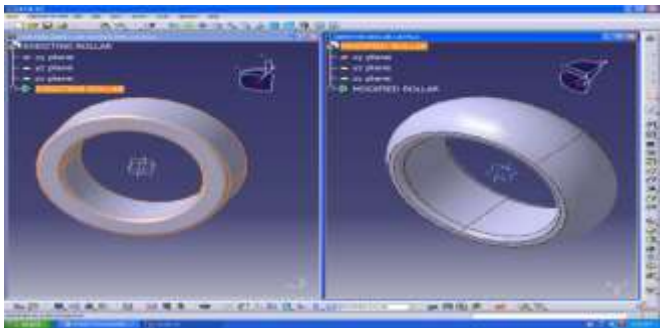
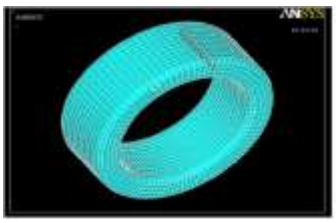


Fig.4 shows the screenshot of 3D modeling

2.2.1 *Boundary Conditions:* -The roller is having a fillet of 0.5mm. The inner surface of the roller is constrained. The load shown is uniformly distributed on a flat plane .The vertical load acting downward and of the magnitude of 675N.



2.2.2 *TEST:-*

1. Natural Frequency of Existing Follower with Line Contact:

The nodal analysis of the existing roller at three different frequencies ranges 828.32Hz, 1206Hz, and 3272.8Hz.

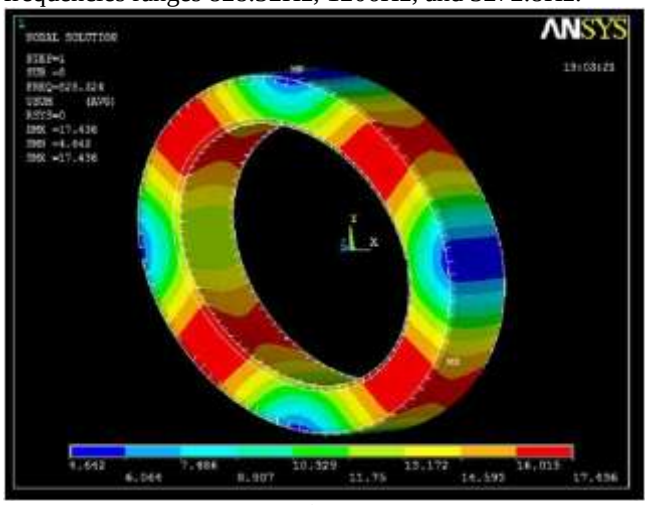



Fig.6 828.3Hz frequency

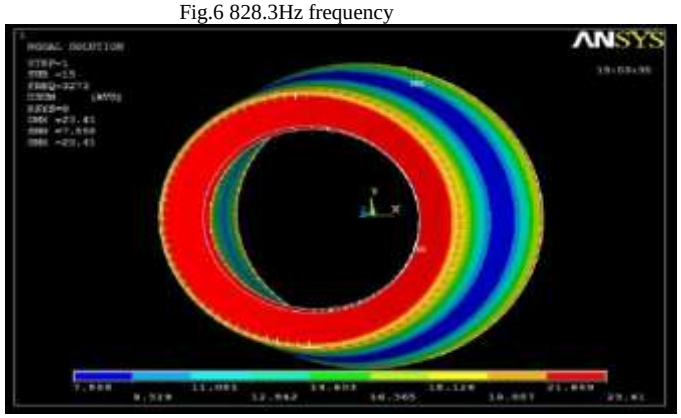



Fig.7 3272.8Hz frequency

2. Natural Frequency of new Follower with point contact:

The nodal analysis of the new roller at three different frequencies ranges 828.32Hz, 1206Hz, and 3272.8Hz.

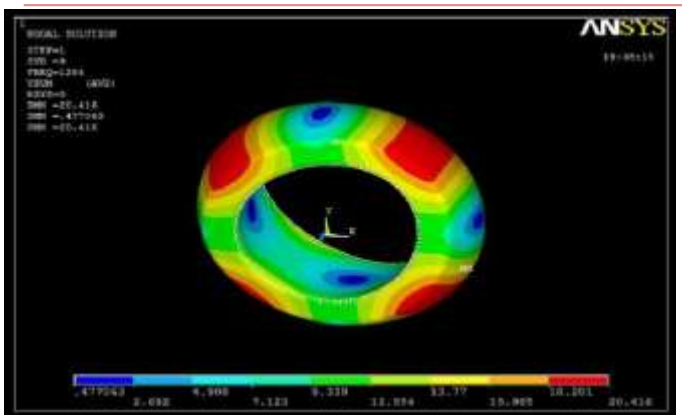


Fig 8 1206Hz frequency

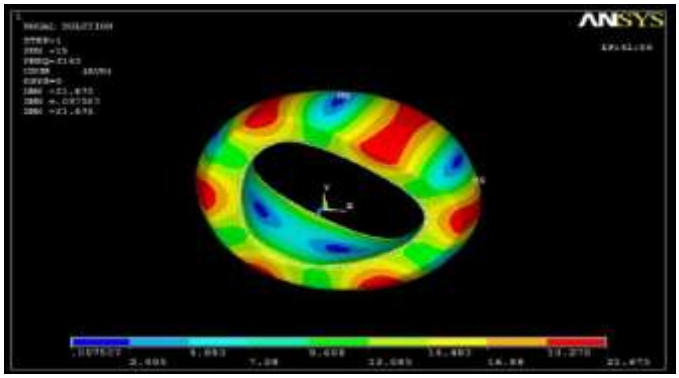


Fig.10 3272.8Hz frequency

*2.2.3 Result:-*

The whole process was been done on the computer in different software which gives accurate results, the whole results are as follows:

| Result Analysis between Existing & Modified roller | | | |
|---|---|---|---|
| **Sr.No** | **Type of analysis** | **Existing Roller** | **Modified Roller** |
| | **Theoretical stress analysis** | | |
| 1 | Stress Analysis | 6.02 N/mm$^2$ | 6.33 N/mm$^2$ |
| | | | |
| | Material Deformation | | |
| 1 | Lateral Direction | 1.49xe-$^4$ mm | 1.576xe-$^4$ mm |
| 2 | Linear Direction | 1.83xe-$^4$ mm | 1.93xe-$^3$ mm |
| | | | |
| | **FEA Analysis using ANSYS** | | |
| 1 | Static Stress | 5.418 N/mm$^2$ | 6.464 N/mm$^2$ |
| | Material Deformation | | |
| 2 | | 2.90 xe-$^4$ mm | 3.12xe-$^4$ mm |
| | | | |
| | **Free Vibration Analysis of Roller** | | |
| 1 | **Natural Frequency** | 828.32 HZ | 953.60HZ |
| 2 | | 1206.9 HZ | 1284.2 HZ |
| 3 | | 2210.1 HZ | 2478.7 HZ |
| 4 | | 2991.0 HZ | 3026.4 HZ |
| 5 | | 3272.8 HZ | 3162.7 HZ |
| | | | |
| 1 | **Deformation Of Roller** | 17.43 | 15.256 |
| 2 | | 25.17 | 20.416 |
| 3 | | 23.41 | 21.675 |
| | | | |

*2.2.4 Conclusion:-*

As per the researcher old and new profiles of rollers matches hence the rollers are safe to use.

And also, the losses reduced considerably.

## III. Conclusion

- After viewing different research papers it is clear that after replacing the rollers of follower the losses reduced.
- As the losses reduced the maintenance cost also reduced.
- The losses can be further reduced by trying different profile and analyzing with finite element analysis.
- Hence, it is clear that the mechanical efficiency is improved by minimizing frictional losses.

## References

[1] **Prof. L. B. Raut. Guide& 1, Akkamahadevi G. Chanagond (Kalyankar)**, "Experimental analysis of cam roller of Internal Combustion engine by change in area of contact," International Journal of Mechanical Engineering and Technology, Volume 6, Issue 2, February (2015), pp. 99-105

[2] **1Nitesh.S.Hirulkar, 2Rajendra.S.Tajane**, "Replacing Line Contact with Point Contact in IC Engine to Reduce Frictional Losses."International Journal of Engineering, Business and Enterprise Applications

[3] **TusharKiran, S. K. Srivastava,** "Analysis and Simulation of Cam Follower Mechanism Using Polynomial Cam Profile", International Journal of Multidisciplinary and Current Research, Research Article ISSN: 2321- 3124, Int. Journal of Multidisciplinary and Current research, Nov/Dec 2013, pp211-220.

[4] **Prof. H.D.Desai, Prof. V.K.Patel**, "Computer Aided Kinematic and Dynamic Analysis of Cam and Follower, Proceedings of the World Congress on Engineering 2010 Vol II WCE 2010, June 30 July 2, 2010, London, U.K.