

## **ABSTRACT**

Automobile manufacturing sector is the backbone of any country providing employment directly and indirectly to people and improve their life style and economy of the country. Global competition in automobile manufacturing sector demands higher productivity and quality levels and cost competitiveness. In order to achieve higher quality level and cost competitiveness, automobile manufacturing sector in this country is forced to go in for TQM, TPM, Lean manufacturing and Six Sigma level quality. Similarly, tier two companies who supply components to automobile manufacturers also need to improve their quality and productivity. In automotive sector, two wheelers are made to as high as 70% of the total vehicle population.

Of these, motorcycles are made more than 50 % due to riding comfort and better acceleration. Moreover, four stroke motorcycle usages in this country have been increasing due to its fuel economy and ease of use in city drive during heavy traffic congestion. In order to sustain in the local as well as global markets, motorcycle performance improvement has become essential which directly or indirectly warrants improvement in its components performances.

In this context, the present study attempts to understand and assess the performance of chain and possibility of improving it by suitable modification. Though several variables are present, which cause chain elongation, only single variable is considered at a time for comparison of chain elongation in this investigation.

The present research work has been divided into four major modules which consist of the need for the study, identifying factors that influence chain elongation, theoretical evaluation and validation with field study and recommended improvements and comparisons.

During the first stage, preliminary survey has been designed to elicit the need for chain elongation study in motorcycle. Based on the literature survey, the factors that cause chain elongation are made and also the objective of the work has been formulated. A particular model of motorcycle has been chosen to study its road characteristics and the torque on wheels and hence force on chain has been found. From this, force acting on chain links is calculated.

Theoretical chain elongation is evaluated and validated with the help of field chain elongation performance. An improved model chain is proposed and its elongation characteristics has been evaluated and compared with theoretical evaluation of existing motorcycle. Also, the effect of change in few characteristics viz. bearing area, hardness of pin, bush interference on chain elongation performance have been made.

Motorcycles are not normally operated at steady speed continuously due to road and traffic conditions. They are operated at varying speeds and at different acceleration and braking. It is difficult to simulate the exact conditions in any experimental or theoretical work. But in order to study the effect of varying speeds on chain performance a few fixed drive cycles are assumed based on earlier research on traffic conditions in a typical city environment. In addition to the above, to find the level of stresses acting on

chain components and the risk of failure of chains in dynamic loading conditions, Modal, Harmonic and Fatigue analysis are carried out.

The summary of the findings are given below:

- In this research work the theoretical evaluation of existing 100cc motorcycle chain is found to closely match with the study conducted in two wheeler service stations on the elongation characteristics of same type of chains used in motorcycles in field. Hence, the theoretical model may be useful to establish the elongation performance of chain in the design stage itself.
- Proposed modification of bush profile has an improved life than the existing chain and the improvement amounts to be as high as 12%.
- The effect of varying load and speed is demonstrated and plotted for comparison. Chain with typical drive cycle is found to elongate faster due to wear than with chain subjected steady load and speed. From this it may be inferred that motorcycle usage in city drives and hill station would cause reduction in chain life than those used in highways.
- Modal, Harmonic analysis of existing and modified bush and related Fatigue analysis revealed that the stresses are well within the limits and the possibility of chain failure by fatigue is remote.