

ABSTRACT

From time immemorial many mechanisms have been developed for transmitting motion and power in machinery and automobile applications, and they have limited lifetime due to failure caused by fatigue and wear. Many research works have been carried out to prolong the lifetime of mechanisms by reducing the wear and improving the fatigue lifetime and reported lubricants to play a vital role in reducing wear in mechanisms. One such mechanism is the transmission chain used in motorcycles as well as in many industrial drives. The wear of pins and bushes of these chains cause elongation reducing its lifetime and efficiency and increasing transmission noise. In India, the two-wheeler population is nearly 75% of the total automobiles being used, due to the road and economic conditions. Most of the two-wheelers are being used by the middle-income group, which is high, considering the total population. In the case of two-wheelers, motorcycles are predominantly used due to its power, acceleration, convenience and comfort level compared to scooters and mopeds. Any attempt to study and improve the life of the motorcycle chain increases its lifecycle, thereby reducing operating costs and downtime.

By analysing the various researches, it is found that the service life of a motorcycle chain is not established scientifically, due to the wear of its components mainly pin and bush that cause chain elongation. Moreover, there is no literature available to establish the wear of chain pins theoretically. In this research work, the wear study on transmission chains that are used in 300 cc motorcycles was carried by conducting experiments on the wear of pins by the custom-built chain pin testing rig and by using the standard pin on disc method with the help of a fixture designed for the purpose. Besides, the

influence of mineral oil, bio-lubricants, CNT lubricants, and grease was studied, and the results are compared. An attempt to establish the wear constants introduced in the Archard's wear model was made using the experimental results

Based on the research carried, it is found the lubricant plays a vital role in reducing chain pin wear followed by roughness, the hardness of the chain pin. Of all the oils tested, *Vitis vinifera* bio-oil performed well in reducing chain pin wear. CNT additive to mineral oil performed the best. It is found that the load acting on chains has a direct influence on-chain pin wear based on Taguchi's design of experiments. Therefore, the study clearly indicates abusive loading/overloading and intermittent shock loading due to sudden acceleration of motorcycle increases the wear of chain pin thereby reducing its life. Further, in this work, the theoretical estimation using the modified Archard's wear model is found in good agreement with the experimental results.