Review on Transmission Rail used in Automobiles

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Abstract— Transmission rail is a component for transmission assembly of commercial vehicle used for shifting fork mounting. The current work studies the various researches conducted in optimizing design and material of transmission rail using numerical and experimental techniques. The study also includes manufacturing process involved, stresses and application of FEA software in analysis of transmission rail.

Keywords: Transmission Rail, Structural Analysis, Design Optimization

I. INTRODUCTION

Transmission system in any vehicle is used to propel the vehicle forward with the help of the torque and power generated by the engine and transferring it to the tires. The tires, which are in contact with the surface produce a reaction force called traction. Traction requirement is what governs the design of any transmission system. The transmission is place between the engine and the drive shaft. The transmission is connected through the clutch.

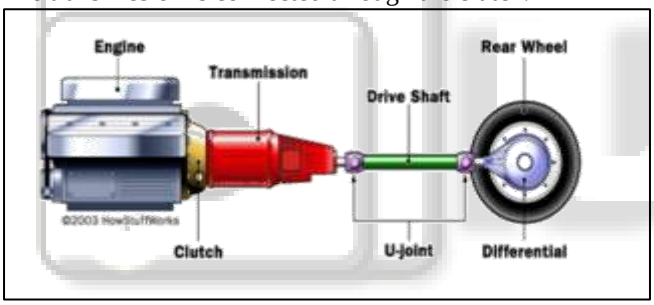

Fig. 1: Gearbox

Transmission changes the speed of the engine and exports different rotational speed. At low rotational speed, high torque can be obtained. High speed has better efficiency but the torque is low. So, when you start a machine you need to start at low speed and after running then change high rotational speed maintaining a high efficiency. Specifically, in order to ensure good transmission performance, it should meet the following requirements.

1) Choose the correct gear shift number and transmission gear ratios and make the optimal matching of engine parameters to ensure that the car has good power and economy.
2) Set neutral to ensure the car engine and the transmission can separate for a long time.
3) Set reverse, so that the car can travel backwards.
4) Set the power output apparatus.
5) Shift quickly, labor-saving, easily.
6) Reliable. During driving, the transmission cannot out-of-mesh, random mesh.
7) Transmission should have a high efficiency.
8) Transmission should be simple, smooth, no noise.

Fig. 2: Transmission shift rail

II. LITERATURE REVIEW

Dogan [1] has done significant work to reduce the transmission gearbox noise and vibration. The torsional vibration of transmission components causes rattling and clattering noises, this noise is undesirable. For experimental analysis the transmission parameters were varied to reduce the effect of rattle and clatter noise.

Wang and yang [2] have investigated the non-linearity on the tooth face in gear dynamics. For numerical simulation backlash, meshing stiffness and frictional forces were used. In this study the critical parameters were identified and chaos, bifurcation with sliding friction was studied.

Abouel-Seoud and Abdallah [3] have used vibration response analysis method for the analytical analysis of car gearbox system. They have performed analytical and experimental analysis of a car transmission system. By using physical properties, they have calculated the radiation efficiency.

Vandi and Ravaglioli [4] this paper presents the implementation of a simplified engine-driveline model to complete an existing vehicle dynamic model. The engage and disengaged phenomena of clutch were investigated.

Nacib and Sakhara [5] have studied the heavy gearbox of helicopters. To prevent break down and accident in helicopters gear fault detection is important. Spectrum analysis and Cepstrum analysis method is used to identify damage gear. Fourier analysis is used for analytical results.

Gordon and Bareket [6] have studied the source of vibration. A Sports Utility Vehicle with sensor and data acquisition system is used to find the vibration source. This study was focused on vehicle vibration response from road surface features.

Kar and Mohanty [7] have used motor current signature analysis (MCSA) and discrete wavelet transform (DWT) for studying the gear vibration. Two sources of vibration, transmission errors and gear defects were identified.

Czech [8] has described the vibro-acoustic diagnostics of high-power toothed gears. The presented analysis was a experimental work done in a steel plant. The methods of time-frequency, scale-frequency and frequency-frequency analysis were used for vibroacoustic diagnostics.

Singh [9] has done two case studies for the vibroacoustic analysis of automotive structures. Analytical and experimental results were presented for brief description. In first case passive and adaptive hydraulic engine mounts and in second case welded joints and adhesives in vehicle bodies were considered.

Tuma [10] has performed the experimental analysis on TARA trucks and found the range of frequency for transmission housing vibration. Jiri Tuma has solved the gear noise problem by introducing an encloser to reduce radiated noise. Fourier transform method is used for the analytical analysis. Analytical result is verified using experimental investigation. The natural frequency of vibration is varying in between 500 Hz to 3500 Hz at varying rpm. The severe vibration occurs at the frequency range of (500-2500) Hz.

VinodNirale et al.[11] referred about recent years, there were no vehicles equipped with reverse gear motion. So, it is difficult to physically challenged person. In this concept to obtain reverse gear motion with the help of portable gearbox. It contains for reverse gear, v-belt or sprocket for transmission and other necessary parts of two-wheelers. It will provide a better convenient ride to physically challenged people while driving in roadways.

Abhijithet al. [12] observed the difficulty faced by the physically challenged person by while riding a vehicle. It is difficult to remove the vehicle from parking to riding position. By using the additional gearbox and supporting wheels to overcome the problem. In this project additional gearbox coupled with vehicle gearbox. For gear shifting hand operated lever was fixed with the engine. Based on the position of a lever the vehicle moves in a forward or reverse direction.

K. Pradeep Kumaret. Al. [13] implement semi-automatic gear shifting using electronic setup. It is a hand operated gear shifting method. It is an easy method of gear shifting. In this mechanism, the gear engagement was done by electronic equipment's. The gear was shifted by dc motor. The components of this project were dc motor, gearbox, microcontroller, push button, etc.., the vehicle moves forward or reverse motion as per the position of the hand lever.

Mohammad Ahmad et al. [14] explained about the problem faced by the physically challenged people in the society. They explained the reverse gear mechanism in a two-wheeler. They used the components like a lever, reverse gearbox, chain sprocket, spur gear, bearing, etc.., they explained about the world level focus on developing the physically challenged people.

P.Alexander et al. [15] studied about using the embedded system to make the gear transmission faster and less destructible for the driver in the auto clutch equipped vehicle. By using this gear transmission makes easier driving and to drive efficiently. According to the gear shifting method selection of gear transmission as per the speed of the vehicle controlled by microcontroller without human interference. Fuel efficiency can be achieved and also make the driving easier by using this application.

Ashish M. Sonawane et al. [16] have prepared data collection system to acquire the signal, Arduino with help of Hall Effect sensor, throttle positioning sensor is mounted on the vehicle. Create a data logger system for a vehicle. it can give the signal to the controller in further these data will be used making a strategy of the vehicle, that strategy help to shift schedule in automate manual transmission vehicle.

Shivam Dwivedi et al. [17] referred about automobile several research going on, in this, they introduce automation in an automobile that means implementing automatic gear shifting mechanism in the vehicle without human intervention with help of embedded control system for actuating gear automatically this automation is controlled by using of microcontroller and necessary sensors and actuators. After equipping the desired gear shifting technology, will able to get a smooth ride in on road and off-road condition.

Rahul Sharma et al. [18] explained about an automobile, gears are used to transmit the power from engine to the wheel and these gears are used to control by manually. In the two-vehicle gearbox are used which are operated by foot pedal. This type of manual linkage, gear shifting takes time, it can make a deciding factor while driving. Instead of using an electronically actuated system can reduce the factor of gear changing time. Through this, aimed to design semiautomatic which will be used to future race car projects.

Basil Mathew et al. [19] referred about currently, most of the vehicle has a manual transmission system which is done by the user. In technical terms, the driver of the vehicle must manually press the clutch plate. And it is a tiresome process in heavy traffic. Automatic manual transmission is already implemented in cars, automatic manual transmission in two-wheelers fully based on electrical control unit which intakes different unit such as rpm sensing unit, speed sensing unit, clutch control etc. And also control gear shifting.

Marco et al. [20] developed a theoretical model that investigated the performance of ground vehicles utilizing speeding up tests. The model takes into account the moving grating of the drive gadgets, their slip on the dirt, streamlined opposition, street incline and footing created by the motor. It was concluded that the by and large productivity is essentially affected by how the power is partitioned between the mechanical and the hydrostatic part and, in this way, by the level of commonness of one over the other. CVTs are broadly of two types: non-power split type and power-split type.

III. CONCLUSION

Various researches are conducted to determined vibration of transmission assembly, its effects on transmission life and parameters effecting shear stress, fatigue life of transmission assembly. The findings have shown that magnitude of load applied, transmission type and material are major factors which determine the life of transmission assembly.

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