



Design, Analysis and Fabrication of Automatic Transmission System

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Abstract:

The main objective of this paper is review on design of transmission system for off-road vehicle. While designing transmission system for off road vehicle it is necessary to choose the suitable transmission system which fulfills the requirement of off road vehicle. Off road vehicle require high acceleration with variable torque. There are mainly two types of transmission such as manual and automatic transmission system. Manual transmission have certain limitations regarding with acceleration achievement and torque transmission, while automatic transmission overcome this limitations with the improved level of efficiency. Therefore for off road vehicle we choose automatic transmission system (CVT) with customized two stage gear box for better fuel consumption which improves the efficiency of drive and we get required gear ratio with stepless speed regulation.

Keywords: Automatic Transmission, CVT, Two stage Gear Box.

1. INTRODUCTION

The performance of vehicle is mainly depends on transmission system. The main function of transmission system is to transfer power from engine to rear wheel via gearbox to obtain the various gear ratios. Tractive force is the main consideration while designing any transmission system. Tractive force is the force required to just move the vehicle from static position. Off road vehicle is subjected to variable load condition. So, it require continues power transmission with variable torque and also it should be uninterrupted. This condition is achieved with the help of continues variable transmission (CVT) with two stage gear box. In this paper efforts have made to present how to reduce the weight of the gearbox using suitable material. For safety purpose it is important to reduce the stresses induced in the system and minimize the deformation to avoid failure. The whole design is validating using the Finite Element Analysis.

Mayur .R. Mogre [1] studied on comparison of manual and automatic transmission system. In this paper author describe the advantages and disadvantages of both transmission system individually with various examples and finally conclude that which transmission system is better. As per the fuel consumption, comfort level, maintenance cost and efficiency we can choose the proper transmission system for vehicle.

Vishnu Seelan [2] mainly focused on Continues Variable Transmission (CVT) .By using the CVT we get infinite gar ratio within the limit with stepless regulation which improve the power transmission efficiency. In this paper author studied about then working principle of CVT, their types with advantages and disadvantages Author also reveals that concept of torque converter and hydraulic actuator.

Puttapaka Nagaraju [3] has studied about reduction gearbox which is part of mechanical system and using this reduction gearbox we can obtain slower speed at output shaft. Normally speed and torque have inverse relation with each other. So, by lowering output speed we get more torque.

While transferring more torque gear are subjected to various fluctuating forces, due to this gear failure takes place. Therefore, for safety purpose of gears it is necessary to perform failure analysis of gears. He did the simulation of this gearbox using the solid works. He also describes the various types of gear train and their important in various applications

Adityapatnkar [4] mainly focused on design and development of transmission system for off road vehicle, which is reliable, safe and cost effective. Off road vehicle mainly subjected to varying and rugged load conditions for this reason off road vehicle require constant and interrupted power transmission .This need of off road vehicle is satisfied with the help of CVT and customized two stage gearbox. Main consideration for an optimal design is that transmission ratio is same for both stage. Author also mentioned that for off road vehicle safety factor 1.5 is sufficient. Finally design is analyzed by using finite element analysis for safety purpose.

Mr.Vijaykumar [5] studied about vibration analysis of gearbox casing using finite element analysis. During power transmission gearbox is subjected to vibration, due to which unwanted sound is produced. Therefore, for safety purpose it becomes necessary that to avoid this unwanted vibration, which gives noiseless working of gearbox. Also due to vibration at the joint failure takes place. Hence to overcome this all problem vibration analysis of casing is done using finite element analysis. In this paper author describes various techniques of vibration analysis such as Time domain analysis, Frequency domain analysis, frequency band analysis, Spectrum analysis etc. Finally conclude that vibration form in gearbox is periodic in nature. Therefore, Time-frequency-domain average technique is used for analysis.

AkileshYamsani [6] describes the method to determine gradeability and how we can increase it to the required scale. Gradeability means highest inclination a vehicle can ascend maintaining a particular speed. Major factors affecting the gradeability are aerodynamic resistance, rolling resistance and gradient resistance. Gradeability is determined by using

Traction diagram. Traction is the plot between Traction available and traction calculated as a function of vehicle speed.

2. DISCUSSION

From earlier paper it is clear that for efficient torque transmission, CVT with customized two stage gearbox is the best option to obtain required gear ratio. For maximum acceleration of vehicle is affected by weight of vehicle. If we reduce the weight of gear box using suitable material simultaneously weight of vehicle reduces. To reduce the weight of gearbox EN24 material is used. Also, nanomaterial shaft selection is the best option to reduce weight of shaft. During power transmission, gearbox casing is subjected to vibration, so as to avoid failure of gearbox casing it is necessary to perform vibrational analysis which is done with the help of finite element analysis. Gradeability is also important factor affecting design of off road vehicle. For off road vehicle it is necessary to obtain max gradeability. Therefore, our main aim is to design a vehicle which achieves max grade ability, for this study is focused on how we can increase gradeability and what are the methods to improve gradeability.

3. CONCLUSION

From above discussion it is clear that, for off road vehicle stepless regulation is necessary for this CVT with customized gear box is used. With CVT transmission we can achieve high acceleration, more torque, variable gear ratio, due to this vehicle becomes more efficient. weight of gearbox have more contribution to the overall vehicle weight, so by reducing weight of gearbox vehicle becomes compact due to this high acceleration is achieved. Therefore speed performance of vehicle is improved. Vibrational analysis of Gearbox casing using finite element analysis avoids the failure of gearbox component. Hence safety of vehicle is maintained which is most important factor while designing any off road vehicle. Also, noiseless operation is achieved using this analysis. For finalizing design FEA analysis is performed to minimize stresses induced in the system, to reduce deformation and checking for safety factor. Due to this we can easily avoid failure and our primary aim of safety is achieved.

4. REFERENCES

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