

Basic Analysis of Continous Variable Transmission

Yash Dixit¹, Shivam Sharma², Dr. Pikesb Bansal³

¹Student, ²Assistant Professor, ³Professor,

^{1,2,3}Department of Mechanical Engineering, ABES Engineering College, Ghaziabad, Uttar Pradesh, India

ABSTRACT

Worldwide there have been many transmission systems proposed according to different point of views.

CVT was first conceptualized as a stepless continous variable transmission in year 1490 by Leonardo da Vinci. From then it has gone through tremendous development to be ready as an efficient transmission system for the automobile sector. This paper discusses its development and contribution to the said sector.

KEYWORDS: CVT, belt, transmission, efficiency

How to cite this paper: Yash Dixit | Shivam Sharma | Dr. Pikesb Bansal "Basic Analysis of Continous Variable Transmission"

Published in International Journal of Trend in Scientific Research and Development (ijtsrd), ISSN: 2456-6470, Volume-4 | Issue-4, June 2020, pp.672-673, URL: www.ijtsrd.com/papers/ijtsrd31135.pdf



Copyright © 2020 by author(s) and International Journal of Trend in Scientific Research and Development Journal. This is an Open Access article distributed under the terms of the

Creative Commons Attribution License (CC BY 4.0) (<http://creativecommons.org/licenses/by/4.0>)



Literature Review

The early transmission system was of automated transmission system which was further replaced by newly adopted transmission system known as continous variable transmission(CVT). This CVT was capable of changing speeds quickly and greater torque transmission capability. CVT was classified into two major categories such as belt drive CVT system and traction drive CVT system. Traction drive CVT system was more dominant over any other transmission system.

Different variations and developments of components of CVT were introduced in the market with slight variations here and there. The major breakthrough was by Nissan Motor Corporation when they introduced first of kind CVT which was successful in achieving an improvement of fuel economy of upto 10% as compared to the existing CVTs. It was also helpful in delivering a feel of more direct drive. They named their this CVT as XTRONIC CVT. The range of low-to-high gear ratio was expanded which provided a significant reduction in friction and increased the efficiency 10% as compared to the previous generation CVT. In order to improve acceleration, fuel combustion and engine noise levels, the range of low and high gear ratio can be increased.

Introduction

Since the introduction of CVT, it has gone through stages of developments which has made it more efficient as a transmission system in the automobile sector. The developments were mostly governed by the regulations for environmental concerns such as global warming and

reduction of emission of CO₂. There were other regulations also such as customer satisfaction, greater output and responsiveness. All these regulations went hand in hand and are the main reasons behind the development of the CVT.

The example of development by such regulations is the fact that the Automatic Transmission available till 2000s were 5 speed transmissions but in the consequent years the shifting gears changed to 6 or 7.

The main aim behind diversification of CVT was to increase the torque transmission capacity. The initial push belt CVT which had 100Nm capacity increased to 350Nm in the current stage. Another type of CVT is chain type CVT which has the same capacity as of push type CVT. Further developments introduced a CVT with traction drive system which had the capability to change speeds quickly and such a capability provided advantage over other systems.

Basic CVT Issues

This section presents the basic CVT issues and problems faced.

For the use in automobile sector there are mainly two types of CVTs being manufactured :-

- Belt type CVT
- Traction drive CVT

A belt type CVT consist of two different types of belts, push system and the pull system. These two systems work by

transmitting power through friction force between the solid surface of the pulley and the belt. Whereas the traction drive system transmits power with the help of shear force generated between a special oil sandwiched between two rolling elements.

Consider a basic relationship of torque with other factors given as below.

$$T = \mu \cdot F \cdot R$$

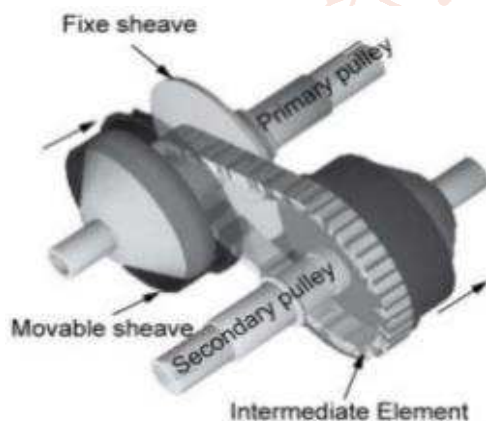
where

μ = friction/traction coefficient

F=normal force acting

R=radius of contact

In order to increase torque capacity (T) any one of the above is to be increased. Now it is difficult to increase the normal force (F) because it would require high power and if increased heavy burden such as mechanical strength, wear and other such factors will come in the frame. If the radius of contact (R) is increased then the size of the system would increase and this would work against the need of compactness and light weight. This brings us to the friction (μ) which is the key to high performance. Although it is difficult to develop such a material which will attain high values of μ keeping in mind the durability and working environment of the system.



Belt type CVT



Traction type CVT

Conclusion

A continuously variable transmission (CVT) is a transmission system which can change through a number of effective gear ratios between maximum and minimum values. Other transmission systems only allow a fixed distinct number of gear ratios to be selected and hence CVT is more dominant over any other transmission system. Over a range of output velocities, CVT allows the flexibility to maintain a constant angular velocity on the driving shaft. For a range of vehicle speeds, CVT transmission system allows a better fuel combustion or fuel economy by allowing the engine to run at the most efficient revolutions per minute (RPM). The majority of CVT's used in snowmobile and motor scooter are either rubber belt CVT or variable pulley CVT.

Soon there will be a trend of automotive transmission electrification which will replace the existing single speed gear box in the electric vehicle market. So we should focus more on how to develop electric CVT for the market because presently CVT is the best transmission system available in the non electric market.

References

- [1] Hendriks, E., et al: "Aspects of metal pushing V belt for automotive application."
- [2] Kuchukay, F: "The future of automotive transmissions."
- [3] Nozaki, Y, et al: "Toyota's new six speed automatic transmission systems for vehicles."
- [4] Taguchi, Y, et al: "Development of an automated manual transmission system based on robust design."
- [5] Pelders, R: "High torque push belt CVT design."
- [6] Liebrand, N; "Future developments in push belt for CVT application."
- [7] Kunii, H, et al: "The development of new light weight, compact and high efficiency CVT."
- [8] Mogi, Y et al: "Development of high performance belt CVT fluid."