



e-ISSN: 2319-8753 | p-ISSN: 2320-6710

# IJRSET

International Journal of Innovative Research in  
**SCIENCE | ENGINEERING | TECHNOLOGY**

# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

**Volume 9, Issue 9, September 2020**

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA

**Impact Factor: 7.512**

9940 572 462

6381 907 438

[ijirset@gmail.com](mailto:ijirset@gmail.com)

[www.ijirset.com](http://www.ijirset.com)

# Design, Fabrication & Testing Experimental Set-up of Continuous Variable Transmission (CVT)

Gaurav Nandkumar Kasale<sup>1</sup>, Mrunal Sumant Korgaonkar<sup>2</sup>, Chirag Mangesh Mudras<sup>3</sup>, Arbaz Aslam Waghu<sup>4</sup>,  
Eknath Laxman Manjarekar<sup>5</sup>

U. G. Student, Department of Mechanical Engineering, SSPM's college of Engineering, Kankavli, Maharashtra,  
India<sup>1234</sup>

Associate Professor, Department of Mechanical Engineering, SSPM's college of Engineering, Kankavli, Maharashtra,  
India<sup>5</sup>

**ABSTRACT:** One possible response for this mileage trouble is the continually variable transmission (CVT), an old idea that has starting late become a bastion of might want to automakers. CVTs may empower IC vehicles to meet the chief influx of new fuel rules while improvement of crossbreed electric and force module vehicles continues. Rather than picking one of four or five contraptions, a CVT ceaselessly change its gear extent to improve engine capability with a greatly smooth force speed twist. This improves the two gas mileage and speeding up diverged from standard transmissions. Notwithstanding the way that CVTs have been used in vehicles for a significant long time, compelled force limits and flawed faithful quality have blocked their turn of events. Today, in any case, advancing CVT research has provoked consistently enthusiastic transmissions, and thusly ceaselessly varying vehicle applications. As CVT improvement continues, creating costs will be moreover decreased and execution will continue extending, which will accordingly construct the enthusiasm for additional headway. This pattern of progress will in the end give CVTs a solid foundation on the planet's vehicle structure.

**KEYWORDS:** Transmission system, Speed ratio, Torque converter, Constructional Features, Actuators.

## I. INTRODUCTION

A manual transmission, otherwise called a manual gearbox, a standard transmission, stick move (in some cases basically stick), gearbox, or grip, is a kind of transmission utilized in engine vehicle applications. It utilizes a driver-worked grasp, normally connected with and separated by a foot pedal or hand switch, for managing force and force move from the motor to the transmission; and a rigging selector that can be worked by hand. In a manual transmission, the flywheel is annexed to the engine's driving rod and turns close by it. The hold hover is in the weight plate and the flywheel, and is held against the flywheel under strain from the weight plate.

A Continuous Variable Transmission (CVT), otherwise called a shiftless transmission, single-speed transmission, stepless transmission, pulley transmission that can change consistently through a ceaseless scope of successful rigging proportions. CVT continually changes its devices rate to decorate engine capability with a perfectly smooth force speed twist. This improves the two fuel mileage and developing pace stood out from standard transmissions.

## II. LITERATURE REVIEW

A belt-driven design offers generally 88% viability, which, while lower than that of a manual transmission, can be counteracted lower creation cost and by enabling the engine to run at its most capable speed for an extent of yield speeds. Exactly when force is a higher need than economy, the extent of the CVT can be changed to empower the engine to turn at the RPM at which it creates most essential force. This is regularly higher than the RPM that achieves top profitability. In low-mass low-force applications, (for instance, motor bicycles) a belt-driven CVT similarly offers ease of use and mechanical straightforwardness. A CVT doesn't cautiously need the closeness of a hold. Coincidentally, in specific vehicles (for instance bicycles), a diffusive grasp is added to energize an "unbiased" position, which is important when sitting or truly exchanging into a parking space.

Leonardo da Vinci, in 1490, conceptualized a stepless steadily factor transmission. Milton Reeves devised a variable-speed transmission for saw handling in 1879, which he applied to his first vehicle in 1896.

In 1910, Apex Cruisers made a V-twin engined bicycle with the Gradua-Apparatus, which was a CVT. In 1912, the English bicycle maker Rudge-Whitworth gathered the Rudge Multigear. The Multi was an altogether better type of Apex's Gradua-Apparatus.

In 1926, George Constantinesco conveyed the Constantinesco vehicle with a smooth, beneficial, inertial masses CVT, which he had made in 1923, fused with the two-chamber engine.

During the last part of the 1940s and mid 1950s, Charles H. Digger of Denver, CO made basic headways in making a CVT by building up the "Variable Speed Grasp Pulley". He archived and was permitted various US licenses for his CVT structure using steel balls and spiral capacity to control the moveable side of the force end of his V-belt hold.

A CVT, called Variomatic, was arranged and worked by Center van Doorne, individual supporter of Van Doorne's Automobiël Fabriek (DAF), in the last part of the 1950s, expressly to make a modified transmission for a little, sensible vehicle. The first DAF vehicle using van Doorne's CVT, the DAF 600, was conveyed in 1958.

Numerous snowmobiles use a versatile belt CVT. In 1974, Rokon offered a bicycle with a versatile belt CVT.

In summer 1987, the Passage Holiday and Fiat Uno transformed into the central standard European vehicles to be outfitted with steel-belted CVT.

For the 2019 Toyota Corolla Hatchback Toyota made an all new CVT with a "dispatch gear" or a physical first apparatus from a customary modified transmission near to the CVT pulley. From 0-25 mph the transmission would stay in this dispatch mechanical assembly to help in speeding up from a stop and improve quality of the CVT. After 25 mph, the transmission would switch over to the CVT pulley.

### III. PROBLEM IDENTIFICATION

A Conventional transmission system consists of Engine, flywheel, clutch, gearbox and output transmission. Which are having some disadvantages as follows:

- 1) The Conventional gives fixed speed ratios as per tooth ratios.
- 2) Conventional transmission system uses single plate clutch, which has efficiency less than 70%.
- 3) Manual transmission gearbox has gears namely 0-1-2-3-4-5 hence in order to move to top gear one has to move from 0 (i.e. neutral to 1) in which the following operations are to be performed
  - a. Disengage gear
  - b. Change gear
  - c. Gradually engages clutch

Thus three operations are to be performed while moving from one gear to another, hence in all 15 operations are performed to move to the top gear. So also, 1<sup>st</sup> gear speed cannot exceed 20 kmph, where as in 5<sup>th</sup> gear vehicle cannot be tracted from still condition (e.g. at traffic signal).

To avoid these problems the transmission system utilizes complete engine speed range whereas engine gives best efficiency over a fixed range of speed.

### IV. SOLUTION

- a. CVT constantly changes its gear ratio to optimize engine efficiency with a perfectly smooth torque-speed curve. This improves both gas mileage and acceleration compared to traditional transmissions.
- b. The simple shape of the CVT makes the manufacturing process easy and at low cost.
- c. The transmission element of the CVT is Classical Synchronous belt with the following features
  - Trapezoidal teeth profile.
  - High efficiency due to positive engagement between belt teeth and sprocket bars.
  - No re-tensioning required.
  - Free from maintenance.
  - No high tension required.

## V. METHODOLOGY

In our attempt to design a special purpose machine we have adopted a very careful approach, the total design work is divided into two parts:

- Mechanical design
- Creating CAD model
- Manufacturing of parts
- Assembly of components

In mechanical design components are categorised in two parts

- Design parts.
- Parts to be purchased.

For design parts, parts are designed and are rounded off to the next standard dimension available in the market this simplifies the assembly and post production service work.

The various tolerances on workpieces are specified in the manufacturing drawings. The process charts are prepared and are passed on to the manufacturing stage. The parts which are to be purchased directly are specified and selected from the standard catalogues.

The parts which are to be designed are:

- Input shaft
- Output shaft
- Pulley
- Belt
- Spring
- Power screw
- Bearing
- Spring

## VI. WORKING

The variable assessment pulley are the focal point of a cvt. Every pulley is incorporated two 20 degree cones challenging one another. A belt rides arranged between the two cones. V-belts are delighted in if the belt is made of adaptable. Right when the two cones of the pulley are far separated (when the widths develops), the belt rides lower arranged, and the scope of the waist band circumventing the pulley gets more humble. Precisely when the cones are practically one another (when the assessment decreases), the belt rides higher arranged, and the extent of the waist band circumventing the pulley gets more noteworthy. CVT's may utilize water energized weight, diffusive force or spring strain to make the force fundamental to change the pulley parts.

Variable partition across over must dependably come two by two. One of the pulleys, known as the drive pulley (or driving pulley), is connected with the driving rod of the motor. The driving pulley is besides called the data pulley since it's the detect the centrality from the motor enters the transmission. The subsequent pulley is known as the chose pulley considering the way that the first is turning it. As a yield pulley, the chose pulley moves vitality to the driveshaft. Right when one pulley develops its range, different abatements it's compass to keep the belt tight. As the two pulleys change their radii relative with each other, they make a ceaseless number of rigging degrees – from low to high and everything in the middle.

## VII. CALCULATION

### 1. DESIGN OF CVT:

- **Design of Input Shaft:**

Material Selected: C-50

Syt: 600 N/mm<sup>2</sup>

Sut: 720 N/mm<sup>2</sup>

Diameter of spindle=d= 20mm.



- **Design of Output Shaft:**

Material selected: C-50  
Syt: 600 N/mm<sup>2</sup>  
Sut: 720 N/mm<sup>2</sup>  
Diameter of spindle=d= 20mm.

- **Design of Output Shaft:**

Material selected: C-50  
Syt: 600 N/mm<sup>2</sup>  
Sut: 720 N/mm<sup>2</sup>  
Diameter of spindle=d= 20mm.

- **Design of Belt:**

Permissible tension in belts= 2.8MPa.  
Belt Density= 1140 kg/mm<sup>3</sup>  
Co-efficient of friction between belt and pulley: 0.3  
For usual drive load,  
Width=w= 22mm  
Thickness=t= 14mm  
Length of belt=L= 1191.02mm

- **Design of bearings:**

Shaft will be subjected to purely radial and axial loads, hence we will be using ball bearing.  
Selecting single row deep groove ball bearing.  
For d=20mm  
Selecting Series 60  
Bearing no.: SKF6004

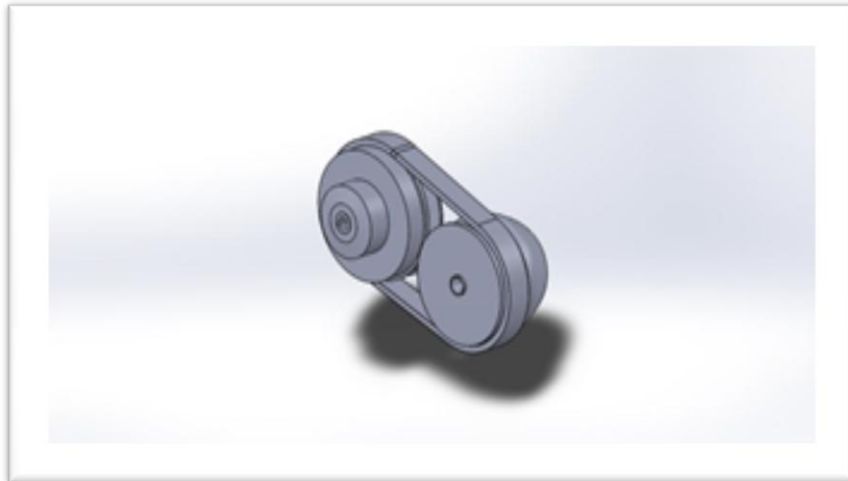
- **Design of Handle:**

Length of handle: 145mm.

- **Design of spring:**

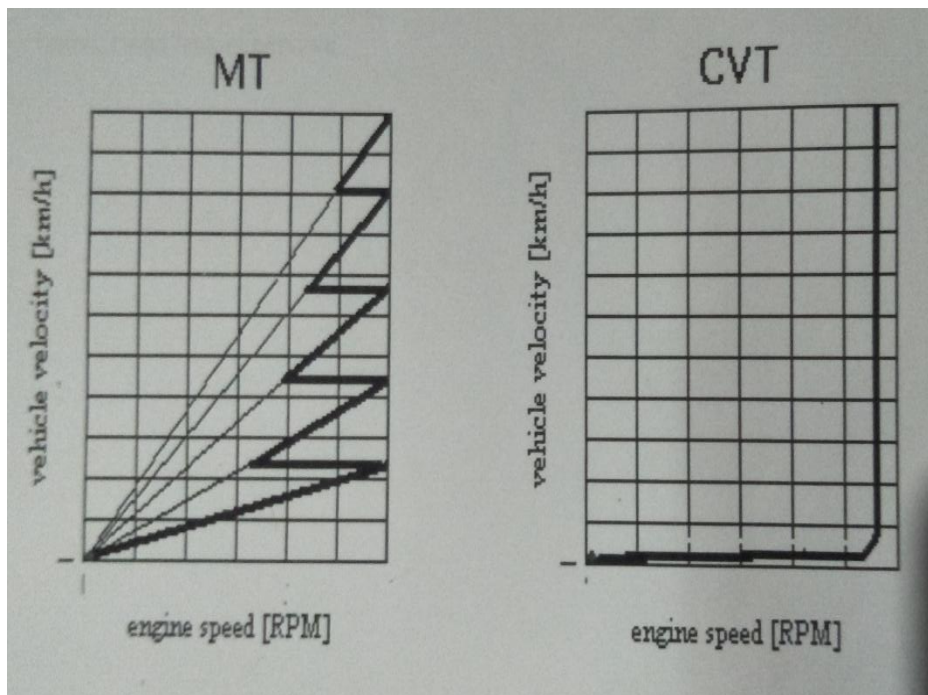
Maximum Deflection= 30mm  
Diameter of spring wire=4.47mm  
Mean Diameter of spring= 26.8mm  
No. of coils= 29.

### VIII. CAD MODEL



### IX. RESULT

When compared to manual transmission CVT gives smooth stepless acceleration because of the absence of discrete speed ratio.



## X. CONCLUSION

A consistently factor transmission or CVT mixes the simplicity of a robotized transmission with the presentation of a manual transmission." this declaration made by methods for the Honda engines totally sums up the idea of CVT. CVT is really a time of the predetermination with its higher fuel proficiency, boundless apparatuses proportions, decline creation costs, consistent cruising speeds and higher increasing speed abilities. This period has found such wide applications least difficult nowadays. Thus greatest people must become acclimated to the elements of a CVT-prepared vehicle for its higher appreciation.

A persistently factor transmission or CVT mixes the simplicity of a robotized transmission with the presentation of a manual transmission." this declaration made by methods for the Honda engines completely sums up the idea of CVT. CVT is truly a period of the fate with its higher gas effectiveness, boundless apparatuses proportions, decline creation costs, consistent cruising speeds and higher quickening abilities. This period has found such wide applications easiest nowadays. Thus greatest people must become accustomed to the elements of a CVT-prepared vehicle for its higher appreciation.

## REFERENCES

- [1] Christopher Ryan Wills, Dr. Charles F. Reinholtz, Chair, Dr. Richard M. Goff, Dr. Mehdi Ahmadian "A Kinematic Analysis and Design of a Continuously Variable Transmission" Blacksburg, VA 19 Jan. 2006.
- [2] Norman H. Beachley, Andrew A. Frank "Continuously Variable Transmission: Theory and Practice" college of engineering university of Wisconsin, Madison August 1979.
- [3] How a CVT works- Ingenuity and Engineering to.-TEAM Industries [www.team-ind.com](http://www.team-ind.com)> CVT Retrieved 23 September 2013.
- [4] G. Julio, J.-S. Plante "An experimentally validated model of rubber-belt CVT mechanics", Elsevier Journal, April 2011.
- [5] Nilabh Srivastava, Imtiaz Haque "A review on belt and chain continuously variable transmission subject to wear", Elsevier Journal, February 2012.
- [6] Systems Symposium, pg. 171-179SAE.C.de Silva, M.Schultz (2002) "Kinematic analysis & Design of a CVT" - University of BritishColumbia.
- [7] Sedhom, M. (2015). *Nuvinci Launches New N380™ and N330™ CVT Hubs*.EbikeReviews.com.au. <http://www.ebikereviews.com.au/news/nuvinci-launches-new-n380- and-n330-cvt-hubs-for-ebikes/>.
- [8] S.Sakaguchi, E. Kimura and K. Yamamoto: "Development of an Engine-CVT Integrated Control System" SAE Paper No. 1999-01-0754, in SAE SP-1440, Transmission and Driveline Systems Symposium, pg. 171-179SAE.
- [9] Kavanagh, A. (2016). *How to use bike geometry charts and what they mean*. BikeExchange Inc. <https://www.bikeexchange.com.au/article/privacy-and-security>. Accessed 23 June,17.
- [10] Mandy Concepcion "Automotive Continuously Variable Transmissions – CVT" Kindle -2Editions.



**INNO SPACE**  
SJIF Scientific Journal Impact Factor

**Impact Factor:  
7.512**

**ISSN** INTERNATIONAL  
STANDARD  
SERIAL  
NUMBER  
INDIA



# INTERNATIONAL JOURNAL OF INNOVATIVE RESEARCH

IN SCIENCE | ENGINEERING | TECHNOLOGY

 9940 572 462  6381 907 438  [ijirset@gmail.com](mailto:ijirset@gmail.com)



[www.ijirset.com](http://www.ijirset.com)

Scan to save the contact details