

# A Review on Automobile Gear Transmission Mechanism

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**ABSTRACT:-** In the era of automobile, gear shifting system plays a vital role in varying the speed. It can be both manual and automatic. Use of manual gear shifting system is much difficult for handicap people since it takes a physical effort while changing the gear. Everyone looks for the smooth running of the vehicle whatever may be the speed and pickup of the vehicle. One of the most vital system concerned with the every engineer is the gear shifting system for acquiring smooth ride on their vehicles. In this mechanism, gear shifting is done with the help of two solenoid plungers. Gearboxes are used in a wide range of applications such as automobiles, air crafts, and industrial machinery for transmitting power from a generator to a user which has ominously different torque and speed characteristics.

**Keywords:** Gearbox, automobile, transmission, vehicles, torque.

## I. INTRODUCTION

Today use of automobile is growing rapidly and to survive in the market is quite difficult with previous technologies. So to survive in the market new technologies are mandatory. The technology must be flexible enough to undertake changes. The technology must continue to grow. Automotive technology has been developed in many areas like ABS system, active steering system and other safety systems which are implemented to increase the passenger safety and comfort. The development has concluded the gearbox which became much smoother and produces less noise. Gear shifting mechanism must be easy to use and workable as these demands are very important especially for physically challenged and special people.

The gear box is used to vary the torque as per the different driving conditions. The gearbox increases the required torque for start the ride and put the motorcycle into motion. After the start or the running of the motorcycle there is no need of high torque, so now gear box will transmit the optimum torque to the rear wheel at high speed. For the operation of gearbox and shifting the gear there is need of some effort of driver of motorcycle. A foot lever is used to shift the gears in a motorcycle. Also, a clutch is placed between the engine and the transmission in order to engage and disengage the flywheel with the transmission.

## II. TYPES OF AUTOMATIC TRANSMISSIONS

Automatic transmissions has now become the leading choice for most drivers around the world. There are some factors like convenience, hassle free shifting and accessibility which have risen above the use of traditional three-pedal shifters. Quicker gear shifts than manuals which attract several manufacturers to opt it as performance vehicles.

Smarter computers and sensors have shaped automatics that prioritize less power and proper gear selection for maximum fuel savings. On the outward, it may seem that automatic transmissions are limited to automatic gear selection, but there are many differences that are used in almost all types of vehicles. The various types of automatic transmissions are;

- A. Traditional Automatic Transmission
- B. Automated-Manual Transmission
- C. Continuously Variable Transmission
- D. Dual-Clutch Transmission (DCT)
- E. Direct Shift Gearbox (DSG)
- F. Tiptronic Transmission

### A. Traditional Automatic Transmission

This is the most widely-used automatic transmission in cars and is also known as a torque converter automatic. This type of transmission uses a hydraulic fluid coupling or a torque converter to do the work of changing gears instead of a clutch. The ECU (engine control unit) is directly connected to this mechanism to allow smooth and precise engine control of the vehicle.



**Figure 1: Traditional Automatic transmission**

### B. Automated-Manual Transmission

This is a semi-automatic transmission that uses a regular clutch and gear configuration, but makes use of sensors, actuators, processors, and pneumatics to simulate manual gear use. These types of vehicles are known for jerky engine performance at low speeds and hard acceleration, but can get high fuel mileage over long distances.



**Figure 2: Automated-Manual Transmission**

### C. Continuously Variable Transmission

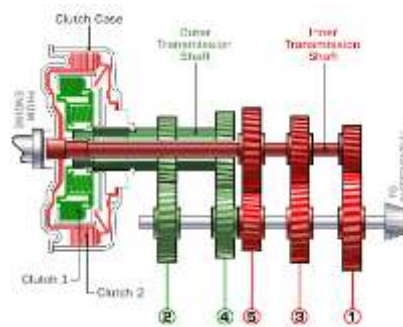
A continuously variable transmission uses belts or pulleys instead of traditional steel gears, and allows seamless gear shifting with various ratios dependent on engine speed or RPM. This allows for maximum efficiency and continuous acceleration, which is good for fuel economy. However, engine noise can be loud.



**Figure 3: Continuously Variable Transmission**

#### D. Dual-Clutch Transmission (DCT)

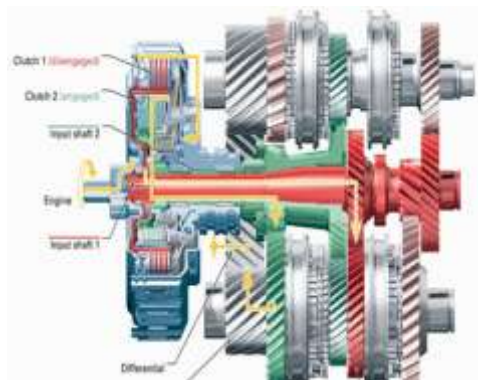
A dual-clutch transmission is the combination of an automatic and manual transmission and it has no torque converter. But, instead it uses two separate shafts with their own clutches for gear changing, one for odd-numbered gears, and another for even numbered ones. Shifting to higher and lower gears are seamless, but they can get noisy and can shift roughly after wear. The DCT is a dry transmission that does not need the driver to change the gearbox fluid ever. It leaves the clutches dry and wears out its frictional quality eventually.



**Figure 4: Dual-Clutch Transmission**

#### E. Direct Shift Gearbox (DSG)

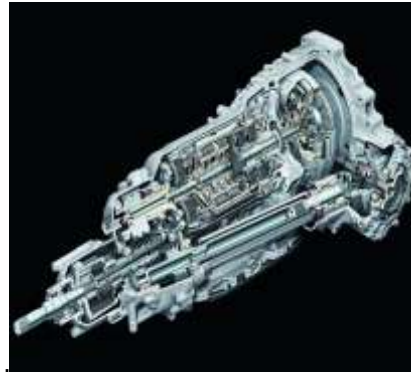
Using a similar setup to a dual-clutch transmission, a direct shift gearbox (DSG) uses two clutches that disengage alternately in changing gears. This setup offers fast shifting and smoother acceleration. Modern systems also provide fuel efficiency that surpass manual gearboxes. A DSG system is a wet transmission so expect decades of service till the fluid is changed.



**Figure 5: Direct Shift Gearbox**

#### F. Tiptronic Transmission

It is commonly used in performance or sport oriented vehicles, and also known as “manumatic”, the tiptronic transmission was pioneered by Porsche in the ‘90s. It functions similarly to a manual gearbox, however it uses a torque converter in place of a clutch pedal. There is an option for automatic shifting of gears and an option for the driver to override the automatic mode for manual selection of gears. There is a built-in safety feature that prevents the driver from damaging the gearbox through over-revving when downshifting



**Figure 7: Tiptronic Transmission**

### **III. ADVANTAGES OF AUTOMATIC TRANSMISSION**

Today in the commercial vehicle market the term “automatic” is frequently used to define any two-pedal set-up. But there are significant differences between a fully automatic and an automated manual transmission (AMT) that can affect performance, fuel efficiency and reliability in truck applications. As demand for fully automatic trucks and buses increases, the supplier finds a steady rise in demand for both on-road and off-road applications.

A manual or AMT transmission operates a traditional dry clutch to transmit engine power to the vehicle driveline and engages different sets of gears to achieve the various gear ratios. Conversely, in a fully automatic transmission, a continuous flow of power between the engine and vehicle wheels is guaranteed via a torque converter module, while a single, sophisticated set of gears produces all of the different gear ratios. This planetary gear set takes a central “sun gear” and outer ring gear with its teeth on the inside, and connects the two with a series of “planet” gears mounted on a carrier frame.

The chief advantages of automatic transmission includes;

- **Torque Converter**
- **Fuel Economy**
- **Reliable Performance**

#### **TORQUE CONVERTER**

The torque converter device evolved from the fluid flywheel and is located in the front of the automatic transmission housing and is filled with transmission fluid. This fluid transmits engine torque to the transmission during vehicle launch. The torque converter is the key to the fully automatic transmission and provides many unique benefits such as multiplication of the engine torque and reduced shock and strain on the entire driveline. Modern automatic transmissions incorporate a lock-up clutch in this module that provides a direct mechanical connection from the engine to the transmission to maximize fuel economy.

The torque converter provides many of the differentiators that establish performance between a fully automatic transmission and an AMT. With an AMT every time when a shift occurs the clutch separates the engine from the transmission. Therefore at every shift there is a loss of power, momentum and speed. With a fully automatic engine, transmission are always connected, leading to a more efficient use of engine power and fuel, thus providing faster acceleration and improved productivity.

#### **FUEL ECONOMY**

Historically fuel consumption for automatic transmissions has been a concern, but much of this relates to early forms of the technology. The commercial vehicle market is focused on executing “work” at minimum cost and fuel consumption. The new generation of Allison electronically-controlled fully automatic transmissions optimizes the efficiency of the truck or bus operation assuring that at every shift there is no loss of engine power. This makes it possible to get excellent fuel efficiency with an automatic transmission.

## **RELIABLE PERFORMANCE**

Losing control or traction on muddy, sticky or slippery ground is an issue for truck drivers in construction. The truck pulls away gently and easily without getting stuck or splattering mud. And it's great to have the engine's power continually delivered to the wheels with no interruptions for gear shifting. Reliability in off-highway applications is critical and the benefits of a fully automatic are leading more OEMs to offer this.

An automatic transmission is commonly used in airport where everything from the twin engine-transmission fire truck through the shunters that all benefit from the ease of manoeuvrability. Another example is the strong presence of fully automatics in the public transport sector. The very same reliability, efficiency, ease of operation and cost effectiveness are the key reasons for an increasing number of cities across the world to specify their city-buses with an Allison Automatic.

## **IV. CONCLUSION**

The research study mainly focusses on the mechanism, types and advantages of automatic gear shifting mechanism. It explains that device which changes gear ratios automatically will deliver maximum efficiency and is also easier to drive because they do not have a clutch pedal or gearshift lever.

## **V. FUTURE ENHANCEMENT**

Touch screen based gear system can be opted which reduces human effort. It gives more flexibility and reliability in shifting the gear while driving. The transmission to the touch screen based system from existing should give more importance to cost reduction with optimised control.

## **VI. REFERENCES**

- [1] Ranbir Singh (2012) "A Brief Review of Transmission in Automobiles" IJESRT- international journal of engineering sciences & research technology, Vol.1, issue 2: Page No.D222-D226, July-August (2012).
- [2] Suraj S Raut (2014) "Automatic Transmission Gearbox with Centrifugal Clutches" IJESRT- international journal of engineering sciences & research technology, Volume: 03 Issue: 10 Oct-2014.
- [3] Hiroshi Kuroiwa (2004) study on "Next-generation Fuel-efficient Automated Manual Transmission" Hitachi Review Vol.53 (2004).
- [4] Chinmay Kirtane (2013) "Gear Shift Schedule Optimization and Drive Line Modeling for Automatic Transmission" 1st International and 16th National Conference on Machines and Mechanisms (iNaCoMM2013), IIT Roorkee, India.
- [5] Teng Ma (2013) "Model-Based Control Design and Experimental Validation of an Automated Manual Transmission" a thesis, The Ohio State University.