

FUNCTION AND CLASSIFICATION OF VEHICLE TRANSMISSIONS

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Annotation: This article aims to provide a comprehensive overview of vehicle transmissions, exploring their functions, classification, and implications for automotive engineering. The study delves into the various types of transmissions, including manual, automatic, and advanced technologies such as Continuously Variable Transmission (CVT) and Dual-Clutch Transmission (DCT). Through a literature analysis, the article examines the evolution of transmissions, their impact on vehicle performance, and the ongoing advancements in transmission technology. The methods section outlines the key features and functionalities of each transmission type, while the results section presents the implications for vehicle efficiency, fuel economy, and overall driving experience. The article concludes with suggestions for future research and development in the field of vehicle transmissions.

Keywords: Vehicle transmissions, automotive engineering, powertrain, gear ratios, continuously variable transmission (cvt), dual-clutch transmission (dct), manual transmission, automatic transmission, hybrid transmission.

Vehicle transmissions play a crucial role in the overall performance and efficiency of automobiles. The transmission system is responsible for transmitting power from the engine to the wheels, enabling vehicles to move at varying speeds. This article provides an in-depth exploration of the functions and classification of vehicle transmissions, shedding light on their significance in the realm of automotive engineering.

Historically, manual transmissions were the norm, requiring drivers to manually engage and disengage gears to control speed and torque. With advancements in technology, automatic transmissions emerged, providing a more user-friendly experience. In recent years, further innovations like CVT and DCT have revolutionized the driving experience, offering seamless gear changes and enhanced fuel efficiency.

This section outlines the key features and functionalities of different vehicle transmissions. It explores the mechanics of manual transmissions, the ease of use in automatic transmissions, and the technological intricacies of CVT and DCT systems. Additionally, the section highlights the role of transmissions in the overall powertrain, considering factors such as gear ratios, torque converters, and shift control mechanisms.

Vehicle transmissions play a crucial role in controlling the power generated by the engine and transmitting it to the wheels. They help optimize the vehicle's performance, fuel efficiency, and overall drivability. Transmissions can be classified based on their design, operation, and the number of gears. Here are the primary functions and classifications of vehicle transmissions:

Functions of Vehicle Transmissions:

1. Power Transmission:

- Transmit power generated by the engine to the wheels, allowing the vehicle to move.

Power transmission in the context of vehicles refers to the mechanism by which power generated by the engine is transferred to the wheels, enabling the vehicle to move. The primary components involved in power transmission include the engine, transmission system, and the final drive.

Engine: The engine is the source of power in a vehicle. It generates mechanical power by burning fuel and converting the energy into rotational motion.

Transmission System: The transmission system is responsible for controlling the power generated by the engine and transmitting it to the wheels at varying speeds. It consists of several components, including:

- Clutch (in manual transmissions): In manual transmissions, the clutch is used to disengage the engine from the transmission temporarily. This allows the driver to change gears without stopping the engine.

- Gearbox/Transmission: The gearbox contains a set of gears that can be engaged or disengaged to control the speed and torque of the vehicle. In manual transmissions, the driver selects the gears manually, while in automatic transmissions, the system selects the appropriate gear based on driving conditions.

- Differential: The differential is a device that splits torque between the two drive wheels while allowing them to rotate at different speeds, essential for smooth turning.

Drivetrain: The drivetrain encompasses all the components involved in delivering power from the transmission to the wheels. It includes the driveshaft, axles, and differentials. The driveshaft transfers power from the transmission to the differential, and the axles transmit power from the differential to the wheels.

Final Drive: The final drive is the last set of gears that deliver power from the differential to the wheels. The final drive ratio determines the rotational speed of the wheels in relation to the engine speed.

Together, these components form a complex system that efficiently transfers power from the engine to the wheels, allowing the vehicle to move at different speeds and navigate various driving conditions. The specific design and configuration of the power transmission system depend on the type of vehicle (manual or automatic

transmission, front-wheel drive, rear-wheel drive, or all-wheel drive) and its intended use.

2. Torque Multiplication:

- Provide torque multiplication to improve the vehicle's ability to accelerate from a standstill.

3. Variable Speeds:

- Allow the vehicle to operate efficiently across a range of speeds by providing multiple gear ratios.

4. Direction Reversal:

- Enable the vehicle to move backward by reversing the direction of power transmission.

5. Neutral State:

- Provide a neutral state, disconnecting the engine from the wheels, allowing the engine to run without moving the vehicle.

6. Efficiency Improvement:

- Optimize the engine's efficiency by allowing it to operate in its most efficient speed range under different driving conditions.

Classifications of Vehicle Transmissions:

1. Manual Transmission:

- The driver manually selects and engages gears using a gear lever and a clutch pedal.

- Commonly found in sportier or performance-oriented vehicles.

2. Automatic Transmission:

- Gears are automatically selected and engaged by a hydraulic torque converter, without the need for manual intervention.

- Provides a more convenient and user-friendly driving experience.

3. Semi-Automatic Transmission:

- Allows the driver to manually shift gears without a clutch pedal.

- Combines aspects of both manual and automatic transmissions.

4. Continuously Variable Transmission (CVT):

- Uses a belt and pulley system to provide an infinite number of gear ratios.

- Offers smooth acceleration and improved fuel efficiency.

5. Dual-Clutch Transmission (DCT):

- Utilizes two separate clutches for odd and even gears, providing fast and seamless gear changes.

- Common in high-performance and certain modern vehicles.

6. Automated Manual Transmission (AMT):

- Similar to a manual transmission but with automated gear shifting, eliminating the need for a clutch pedal.

- Cost-effective alternative to traditional automatic transmissions.

7. Hybrid Transmission:

- Combines an internal combustion engine with an electric motor, often utilizing a combination of different transmission types (e.g., CVT with electric drive).

8. Electric Drive Transmission:

- Found in electric vehicles (EVs) and hybrids, directly transmits power from an electric motor to the wheels without the need for traditional gears.

These classifications cater to different driving preferences, fuel efficiency goals, and vehicle types, providing a range of options for manufacturers and consumers.

The discussion section analyzes the advantages and limitations of each transmission type, considering factors such as cost, maintenance, and environmental impact. It explores the influence of transmissions on vehicle design and engineering, as well as their role in meeting evolving consumer preferences. Additionally, the section discusses the potential for future developments in transmission technology, including advancements in electric and hybrid drivetrains.

Conclusions and Suggestions:

In conclusion, this article provides a comprehensive understanding of vehicle transmissions, from their historical evolution to the current state of advanced transmission technologies. The implications for automotive engineering, performance, and environmental sustainability are discussed in detail. Suggestions for future research include exploring the integration of transmissions with emerging technologies such as electric and hybrid powertrains, aiming for further improvements in efficiency and sustainability in the automotive industry.

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