Vehicle Electrification System Standards

VI. Electric Transmissions and Drive Units

VI.b Overview of Electric Transmission, Transaxle, and Drive Units

Overview:

BEV Drive Units – with Gear Box

- Drive Unit Design
- Vehicle Applications
- All-Wheel Drive Systems
- Advantages & Disadvantages
- Description of Operation
- Servicing
- Diagnostics

Hybrid Transmissions – Planetary Gear Sets with Clutch System Design

- Transmission Unit Design
- Vehicle Applications
- All-Wheel Drive Systems
- Advantages & Disadvantages
- Description of Operation
  - Mechanical Systems
  - Hydraulic Systems
- Servicing
- Diagnostics

BEV Drive Units – without Gear Box

- Drive Unit Design
- Vehicle Applications
- All-Wheel Drive Systems
- Advantages & Disadvantages
- Description of Operation
- Servicing
- Diagnostics

Hybrid Transaxles – Planetary Gear Sets without Clutch System Design

- Transaxle Unit Design
- Vehicle Applications
- All-Wheel Drive Systems
- Advantages & Disadvantages
- Description of Operation
  - Mechanical Systems
  - Hydraulic Systems
- Servicing
- Diagnostics

Description:

Electric Drive Units, Transmissions and Transaxles transfer rotating electrical speed from the electric machine rotor to the drive axles and wheels through a system of gears that will multiply torque. These powertrain components can be designed for various applications and configurations to ensure a product delivers speed and torque, while maintaining high levels of efficiency and quality.

Outcome (Goal):

Students will be able to describe the differences between electric transmissions, transaxles, drive units, and eAxles and identify each configuration.

Objective:

Students shall be able to:

1. Identify component parts for each type of a powertrain transmission system
2. When provided a transmission, transaxle, or drive unit, the student will describe the operation and function of each operating mode (if applicable)
3. Describe the powerflow (speed and torque flow) of each powertrain transmission device when provided with a transmission gear and clutch diagram
4. Identify the mechanical and electrical powertrain transmission internal lubrication system
5. Calculate the gear ratio of the powertrain transmission and the differential gearing to acquire the final gear ratio
6. Describe the operation of a powertrain transmission when specific mechanical and/or hydraulic failure modes are presented
7. Operate a serial data (scan tool) to acquire data to ensure a transmission system is operating correctly
8. When provided an electric powertrain transmission, students will disassemble, and assemble the transmission

Task:

Students will be able to:

1. Identify powertrain transmission components when given a worksheet or diagram
2. Articulate (both verbal and written) powertrain transmission operating modes, and powerflow when given a transmission diagram
3. Describe the operation of a transmission powertrain, using powerflow diagrams, when the failure of specific internal components occur when provided hydraulic and mechanical diagrams
4. Complete the acquisition of transmission data during the road test of a vehicle to determine if the transmission data is within correct operating parameters
5. Correctly disassemble and assemble an electric powertrain transmission unit using proper tools, measuring devices, and procedures
6. Use OEM vehicle service, component supplier information, and DOE/NREL/INL/ANL vehicle electrification website information to complete all tasks

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