E-MOBILITY: Recuperation test with function and performance dynamometers

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E-Mobility
Recuperation Test with function and performance Dynamometers
Agenda

1. Recuperation what is it?
2. How to perform recuperation tests?
3. Which Tests can be performed?
5. Résumé and considerations
1. Recuperation what is it?

Recuperation from Latin “recuperare” - Recovery

- Exploitation of anyway available kinetic energy to reload the electrical battery of the vehicle.
- Happens automatically during coast down phases while driving.
- Significant fuel reduction and improvement of the CO2 Balance.
2. How to perform recuperation tests
   a) Test-drive on the road
      • Difficult to receive repeatable results due to different ambient conditions.
      • Additional staff requirement (at least 2 person are needed)
      • No accessibility to the Motor from outside during the test so that everything hast to be fitted “perfectly” before the test drive.
2. How to perform recuperation tests

   b) Test-drive on a Dynamometer

   • Laboratory conditions grant great repeatability.
   • One man operation.
   • All measurements can be done easily from inside and outside the vehicle.
3. Which tests can be performed?

a) Energy Conversion Efficiency
   Test-drive over a defined load and simultaneous measurement of Battery voltage and loading conditions.

b) Function Test and Recuperation
   Reloading of the battery; Generator operation in conjunction with an Electric motor.
4. Available Dynamometer Technology - General Challenges

- Extreme Tyre tumbling in conventional double roller Dynamometers
- RPM control on both axles (driven and non driven axle)
- Connection between front and rear axle is needed to make sure that same speed appears on both axles.
- Fixing of the different vehicles.
4. Available Dynamometer Technology - Nowadays Solution

- Single rollers with large roller Diameter.
- Reasonable inertia, closer to the actual vehicle weight.
- Electro Motor, do drive the non driven axle or simulate recuperation!

Drive Rollers

Eddy Current Brake

Electro Motor
4. Available Dynamometer Technology - Nowadays Solution

- Standard configuration with movable roller set to adjust to certain axle separations.
- Front and rear axle can be connected electronically or mechanically.
- Contact area between tyre and roller quite similar to real street conditions.
- Due to increased roller diameter is the Rotating mass already close the vehicle mass.
4. Available Dynamometer Technology - Nowadays Solution

• Preprogramed driving cycle (e.g. NEDC)

• Analogue interfaces for own measurement devices.
5. Résumé and considerations

- Technology for repeatable measurements are available.
- Proofed Dynamometer Technology, so far no standardized procedures for measurement of recuperation available.
- Most nowadays vehicles need both axles running on same speed \(\Rightarrow\) regulated 4WD configuration.
- Thermal problem while battery loading \(\Rightarrow\) ensure a good ventilation.
- All High Voltage Cables / Harnesses are easy to identify in orange colour, Keep your fingers away from the ORANGE cables!
- Before touching the high voltage system disconnect the service plug
Thank you for your attention!

Your success is our motivation!