REGENERATIVE BRAKING – SCIENCE & TECHNOLOGY

News: Electric vehicles are manufactured with Regenerative braking technology

Whats in the news?

- Recent efforts to lower emissions focus on reducing consumption and changing consumer habits.
- Electric vehicles (EVs), supported by government incentives, play a key role.
- Regenerative braking in EVs improves energy efficiency, promoting sustainable transportation.

MECHANICAL BRAKES	ELECTROMAGNETIC BRAKES
Disc Brakes: • Consist of brake pads pressing against a disc attached to wheels. • Friction converts kinetic energy into heat. • Holes in discs aid heat dissipation. **Drum Brakes:** • Brake shoes press against the inner surface of a drum attached to wheels. • Friction slows down wheels through heat generation.	**Induction Brakes:** • Often used in trains. • Magnets induce electric currents in a conducting wheel. • Currents create a magnetic field that opposes the magnet's field, slowing down the wheel. • Energy dissipated as heat due to resistance in the conductor.

Regenerative braking is a system designed to convert the kinetic energy of the wheels to a form that can be stored and used for other purposes. Here the motor operates as a generator, turning mechanical energy back to electrical energy.

Regenerative Braking

- Regenerative braking is a system in electric and hybrid vehicles designed to convert the kinetic energy of the wheels into electrical energy, which is then stored in the vehicle's battery.
- This system operates by using the electric motor as a generator during deceleration, thus reversing the motor's function.

Working Principle:

- **Deceleration Detection**: When the driver lifts off the accelerator or applies the brakes, the system detects the need to slow down.
- **Motor as Generator**: The traction motor switches from driving mode to generating mode.
- **Energy Conversion**: The kinetic energy from the moving vehicle is converted into electrical energy by the motor.
- **Energy Storage**: The electrical energy generated is stored in the vehicle's battery for later use.

Benefits:

- **Energy Efficiency**: Recovers energy that would otherwise be lost as heat in conventional braking.
- **Extended Range**: Increases the driving range of electric vehicles by reusing captured energy.
- **Reduced Brake Wear**: Decreases wear and tear on conventional brake components, leading to lower maintenance costs.
- **Environmental Impact**: Reduces emissions by improving energy use efficiency.

Downsides of Regenerative Braking:

- **Not Sufficient for Complete Stops**: Requires conventional brakes for complete halting.
- **Limited Effectiveness at Low Speeds**: Less kinetic energy available to convert into electrical energy.
- **Brake Feel**: Can differ from conventional brakes, potentially affecting driver comfort.
- **Additional System Requirements**: Needs integration with conventional braking systems to ensure safety and performance.

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