REGENERATIVE BREAKING SYSTEM

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Abstract

Regenerative Braking Systems (RBS) include an effective technique to help hybrid electric buses improve fuel efficiency while reducing exhaust emissions. The control impacts and efficiencies of the control strategies are simulated and analyzed in a typical deceleration method.

Key words: Regenerative braking system, fuel efficiency.

Introduction

There are presently two variants of regenerative braking. The first form is serial regenerative braking based on a mixture of a friction-based adjustable braking system[1], [2] with a regenerative braking system that, as part of an embedded control approach[3], transfers energy to electric motors and batteries. The second one of braking system is a parallel braking Where the friction-based braking system and the regenerative braking system are operated in tandem, without embedded control, making it impossible to readily adjust either the friction braking force or the regenerative braking force.

Methodology

The bus drive train involves an Auxiliary Power Unit (APU)[4], [5] consisting of an internal combustion engine combined with a generator and rectifier capable of powering the electric motor or charging the batteries as required by the Vehicle Control Unit (VCU). The electric motor, regulated by the motor control unit, can function as a motor drive or generator. When the engine works as a generator during regenerative braking, the battery can drive the engine or absorb the current from the APU and the electric motor. The RBS series structure shown in Figure 1 is comprised of the RBS control unit, the ABS system, and two duty valves used to adjust the braking force of friction. In the front and back brake lines, the duty valves[6] are mounted.

As shown in the figure, the duty valves are demonstrated and the response time is fast. In order to regulate the pressure, the brake control unit sends PWM signals to the valves, thus controlling the

mechanical driving force under the RBS control system. The ABS controller emits a signal to activate the modulator valve when the ECU detects a back-wheel lockup. Since the RGS is mounted on the rear axle, it is possible to use the same signal to regulate the regenerative braking force and thus enhance car stability by minimizing hard-breaking.

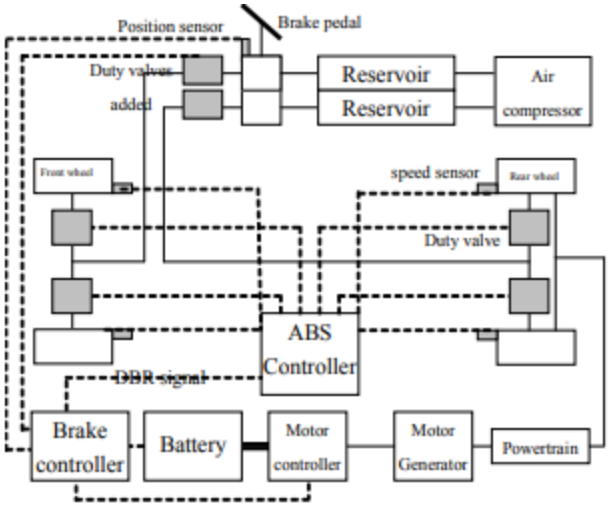

Figure 1 Series RBS

Conclusion

The paper focuses specifically on the use of the electrical energy produced during the regenerative braking of the hybrid vehicle so that the regenerative braking does not need to be shut down.

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