Fully Regenerative braking and Improved Acceleration for Electrical Vehicles

Wim J.C. Melis and Owais Chishty

School of Engineering
University of Greenwich
Central Avenue
Chatham Maritime
Kent ME4 4TB; United Kingdom
E-mail: Wim.J.C.Melis@gre.ac.uk, owaischishty@yahoo.com

Abstract

Generally, car brake systems use hydraulic brake technology, which converts the excess of kinetic energy into heat, effectively resulting in an energy loss. Regenerative braking technology focuses on converting this kinetic energy of the decelerating vehicle back into electrical energy that can then be reused for example during acceleration. Current hybrid vehicles are equipped with such regenerative braking technology, which makes them particularly interesting for situations with frequent deceleration, like city traffic. However, the technology used in these vehicles has its limitations and therefore does not stand on its own, but is always assisted with conventional hydraulic brakes. This paper looks at removing this limitation and allowing a vehicle to fully rely on regenerative braking technology to deal with any braking situation ranging from simple slow down to emergency stops. To enable this, multiple generators with different gear ratios are used. The additional benefit of this construction is that, by introducing the appropriate control circuit, the generators can be used as electrical engines. Since these motors are connected with different gear ratios there is a more consistent acceleration at any speed. The paper shows that the overall efficiency of the system is very close to the efficiency of the generators used while achieving braking performance similar to conventional braking mechanisms.