

Tetiana Bas  
V.V. Protsiv, research supervisor  
V.O. Lapina, language adviser  
National TU «Dnipro Polytechnic», Dnipro, Ukraine

**Using an Electric Drive  
with an Energy Recuperation System on Cars**

At present, the issue of economical use of fuel resources is becoming more acute. One way to solve this problem is to create hybrid and electric cars. Using an electric drive with an energy recuperation system makes it possible to replenish the energy reserve while the vehicle is moving.

It is known that when the car moves, kinetic energy appears. However, when braking in the traditional form, excess energy is simply lost in the form of heat, the brake pads rub against the brake discs, expending kinetic energy for nothing, heating the friction material and metal, giving out the heat eventually to the surrounding air. This is a very wasteful approach.

The system of recuperative braking does not expend kinetic energy simply on friction in order to brake. Instead, an electric motor that is included in the transmission is used, which starts at braking to function as a generator, converting the torque on the shaft into electricity that charges the battery pack. The braking torque of the rotor, which occurs in the generator mode, just gives the car braking. As such, the energy stored in the battery after a while again serves to drive the car, that is, it is used again.

The use of energy recovery systems has reached the greatest development in the area of urban electric transport and rail transport. However, the main difference of cars from this type of transport is the lack of a contact network, where one could give the energy recuperated during braking. Furthermore, the main problem is the very limited possibility of accumulating recovered energy. This is due to the significant cost of its storage devices and its relatively small number.

It is interesting that modern studies of hybrid cars are mainly related to the simulation of assembly schemes and the determination of traction-velocity properties and energy reserves. Questions of researching brake properties of hybrid vehicles on which the energy recuperation and its accumulation systems are used remain open. Similar works are in the development stage in Ukraine.

In general, there are many unresolved issues related to the process of recuperative braking of vehicles. First, there is no single approach to determining the optimal indicators of regenerative inhibition. Secondly, taking into account modern trends based on an integrated approach to the study of complex vehicle systems and the synergistic effect that appears during the use of the energy recovery system, the task of a comprehensive study of the energy recovery system and its properties arises. Thus, the study of energy recovery systems on vehicles remains relevant.