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## **Energy Management**

### **— Technology for higher environmental performance of vehicles —**

One of the major challenges facing the auto industry today is how to increase fuel efficiency while reducing CO2 emissions. Despite the many advances in technology, only about 20 percent of fuel energy is actually used for driving the vehicle and some is used for other functions like powering the alternator or air conditioning system, while the remaining fuel energy is simply wasted. To help resolve these issues, DENSO is committed to “Energy Management,” an approach to a more efficient use of fuel energy, along with further development of fuel-saving technologies like gasoline direct injection, diesel common rail systems, hybrid system products, and start and stop system components.

#### **DENSO’s Energy Management Approach is Based on the following Principles:**

##### **1. Reducing the burden on an engine**

DENSO is working to improve the efficiency of alternators so they produce more electricity. The company also strives to reduce the amount of energy consumed by air conditioning systems and other devices. In addition, DENSO is developing a system to control the air conditioning system and alternator in response to the continuously changing engine load, which will use the energy generated by the engine more efficiently.

Looking forward, DENSO is conducting research on a “car-navigation cooperative control system,” a system that uses road information from the car navigation system to precisely control the alternator in accordance with changes in driving conditions.

##### **2. Recovering lost energy through regeneration**

There are mainly two types of energy wasted in vehicles: the thermal energy emitted from the engine and other devices, and the kinetic energy dissipated while braking.

To use the wasted thermal energy, DENSO is developing a new system that uses exhaust heat from the engine to improve heating performance during the winter. This also will quickly warm the engine and transmission to the optimum temperature for driving, which helps to improve fuel economy. To better utilize wasted kinetic energy, DENSO is improving the performance of products and systems that convert deceleration energy into electricity.

By integrating a wide range of technologies used in powertrain, thermal, electric, electronic and information and safety systems, DENSO is developing environmentally friendly technologies. These efforts help contribute to the improvement of a vehicle's environmental impact without influencing the vehicle's safety, comfort, or convenience.

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