DENSO

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Permanently Engaged Starter for Start and Stop Systems

— Achieving quicker and quieter engine restart and less engine stop vibration —

How much gas do you think your car wastes while idling at a stoplight? Now multiply that by about 254 million – According to a 2007 U.S. Department of Transportation study, that is the estimated number of registered passenger vehicles in the United States. Imagine the gallons of oil that could be saved if the engine was cut at a stop, not to mention the monetary savings on your pocketbook or the positive impact on the environment.

Start and stop systems automatically stop the engine while the vehicle is idling at a stop light or in other traffic situations to help reduce fuel consumption and CO_2 emissions. In North America, demand for this system is expected to grow in the near term as fuel economy regulations become more stringent.

DENSO has developed the permanently engaged starter, a key component for start and stop systems, which achieves a quicker, smoother and quieter engine restart. Created jointly with Toyota Motor Corp., the starter is used in Toyota models, such as the Auris and Yaris models sold in Europe since January 2009. The system is expected to proliferate the North American market in the next two to five years.

Conventional start and stop system starters disengage gears, which can result in up to a 1.5 second engine-restart delay. More specifically, when starting a conventional starter, the pinion gear is thrust forward to engage the ring gear (the engine flywheel gear), and when the ignition key is returned to the "on" position, the two gears disengage to bring the pinion gear back to the original position. With this conventional structure the pinion gear does not mesh with the ring gear while the ring gear is coasting - even after the vehicle is stopped and the fuel supply ceases - which results in the delayed restart immediately after the vehicle has stopped. DENSO's permanently engaged starter solves this issue, because it constantly engages the pinion and ring gear, allowing the engine to restart more quickly and smoothly.

Compared to conventional starters, the new starter's structure also prevents gear-tooth striking noise. For better driver comfort, DENSO also uses a rubber shock absorber and a clutch to isolate engine oscillations* that help reduce engine-restart noise and engine-stop vibrations.

DENSO, which has been making starters since its foundation 60 years ago, has been commercially producing start and stop system starters since 2003. Based on technologies accumulated over many years, DENSO will continue to develop products to help vehicles increase fuel efficiency and reduce CO_2 emissions.

*Engine oscillation refers to when the engine repeats forward rotation and reverse rotation before it is stopped completely, causing the vehicle's seats to vibrate.

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