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Antonov dual-speed drive helps reduce vehicle fuel consumption by making engine accessories more efficient

Numerous applications of a simple dual-speed drive unit have emerged from Antonov Automotive Technologies, which can help to make cars more fuel and CO₂ efficient.

The dual-speed drive units reduce fuel consumption by allowing alternators, water and air-conditioning pumps, superchargers and other engine ancillaries to operate more often in their most efficient speed range.

The innovative technology is based on a simple mechanical shift for an automatic transmission system invented 20 years ago by the polymath scientist-engineer Roumen Antonov.

Today, the vehicle technology company has a dual-speed supercharger and a self contained dual-speed pulley drive already in production and other applications in development.

The purely mechanical fully automatic system does away with the need for expensive electronic, pneumatic or hydraulic control systems.

Antonov expects that the highest volume application for the technology is in engine accessory drive systems. Antonov has integrated its dual-speed drive unit into the pulley located at the front end of an engine crankshaft, which drives auxiliary units such as the water and air-conditioning pumps and electrical alternator.

The ability for the drive unit to operate as a passive device without the need for external electronic controls or hydraulic systems is a major cost-reducing benefit. There is also no need to modify the base engine, making the drive unit easy to apply to existing powertrain systems.

The dual-speed front end accessory drive employs a planetary gear set to enable either a direct or step-up ratio. In this configuration, smaller and less expensive alternators, water and air-conditioning pumps can be fitted. These ancillaries achieve their required output at engine idle by being driven through the pulley system at up to twice their normal speed. Once the engine itself speeds up a clutch in the dual-drive unit is automatically closed and the pulley system reverts to direct drive. In this mode it has no mechanical losses as all the internal elements are locked giving in effect a solid pulley.

“The benefit of a two-speed drive is the efficiency gain by not running the alternator, water and air-conditioning pumps faster than is needed for effective operation,” says programme director Philippe Echardour.

“The impact of this on vehicle fuel consumption depends on vehicle size, but independent studies have shown between 4 and 5 per cent improvements. This is more than sufficient to justify the expected \$100 additional cost of a two-speed pulley.”

“Further benefits will unfold as geared pulley systems are more widely adopted and when powertrain engineers start to design the front end accessory drive incorporating dual-drive units.”

Antonov has similarly developed a standalone dual-speed alternator. This is targeted at a specific client application where insufficient current can be generated by the alternator at engine idle speed to meet the high demand from the vehicle. The vehicle currently has to have two alternators fitted which adds cost, package complexity and adds to losses at higher engine speeds. Antonov is now looking for other applications for this unit to assess if there is sufficient production demand to justify the development and tooling investment to take this to production.

The supercharger application, already in production for aftermarket applications, delivers better low end torque to an engine improving a vehicle’s performance and driveability. The torque curve can be tuned so that a small displacement downsized engine can match the performance of a much larger naturally aspirated engine.

Antonov’s research and development engineers say that dual-speed drive units can provide an optimum solution when considering the cost, weight, packaging and vehicle refinement implications of supercharging engines for high volume series production. The availability of two speeds allows the charge of air from the supercharger to the engine to be delivered over a wide engine speed range.

Antonov has recently launched a self contained two-speed pulley unit, the Antonov dual pulley unit (DPU), to make available the benefits of dual speed drives to any belt driven application. The initial target market is US aftermarket supercharger installations where the relay pulley in the standard installation can be replaced by an Antonov DPU to provide two speed supercharger operations.

Three dual-speed supercharger studies are currently being pursued by Antonov. This includes an engine downsizing application for a typical family car, an aftermarket application already in production for high performance vehicles and a performance enhancement application for off-road vehicles with relatively poor class performance, which is also in production. Each of these vehicles is available for assessment.

Ends

Note to editors:

Journalists are welcome to drive a number of Antonov technology demonstration vehicles at the SMMT test day at Millbrook on Thursday 22 May. Antonov’s dual-speed supercharger technology will be demonstrated in a variety of vehicle types comprising a family saloon (Chevrolet Lacetti), off-road vehicle (Hummer H3) and high performance vehicle (Ford Mustang). In addition a low cost 4-speed automatic transmission will be demonstrated in a previous generation Vauxhall/Opel Corsa. Visits can also be arranged to the company’s new technical centre at Warwick for further driving opportunities and an interview with chief executive John Moore and operations director Chris Baylis.

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Picture 1: Antonov dual-speed supercharger

Picture 2: Antonov dual-speed front end accessory drive

Picture 3: Antonov dual pulley unit

Picture 4: Antonov dual-speed alternator

Images for this release and previous press releases and pictures can be downloaded from www.newspress.co.uk