



Water injection

Water instead of gasoline: Bosch innovation reduces fuel consumption by up to 13 percent

August 30 2016

PI 9254 FF GS/Tau

- ▶ Bosch is the first and only supplier to offer water injection
- ▶ Extra bonus: water saves fuel and can increase engine power
- ▶ Online special with videos and animated films: www.bosch-waterboost.com

Did you know that even advanced gasoline engines waste roughly a fifth of their fuel? Especially at high engine speeds, some of the gasoline is used for cooling instead of for propulsion. While Bosch didn't create an engine that gets its energy from water, it has introduced water injection as a new way to cool the engine and generate additional boost. Particularly when accelerating quickly or driving on the freeway, the injection of additional water makes it possible to reduce fuel consumption by as much as 13 percent in highway conditions and four percent in normal driving. "With our water injection, we show that the combustion engine still has some tricks up its sleeve," says Dr. Rolf Bulander, chairman of the Bosch Mobility Solutions business sector and member of the board of management of Robert Bosch GmbH. The fuel economy offered by this Bosch technology comes especially to the fore in three- and four-cylinder downsized engines: in other words, in precisely the kind of engines to be found under the hood of any average midsize car.

Extra boost for the turbocharged engine

But it is not only in the area of fuel economy that the Bosch innovation comes into play. It can make cars more powerful as well. "Water injection can deliver an extra kick in any turbocharged engine," says Stefan Seiberth, president of the Gasoline Systems division at Bosch. Earlier ignition angles mean that the engine is operated even more efficiently. On this basis, engineers can coax additional power out of the engine, even in powerful sports cars.

The basis of this innovative engine technology is a simple fact: an engine must not be allowed to overheat. To stop this from happening, additional fuel is injected into nearly every gasoline engine on today's roads. This fuel evaporates, cooling critical components like the engine block and turbo charger. With water injection, Bosch engineers have exploited this physical principle. Before the fuel ignites, a fine mist of water is injected into the intake duct. Water's high heat of vaporization means that it provides effective cooling.

This is also the reason only a small additional volume of water is needed: for every one hundred kilometers driven, only a few hundred milliliters are necessary. As a result, the compact water tank that supplies the injection system with distilled water only has to be refilled every few thousand kilometers at the most.

And if the tank should run empty, there is nothing to worry about: the engine will still run smoothly – albeit without the higher torque and lower consumption provided by water injection.

Like many of the technologies introduced in recent years, the idea of water injection isn't new. Water injection is emerging as a possibility today due to the convergence of fuel economy requirements, the increased accessibility of direct injection technology and the need for more enrichment due to the heating caused by downsizing with turbocharging. Bosch has the unique systems know-how and the right components to make yesterday's dreams a reality today.

Additional questions and answers

Is this technology already in production?

The BMW M4 GTS is the first production vehicle to feature an innovative and groundbreaking water injection system. In the vehicle's turbocharged six-cylinder engine, it offers improved performance and consumption even at full load. Bosch supplies water injection parts for the [BMW M4 GTS](#).

How high is fuel consumption in the driving cycle?

In the future consumption test (WLTC), water injection makes it possible to save up to 4 percent fuel. In real driving conditions, even more is possible: here, fuel consumption can be reduced by up to 13 percent when accelerating quickly or driving on the freeway.

Doesn't water injection cause the engine to rust?

No. No water is left in the combustion chamber. The water evaporates before combustion happens in the engine. All the water is expelled into the environment, together with the exhaust.

How is water refilled?

Water injection only requires a small amount of water to be kept on board. On average, it only has to be refilled every 3,000 kilometers. The separate water tank has to be filled with distilled water.

Can the water in the tank freeze?

Bosch has thought through all aspects of this system so the product is viable in both hot and cold environments. The water flows back into its tank when the engine is stopped, where it may freeze in cold weather. The water is thawed following the re-start of the engine.

Is there such a thing as direct water injection?

Bosch uses a port injection system, since it has clear technical advantages and costs less. This makes water injection suitable for large-scale production, as well as for many vehicle segments.

Press photos: 1-GS-22226, 1-GS-22227, 1-GS-22228, 1-GS-22229, 1-GS-22230

Contact person for press inquiries:

Tim Wieland

Robert Bosch LLC

Phone: +1 248-876-7708

Tim.Wieland@us.bosch.com

About Bosch

Having established a regional presence in 1906 in North America, the Bosch Group employs some 31,000 associates in more than 100 locations, as of December 31, 2015. In 2015, Bosch generated consolidated sales of \$14 billion in the U.S., Canada and Mexico. For more information, visit www.boschusa.com, www.bosch.com.mx and www.bosch.ca.

Mobility Solutions is the largest Bosch Group business sector. In 2015, its sales came to 41.7 billion euros, or 59 percent of total group sales. This makes the Bosch Group one of the leading automotive suppliers. The Mobility Solutions business sector combines the group's expertise in three mobility domains – automation, electrification, and connectivity – and offers its customers integrated mobility solutions. Its main areas of activity are injection technology and powertrain peripherals for internal-combustion engines, diverse solutions for powertrain electrification, vehicle safety systems, driver-assistance and automated functions, technology for user-friendly infotainment as well as vehicle-to-vehicle and vehicle-to-infrastructure communication, repair-shop concepts, and technology and services for

the automotive aftermarket. Bosch is synonymous with important automotive innovations, such as electronic engine management, the ESP® anti-skid system, and common-rail diesel technology.

The Bosch Group is a leading global supplier of technology and services. It employs roughly 375,000 associates worldwide (as of December 31, 2015). The company generated sales of 70.6 billion euros in 2015. Its operations are divided into four business sectors: Mobility Solutions, Industrial Technology, Consumer Goods, and Energy and Building Technology. The Bosch Group comprises Robert Bosch GmbH and its roughly 440 subsidiaries and regional companies in some 60 countries. Including sales and service partners, Bosch's global manufacturing and sales network covers some 150 countries. The basis for the company's future growth is its innovative strength. At roughly 118 locations across the globe, Bosch employs 55,800 associates in research and development. The Bosch Group's strategic objective is to deliver innovations for a connected life. Bosch improves quality of life worldwide with products and services that are innovative and spark enthusiasm. In short, Bosch creates technology that is "Invented for life."

Additional information is available online at www.bosch.com, www.bosch-press.com, twitter.com/BoschPresse.

Exchange rate: 1 EUR = \$1.1095

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