

Bosch introduces Rapid Catalyst Heating to reduce cold-start emissions from gasoline engines

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- ▶ Rapid Catalyst Heating accelerates catalyst activation.
- ▶ Emissions reduced during the cold-start phase of vehicle operation.

Farmington Hills, Mich – As automakers focus on the efficiency and performance of internal combustion and hybrid powertrains as part of a multi-lane approach to vehicle propulsion, Bosch is advancing technologies that help to reduce real-world emissions without requiring major vehicle redesigns.

Bosch is introducing Rapid Catalyst Heating (RCH), a system designed to reduce cold-start emissions in gasoline-powered vehicles. The RCH system accelerates catalyst activation (i.e., catalyst “light-off”) during the first seconds of operation, when tailpipe emissions can be highest. By rapidly elevating exhaust temperature, Bosch’s RCH system minimizes light-off delay while enhancing catalyst efficiency during the engine start.

Cold-start emissions – those that occur prior to catalyst light-off – commonly account for the majority of a vehicle’s emissions footprint. Although more severe during colder ambient temperatures, catalyst heating is required across the full range of environmental conditions. Traditional catalyst heating strategies rely on engine-based methods that compromise efficiency for elevated exhaust temperatures. To address this challenge, Bosch developed the RCH system to accelerate catalyst warm-up and reduce cold-start emissions without requiring significant changes to vehicle architecture. Unlike electrically heated catalysts or engine-based warm-up strategies, RCH delivers high thermal power using existing vehicle systems without requiring high-voltage architectures or major aftertreatment redesign.

“As the industry transitions across multiple propulsion technologies, internal combustion engines will continue to play a major role globally for years,” said Peter Tadros, regional president, Power Solutions, Bosch in North America.

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“That reality makes it critical to reduce emissions from the vehicles entering the market with conventional ICE powertrains. Cold start emissions are a key challenge, and the Bosch Rapid Catalyst Heating addresses that issue in a way automakers can deploy at scale without disrupting existing vehicle architectures.”

How the RCH system works

The Rapid Catalyst Heating system features an integrated, fuel-based auxiliary burner that delivers additional thermal energy directly to the exhaust stream, rapidly increasing catalyst temperature during cold start and early drive-off. Key features include:

- 25+ kilowatts (nominal) of available thermal power to help accelerate catalyst warm-up.
- Operates independently from the engine, reducing calibration complexity and efficiency trade-offs.
- Compatible with existing vehicle architectures, operating on a 12-volt electrical system and low-pressure gasoline fuel supply.
- Allows flexible integration with both closely coupled and underfloor catalyst configurations.

By decoupling catalyst heating from engine operation, the system helps enable earlier and more consistent emissions conversion during periods when tailpipe emissions are typically highest. Exhaust thermal management is particularly important in hybridized powertrains – when catalyst temperatures can drop below critical “light-off” thresholds during all-electric operation.

Emissions benefits

Vehicle testing shows that RCH can help reduce emissions by up to 70 percent during cold start and early drive-away conditions. These reductions persist across passenger vehicles and larger platforms, including pickup trucks, under standard and quick drive-away cycles.* Faster catalyst activation may also reduce the needed density of precious metal loading and calibration complexity, helping offset system costs while supporting reduced emissions standards.

RCH aligns with the broader Bosch strategy to advance emissions reductions across multiple propulsion systems while focusing on solutions automakers can implement today. Bosch continues validation with OEM partners, emphasizing durability, packaging flexibility and readiness for series production.

**Note: For a technical overview of RCH development, implementation and performance, see: Disch, C., O'Donnell, R., Singh, R., Chutipassakul, S., et al., “A Rapid Catalyst Heating System for Gasoline-Fueled Engines,” SAE Int. J. Adv.*

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About Bosch

Having established a presence in North America in 1906, today the Bosch Group employs around 38,000 associates in more than 100 locations in the North American region (as of Dec. 31, 2024). According to preliminary figures, Bosch generated consolidated sales of \$18.7 billion in the U.S., Mexico and Canada in 2025. For more information visit www.bosch.us, www.bosch.mx and www.bosch.ca.

The Bosch Group is a leading global supplier of technology and services. It employs roughly 412,000 associates worldwide (as of December 31, 2025). According to preliminary figures, the company generated sales of 91 billion euros in 2025. Its operations are divided into four business sectors: Mobility, Industrial Technology, Consumer Goods, and Energy and Building Technology. With its business activities, the company aims to use technology to help shape universal trends such as automation, electrification, digitalization, connectivity, and an orientation to sustainability. In this context, Bosch's broad diversification across regions and industries strengthens its innovativeness and robustness. Bosch uses its proven expertise in sensor technology, software, and services to offer customers cross-domain solutions from a single source. It also applies its expertise in connectivity and artificial intelligence in order to develop and manufacture user-friendly, sustainable products. With technology that is "Invented for life," Bosch wants to help improve quality of life and conserve natural resources. The Bosch Group comprises Robert Bosch GmbH and its roughly 490 subsidiary and regional companies in over 60 countries. Including sales and service partners, Bosch's global manufacturing, engineering, and sales network covers nearly every country in the world. Bosch's innovative strength is key to the company's further development. At 136 locations across the globe, Bosch employs some 82,000 associates in research and development.

The company was set up in Stuttgart in 1886 by Robert Bosch (1861-1942) as "Workshop for Precision Mechanics and Electrical Engineering." The special ownership structure of Robert Bosch GmbH guarantees the entrepreneurial freedom of the Bosch Group, making it possible for the company to plan over the long term and to undertake significant upfront investments in the safeguarding of its future. Ninety-four percent of the share capital of Robert Bosch GmbH is held by Robert Bosch Stiftung GmbH, a limited liability company with a charitable purpose. The remaining shares are held by Robert Bosch GmbH and by a company owned by the Bosch family. The majority of voting rights are held by Robert Bosch Industrietreuhand KG. It is entrusted with the task of safeguarding the company's long-term existence and in particular its financial independence – in line with the mission handed down in the will of the company's founder, Robert Bosch.

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

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