

## PRESS RELEASE

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### **Algorithm for greener mobility: Gaining up to 8 percent more range in real-world driving**

- **ZF and Embotech are joining forces to maximize efficiency and minimize travel time**
- **Model predictive control (MPC) optimization algorithm uses information from the map and ADAS sensors, as well as powertrain know-how, to reduce the energy demand of the vehicle via a sustainable adaptive cruise control (ACC)**
- **Prepared for the software-defined vehicle, the function can be easily integrated as a software add-on onto series ACCs both for passenger cars and commercial vehicles**

**Friedrichshafen, Germany / Zurich, Switzerland. Assist systems such as adaptive cruise control can not only make driving more comfortable, but also enable energy savings and increase electric range through more efficient driving strategies. ZF has developed a predictive adaptive cruise control (ACC), ZF Eco Control 4 ACC, that enables up to eight percent more range. A core component of this ACC add-on is a Model Predictive Control (MPC) optimization algorithm from Embotech. In particular, it evaluates in real time map information such as uphill and downhill gradients and curves, as well as in-vehicle information about the optimal operating points of the powertrain.**

Successful field tests by ZF have shown that Eco Control 4 ACC can achieve a range gain of up to eight percent in real world traffic. As an add-on function for series ACCs, it can be used in both passenger cars and commercial vehicles, regardless of the type of powertrain. "Eco Control 4 ACC is a ground-breaking development that brings us a significant step closer to Vision Zero emissions," said Uwe Class, Vice President Advanced Systems Development at ZF. "Above all, this solution is practical for everyday use and available for series production."

Alexander Domahidi, Embotech's CTO and Cofounder added: "Eco Control 4 ACC is a game-changer in CO<sub>2</sub> emissions reductions. The saving potential of up to eight percent with 'just a piece of code' is a giant step forward to revolutionize greener mobility and transportation. This is one proof point for Embotech's commitment to offer autonomous software solutions that make our customers' technology more sustainable."

#### **MPC optimization algorithm maximizes efficiency or minimizes travel time**

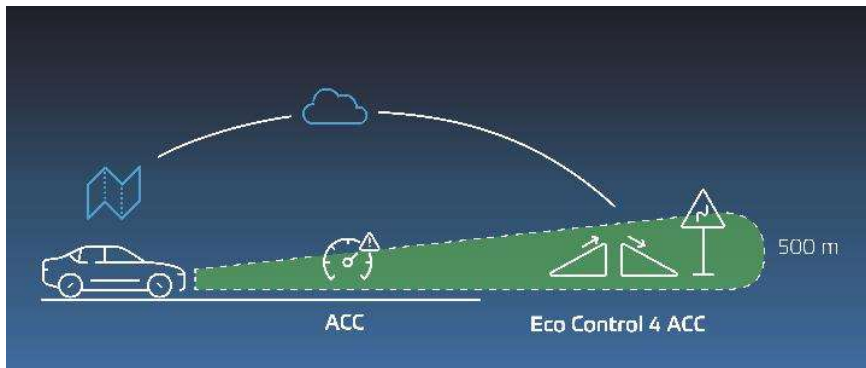
The basis for the optimum driving strategy is the individual decision of the respective driver as to whether the predictive cruise control should maximize efficiency or minimize travel times. A balanced mix of the two strategies is also possible. In addition, the assistance system orients itself as best as possible to the speed set by the driver. Based on these pre-settings, everything else runs automatically.

The algorithm now continuously evaluates the map data in the navigation system and the operating data of the powertrain system for the next 500 meters. This means that information about the following uphill and downhill gradients, curves or speed restrictions is continuously incorporated into the evaluation, and the assistance system attempts to

balance time and energy in the best possible way. In contrast to conventional adaptive cruise control systems, this control system is not rigidly rule-based: In the optimization, the software weighs all of the default settings against all possible use cases in a 500-meter horizon simultaneously and in real time. In addition, the system uses the powertrain's efficiency maps to optimize the current operating point.

Here, the competencies of ZF and Embotech complement each other perfectly: while ZF can provide the appropriate information for the assistance system from its system understanding of the entire vehicle and control the acceleration and braking, Embotech contributes its deep understanding of the appropriate algorithms for real-time evaluation of this data and its embedded solutions. All in all, the two partners have developed a system that gives drivers higher range and lower operating costs without sacrificing comfort and can thus sustainably reduce the burden on the environment. The spectrum of possible applications that ZF can serve ranges from passenger cars to buses and heavy commercial vehicles.

Pictures:



ZF Eco Control 4 ACC, a software add-on to series adaptive cruise control (ACC) driver assistant systems, can increase the vehicle range up to eight percent. A core component of this ACC add-on is a Model Predictive Control (MPC) algorithm from Embotech. It evaluates in real time map information such as uphill and downhill gradients and curves, as well as in-vehicle information about the optimal operating points of the powertrain.

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**About ZF**

ZF is a global technology company supplying systems for passenger cars, commercial vehicles and industrial technology, enabling the next generation of mobility. ZF allows vehicles to see, think and act. In the four technology domains of Vehicle Motion Control, Integrated Safety, Automated Driving, and Electric Mobility, ZF offers comprehensive product and software solutions for established vehicle manufacturers and newly emerging transport and mobility service providers. ZF electrifies a wide range of vehicle types. With its products, the company contributes to reducing emissions, protecting the climate and enhancing safe mobility.

With some 165,000 employees worldwide, ZF reported sales of €43.8 billion in fiscal 2022. The company operates 168 production locations in 32 countries.

For further press information and photos, please visit: [www.zf.com](http://www.zf.com)

**About Embotech**

Embotech is a leading solution provider of AI software for autonomous systems. The company's automation solutions bring significant improvements in safety, productivity, and energy efficiency to logistics yards, ports, mines, and smart factories. Applications include automated driving for passenger cars and commercial vehicles, energy management solutions such as speed profile optimization or mission optimization and, furthermore, industrial robotics automation such as fully automated vehicle charging systems. This complete range of products can significantly reduce costs for electrification and decarbonization in vehicle logistics and intralogistics use cases.

The company, short for Embedded optimization technologies, is a growing tech SME with its head office in Zurich, Switzerland and serves more than 50 customers around the globe.

For further information, please visit [www.embotech.com](http://www.embotech.com)