

Flexibility through standardization

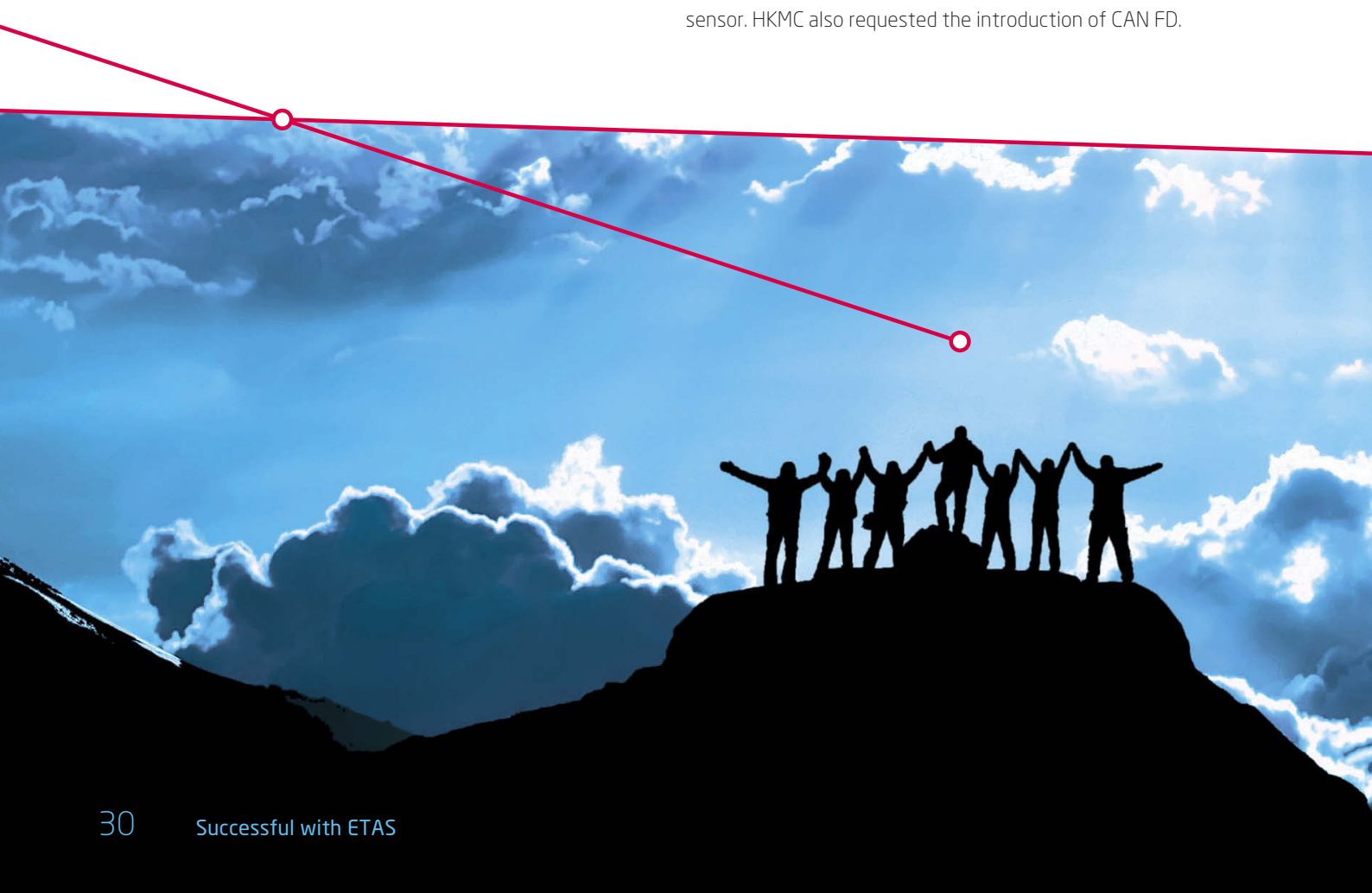
AUTOSAR implementation a team success

It may seem counter-intuitive, but standardization can actually increase flexibility. That's because reliable, standardized basic software speeds up the process of implementing changes and new functions. One company that recently experienced these benefits is the Korean company Motonic, which supplies oil pump units (OPUs) to the Hyundai-Kia Motor Company (HKMC). The engineers introduced CAN FD and AUTOSAR for an oil pump control unit and quickly achieved their goals thanks to ETAS' solutions. Here we take a closer look at how they accomplished this.

Meeting an ambitious goal

In the past, traditional hybrid vehicles typically incorporate two types of oil pumps to produce oil pressure for automatic transmissions: a mechanical pump for the combustion engine, and an electric one for the electric motor. In contrast, modern hybrid vehicles require just one electric pump, which reduces the volume of the system and improves fuel efficiency. Here, a permanent magnet synchronous motor (PMSM) was chosen instead of a brushless direct current motor (BLDC).

There are numerous parameters involved in controlling an oil pump, including torque transmission, lubrication/cooling/slip compensation, and leakage compensation. Base torque transmission in this case relates to the vehicle operating status (stationary/driving), using the line pressure of the automatic transmission and the oil temperature as input data. An additional goal of the new system was to introduce a sensor-less control algorithm for PMSM to improve motor performance and reduce the risk of failure posed by the Hall effect position sensor. HKMC also requested the introduction of CAN FD.



The previous control system was heavily dependent on a specific microcontroller unit (MCU). As a result, the incorporation of new MCUs was an extremely time-consuming process. To solve this problem, Motonic introduced the ETAS RTA basic software based on the AUTOSAR platform, making it possible to run the application software independently of the microcontroller.

Challenges along the way

A new standard development process for MCU firmware was established by developing a specific motor complex device driver (CDD) based on AUTOSAR. ETAS provided support in the form of a global team of experts from Korea, the UK, Germany, and Italy who assisted Motonic with the introduction of the AUTOSAR platform and the new functions.

The Motonic team used ETAS ASCET to develop the software for diagnosis and fail-safe and for the coordination control algorithm. The sensorless control algorithm, however, was hand-coded. The key challenge was to ensure AUTOSAR-compliant implementation of the control timing in line with the specifications. The team's efforts paid off, resulting in an optimized execution and synchronization control algorithm for the new motor. The flash bootloader (FBL) and diagnostic specification satisfied HKMC, too.

The ETAS engineering team performed the AUTOSAR BSW prototype configuration for the OPU FBL development using the basic software RTA-BSW, the operating system RTA-OS, the runtime environment RTA-RTE, and the flash bootloader RTA-FBL. Local technical support and training were also included. The developers also used the integrated AUTOSAR architecture and basic software configuration tool ISOLAR-A, the configuration tool ISOLAR-B, INCA for calibration, diagnostics, and validation, and the CAN FD Bus Interface ES582.

Benefits

Motonic began production of the new OPU with a flexible and reliable firmware platform built on AUTOSAR basic software that has been tried-and-tested in millions of vehicles on the road. This new sensorless control algorithm reduces the risk of failure. The project gave Motonic in-depth insights into the AUTOSAR platform, resulting not only in better technology, but also key improvements to the development process. Motonic has achieved its goals and now has a solid basis on which to build a successful future.

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