14th AUTOMOTIVE
BRAKING SYSTEMS 2022
ELECTRIFICATION | AD/AV | BRAKE-BY-WIRE | FUTURE ARCHITECTURE

ELECTRIC BRAKING SYSTEMS: OUT WITH THE OLD, IN WITH THE NEW

FEATURING

DR. BARNA SZIMANDL,
PROJECT LEADER BRAKES AT
THYSSENKRUPP PRESTA AG

thyssenkrupp
Presta AG

Automotive iQ

Electric braking systems have been part of our vehicles for a few decades now; it started with Anti-lock Braking System (ABS) which prevents the wheels from locking and Electronic Stability Program (ESP) functions. These functions are part of electronic braking systems (EBS) and can be referred to as the 'first generation' of brake-by-wire.

Today, OEMs are rolling out the second generation of brake-by-wire; where braking is done through sensors and electronic signals, which will be applied to autonomous vehicles at level 4/5 automation. However, the brake systems in level 4/5 vehicles must be fully redundant to ensure operation in case of failures, as they won't be relying on the driver.

Earlier electronic braking systems function with hydraulic technology (electro-hydraulic braking), so what are the differences and benefits of the new brake-by-wire systems? We spoke to **Dr. Barna Szimandl, Project Leader Brakes at thyssenkrupp Presta AG** to get some clarity.

> "For the first generation of brake-by-wire systems for domestic cars, the traditional hydraulic technology provides a good solution. Since, on one hand it is based on a proven technology and is easy to extend with further functionalities with the introduction of new components. On the other hand, it can simply switch to the driver taking over to apply the brakes, should there be a major failure in the system.
>
> For the second generation, brake-by-wire systems for autonomous cars use Electro-Mechanical Brake (EMB) technology, which can utilise fail tolerant operation on a competitive cost level. Additionally, it provides many further benefits for the OEMs as well as the final customer, which include flexibility in the vehicle architecture, less maintenance, lifetime zero brake drag, possibility for more wheel individual braking for advanced functions, more freedom for NVH optimization, scalable redundancy, diagnostic possibilities on wheel level etc."

Barna mentions how the new EMB technology is better for noise, vibration, and harshness (NVH), so we asked him to explain further how it will work.

> "With the EMB technology the NVH can be improved further. On one hand there is a bigger freedom to shift the eigenvalues of the brake callipers to be able to create a robust design for the NVH, generated by the sliding friction. On the other hand, the actuation noise is better separated from the driver and the passengers due to the relocation of the actuation from the firewall to the wheels. Besides this, the parking brake functionality can be integrated to the EMB actuators directly even for both the front and rear axles and able to enhance the comfort for the parking brake function, too."

There are currently still plenty of vehicles on the road with a traditional pedal braking system, and others with EBS and now the development of brake-by-wire – so how does it all work? Barna explains the function of brake-by-wire.

> "With the hydraulic brake systems, the control of the vehicle, the wheel and the brake actuator dynamics is centralised. As for the EMB actuators, due to the smart actuator approach there is a possibility for decentralization and arbitrary allocation of different braking functionalities.
>
> Our EMB smart actuator concept is able to provide a high clamping force dynamic and we can connect the wheel speed sensors directly to the integrated ECU of the EMBs. With this the brake actuator dynamics and the wheel dynamics can be handled on wheel level. Naturally, the vehicle dynamics have to be handled on vehicle level by the domain ECU. This approach makes it possible to simplify the control architecture to be able to reduce the effort for the tuning sessions and allow us to reduce the application time and the application cost significantly. Besides, the communication speed between the domain ECU and the EMB actuators can be decreased with this method. We believe that this method brings us to a new era of brake control."

Barna will be speaking at Automotive IQ's 14th **Automotive Braking Systems 2022** conference, which focuses on the latest developments in brake systems, including brake-by-wire technology. Register for the 14th **Automotive Braking Systems 2022** event, taking place in Frankfurt, Germany from 30th August - 1st September 2022.

TO REGISTER PLEASE CLICK HERE

DOWNLOAD THE AGENDA

Steven Wicks
Online Content Manager
Automotive IQ

14th AUTOMOTIVE
BRAKING SYSTEMS 2022
ELECTRIFICATION | AD/AV | BRAKE-BY-WIRE | FUTURE ARCHITECTURE