



HAVEit

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The future of driving.

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Executive summary

This consortium confidential document describes the results of the Brake-by-Wire development within the HAVEit project. The power distribution and the central communication of the braking system are designed into one unit called SCM (System Control Module). Thereby advantages are gained both in terms of an easier system set up. For instance can the number of FlexRay transceivers and controllers needed be reduced, compared to a distributed system.

The system architecture has two independent circuits to comply with the brake regulation requirement. Each circuit has an SCM and also an XCC (see D21.1 and D21.2) module for function control and redundancy management.

Connected to the SCM's are new developed HMI's for service and parking brake functions as well as the functional switch board for specific driver demand signals. The EMB (Electro Mechanical Brake) actuators at the wheel-end have been re-designed to cope with the HAVEit structure and to get clear distinction between service brake and parking brake function.

Background

Current brake systems on heavy vehicles are pneumatically actuated which is a drawback in order to reach optimized performance under all road conditions. Even though the development of the pneumatically actuated systems have gone through several steps with a higher degree of electrification to reach increased performance, including ABS, EBS and ESP, still the actuation at the wheel-end uses the same principle as 30 – 40 years ago. In order to take a further step towards reduced stopping distance, energy optimized braking and increased performance in conjunction with advanced driver assistance systems (ADAS) a system based upon Electro Mechanical Brake (EMB) actuation is required. Brake systems together with steering systems are classified as safety critical which means they must cope with a single failure in the systems in a fail-safe way.

The international braking regulation of the UNO-Economic Commission for Europe – ECE-Regulation No. 13 gives the requirements for vehicle braking systems within the EU and can in principle be used for the type approval of an EMB system. Paragraph 5.2.1.2.7.2 of the regulation says that there must be at least two completely independent energy reserves, each provided with its own transmission likewise independent. In addition, paragraph 5.2.1.13.1 says that each of the energy reserves must be equipped with a warning device, detecting the energy level.

The aim of WP 4200 is to design and equip a 4x2 truck with an EMB system according to the vehicle 2E architecture of HAVEit, meaning two electronic systems; no pneumatic system (see figure 1). Thereafter a pre-homologation of the vehicle will be done in cooperation with an independent institute (TÜV Nord) and the vehicle manufacturer (Volvo).

Conclusions

The work done so far within the challenge of Brake-by-Wire for WP4200 has been concentrated on finding a sufficient system architecture having the ability to comply with the brake regulations, but also to serve as a base for future commercialization of such a system. Therefore the project team has chosen to integrate many of the sub modules (HMI ECU, power supply, star coupler and ESP) into one unit called System Control Module (SCM). By

using two SCM's in the system and each of them being connected to its peer XCC a robust dual circuit concept will be achieved.

As the design phase of the Brake-by-Wire system now is finished and prototype build has been started, the next milestone will be the implementation of the system into the Volvo FH12 4x2 truck which now has been made available to the project as well.