



AEROFLEX

**Aerodynamic and Flexible Trucks for Next Generation
of Long Distance Road Transport**

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Publishable Executive Summary

In AEROFLEX WP2 a so-called Advanced Energy Management Powertrain (AEMPT) has been developed. It includes a pulling unit (truck), one or more electric trailer units, software to make the vehicle units work together efficiently and a communication system which allows the vehicle units to exchange necessary information. Figure 0-1 gives an overview of the system.

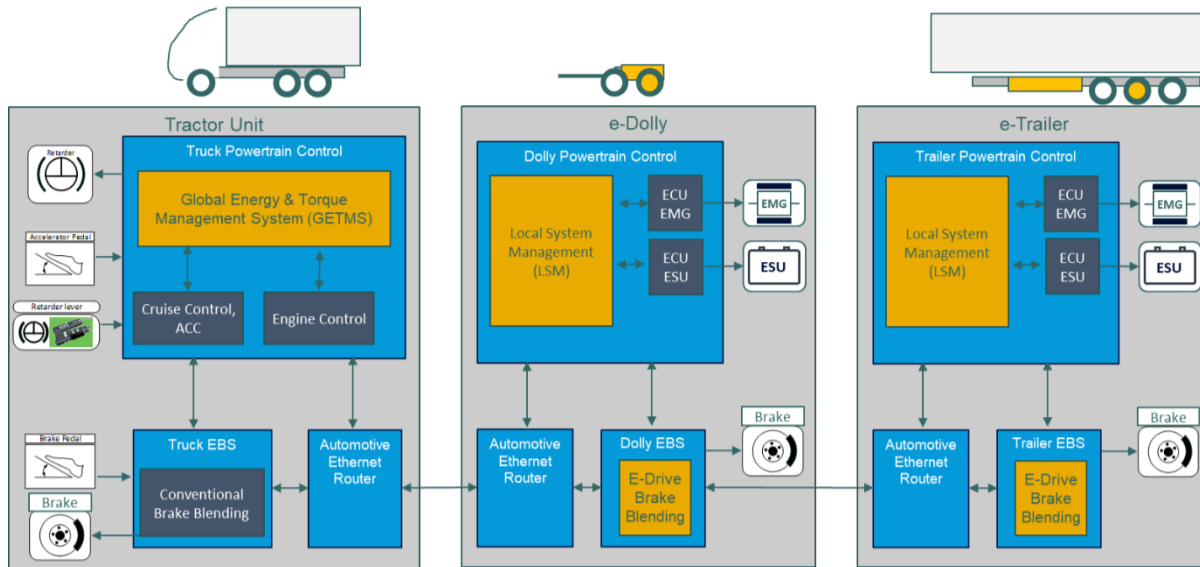


Figure 0-1: Topology of the AEMPT System

The components have been developed by different partners:

- MAN modified the truck powertrain control in order to consider the additional electric drives.
- Van Eck and Fraunhofer IVI develop the e-Dolly
- Wabco develops the e-Dolly EBS and the communication technology.

As the system is complex and many partners are involved, a suitable test and validation process is necessary to avoid that crucial problems are detected too late. For this project, such a process is in particular important, as the system cannot be tested as a whole during the development phase as the units are built at different locations. As this is a truck project, transport of the vehicle units to a common test site involves significant effort and is costly. In turn, when coupling together the vehicle the first time, everything has to already work well. In addition, a thorough validation process is necessary to guarantee a safe vehicle behaviour on the upcoming real road tests.

For the truck powertrain software, basic software testing is done in a model in the loop (MiL) setup. Herein, the adapted powertrain functions (Global Energy And Torque Management System – GETMS) are coupled to virtual models of the truck, the dolly and the trailer. The dolly and the trailer models already include Local System Management (LSM) functions developed by Fraunhofer IVI. Such a completely virtual truck is run over different cycles to test if all functions work properly.

In a next step the real truck including the new powertrain functions are coupled to a virtual heavier and longer vehicle including dolly-trailer models which is run at a TNO test bench. This setup is referred to as Vehicle in the Loop. The truck is coupled via its drive axles to two dynamometers, which mimic the vehicles road load. In this way, driving resistances like road elevation as well as the coupling force could be emulated by a corresponding projection to the dyno brake power.

On the dolly side, correct implementation of the communication with the truck was tested using the GETMS communication recorded in the ViL setup. The electric drive system of the dolly could be tested by a standalone commissioning which does not involve the truck.

By these testing steps, a successful verification of the single systems functionality is done. The testing process will be completed by the upcoming commissioning of the EMS-demo on a test track.

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Project partners:

#	Partner	Partner Full Name
1	MAN	MAN TRUCK & BUS AG
2	DAF	DAF Trucks NV
3	IVECO	IVECO S.p.A
4	SCANIA	SCANIA CV AB
5	VOLVO	VOLVO TECHNOLOGY AB
6	CRF	CENTRO RICERCHE FIAT SCPA
7	UNR	UNIRESEARCH BV
8	SCB	SCHMITZ CARGOBULL AG
10	TIRSAN	TIRSAN TREYLER SANAYI VE TICARET A.S.
11	CREO	CREO DYNAMICS AB
12	MICH	MANUFACTURE FRANCAISE DES PNEUMATIQUES MICHELIN
14	CHALM	CHALMERS TEKNISKA HOEGSKOLA AB
15	DLR	DEUTSCHES ZENTRUM FUER LUFT - UND RAUMFAHRT EV
16	FHG	FRAUNHOFER GESELLSCHAFT ZUR FOERDERUNG DER ANGEWANDTEN FORSCHUNG E.V.
17	HAN	STICHTING HOGESCHOOL VAN ARNHEM ENNIJMEGEN HAN
18	IDIADA	IDIADA AUTOMOTIVE TECHNOLOGY SA
19	NLR	STICHTING NATIONAAL LUCHT- EN RUIMTEVAARTLABORATORIUM
20	TML	TRANSPORT & MOBILITY LEUVEN NV
21	TNO	NEDERLANDSE ORGANISATIE VOOR TOEGEPAST NATUURWETENSCHAPPELIJK ONDERZOEK TNO
22	MHH	MEDIZINISCHE HOCHSCHULE HANNOVER
23	UIRR	UNION INTERNATIONALE DES SOCIETES DE TRANSPORT COMBINE RAIL-ROUTE SCRL
24	WABCO-NL/ZF	WABCO AUTOMOTIVE BV
25	WABCO-DE/ZF	WABCO GMBH
26	VET	Van Eck Trailers



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