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

EUROPEAN COMMISSION
Horizon 2020 | GV-09-2017 | Aerodynamic and Flexible Trucks
GA - 769658

Deliverable No.	AEROFLEX D2.4	
Deliverable Title	Architecture and Design of the SPD	
Deliverable Date	20-04-30	
Deliverable Type	REPORT	
Dissemination level	Confidential – members only (CO)	
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Approved by	Ben Kraaijenhagen	2021-05-03
Status	FINAL	2021-05-05

Document information

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Document Change Log

Name	Date	Comments
Henning Wittig	2020-04-09	first draft
Henning Wittig	2021-03-16	second draft
Henning Wittig	2021-04-20	Final version

Publishable Executive Summary

In the AEROFLEX work package 2 a converter dolly with an electric powertrain, further referred to as Smart Power Dolly (SPD), is developed. The SPD is part of the Advanced Energy Management Powertrain (AEMPT) distributed over several units of the vehicle combination. After presenting general requirements to such system in D2.1, the proposal of technical solutions in D2.2, the present deliverable D2.4 focuses on the development and technical implementation of the powertrain and control system in the vehicle.

Based on the general vehicle states for trucks combined with a SPD and/or Hybrid-on-demand trailers the broad scope of the AEMPT and thus the capabilities and features of the SPD are derived. These are extended to realize an operation scenario that allows an operation of the SPD independently from the towing truck. The main application area is the operation of a SPD-semitrailer combination with shunting speed at a depot.

In line with the simulation results regarding the energy and power demand presented in deliverable D2.1, electric drive components are chosen. As the most important components, the electric motor is provided by ZF and the battery is provided by AKASOL. Due to the requirement of automated operation of the SPD an electronic truck steering system from V.S.E. Vehicle Engineering B.V in combination with a BPW Bergische Achsen Kommanditgesellschaft steering axle is used. Based on these components, the electric and cooling circuits are developed and Van Eck Trailers creates a dolly vehicle design.

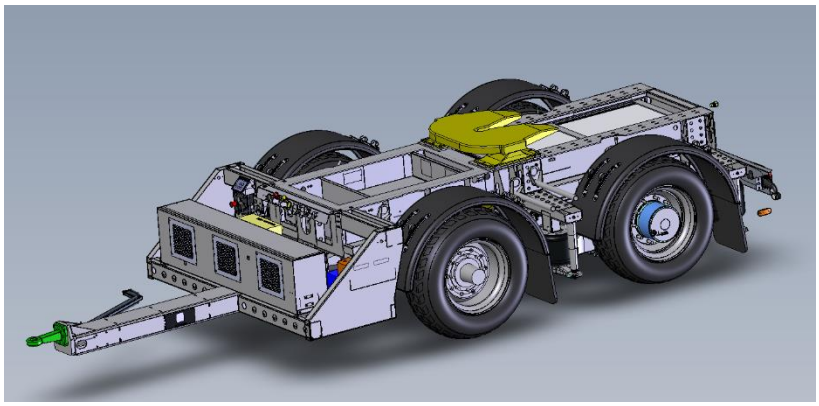

Figure Fout! Geen tekst met de opgegeven stijl in het document.**-1: Design of the SPD incorporating all components of the electric drivetrain and the Local System Management**

As part of the vehicle design the requirements of the high voltage system (HV system) are discussed with the providers of the driven axle and the battery system. Thus, the high voltage circuit is designed, including the connection of the three battery modules to the AC/DC and DC/DC converters as well as protection of the components against short circuit/overload by means of external fuses. The configuration of the low voltage system (LV system) considers especially the requirements arising from the two different operational modes. By the chosen layout the operator/driver can switch between trailer and manual operation. The resulting configurations regarding external or internal 24V supply of the control units and different communication paths presented in section **Fout! Verwijzingsbron niet gevonden.** guarantee functional safety to prevent misuse or hazardous events due to faults in the newly developed control software.

Two cooling circuits are designed to fulfil the different requirements regarding operating temperature levels of the power electronics and the battery system in an efficient way. A model of the cooling circuits is built and simulated using a demanding power profile and characteristic environmental conditions of Central Europe and Spain in particular. Thus, the technical specification of the cooling components are analysed and suitable cooler/fan combinations and pumps are chosen and integrated in the vehicle design.