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*Tomasz Antkowiak, Marcin Krus*: **Contemporary Methods of Designing Rail Vehicle Running Systems with the Use of CAD and CAM Solutions**

The article discusses the process of designing the running system of a rail vehicle using CAD and CAM tools as the solutions supporting the process. It describes the particular stages of design taking its final shape: from a preliminary design, through a detailed design, ending with the stage of production. Each stage includes a presentation of how CAD and CAM tools are used to support design engineers in their practice.

Keywords: running system, design, CAD, CAM

*Andrzej Chojnacki*: **Process of Obtaining Authorization for Placing TSI-Compliant Railway Vehicles in Service in Poland**

The article discusses the legal acts applicable to the process of obtaining authorization for placing TSI-compliant railway vehicles in service. The procedure in the case of applying for the first authorization for a railway vehicle is also outlined. The procedure concerning a vehicle that is authorized for placement in service in another Member State, but that will also be used in Poland, is presented, as well.

Keywords: authorization, railway vehicles

*Juliusz Furman, Andrzej Białoń*: **Influence of Commutational Interferences on the Analysis of Harmonics in the Traction Current**

Commutation phenomena related to the processes of changing the amount of power taken or returned by a vehicle affect the frequency spectrum contained within the traction current. The paper presents the influence of selected physical phenomena on the parameters taken for FFT analysis utilized for assessment of the disturbances generated into the traction network. The paper also describes the stands used for measuring disturbances generated into the traction network. The results of the measurements and calculations of the frequency response of simulated signals are presented, as well as signals measured in real conditions during traction vehicle tests, which are useful for assessing the influence of commutational interferences on the analysis of harmonics in the traction current.

Keywords: interferences, EMC, traction, interoperability

*Dieter Hohenwarter, Christopher Fischer, Matthias Berger*: **Influence of 3D-Printing on the Flammability Properties of Railway Applications Using Polycarbonate (PC) and Polylactic acid (PLA)**

Due to limited production numbers, using additive manufacturing for the production of railway components, is proving more economical. Furthermore, strict requirements regarding flammability properties, standardised in EN 45545-2, are applied on trains. This work focuses on the production of transparent components made of Polycarbonate via 3D-printing. The polymer was modified using different flame retardant agents and the influence of the printing parameters, especially the print density, was determined. Polylactic Acid was examined for comparison reasons only. The printed and modified polymers were tested

exposing the samples to heat radiation, according to ISO 5660-1 using a Cone Calorimeter, and to a direct flame, according to UL 94.

Processing and printing of the polymer causes thermal stress to the molecules. This may lead to a worsening of the flammability causing a decline of the properties compared to the native Polycarbonate. This was confirmed through both testing methods. Moreover, the additive and the print density both influence the flammability properties depending on the polymer type. In summary print parameters and additivation have to be carefully considered when it comes to the flammability properties of polymers.

Keywords: fire behaviour of material (Polycarbonate, also with additives) after 3D print, Influence of 3D printing on the fire behaviour

### *Andrzej Miszkiewicz, Krzysztof Tchórzewski:* **Levels of Electromagnetic Fields From Rail Vehicles in the Context of Formal Requirements**

The article discusses the issue of electromagnetic field levels emitted from rail vehicles with regard to civil protection. The article presents the lack of legal solutions, limits and research methods in the railway industry in Poland. It also depicts the initial results of measurements from rail vehicles. Based on the findings, taking into consideration the measurement results and suppression of electromagnetic waves in free space, electromagnetic fields may reach substantial levels which can affect people's health and life. The authors of the article conclude that the problem should not be ignored and requires further research, bearing in mind the progressing saturation of all rail vehicles with devices and electronic systems which will serve as sources of electromagnetic fields.

Keywords: electromagnetic fields, civil protection, measurements

### *Norbert Tuśnio:* **Analysis of an Event Related to the Uncontrolled Release of Ammonia from a Rail Tanker**

Numerical engineering tools are being more and more frequently applied in supporting decisions responsible for rescue operations in terms of tactics and strategy. This elaboration presents one of the applications of such software in the event of uncontrolled releases of hazardous substances. The adoption of numerical modelling as an element which supports leadership results in the reduction of operating costs and affects its performance. The example used will show the potential of these solutions to people unrelated directly to chemical and ecological rescue. It may become a basis for developing drills, including evacuation drills, for people responsible for their planning and organization in the railway structures.

Keywords: chemical rescue, dispersion modelling, ALOHA

### *Łukasz Zawadka, Dominik Adamski:* **Selected Aspects of Control-Command and Signalling On-Board Subsystem Verification**

This article describes the procedures, standard parameters and control requirements to be performed in order to achieve EC verification of a Control-Command and Signalling On-board Subsystem. An analysis of issues related to the assessment of the on-board subsystem is presented in terms of the necessary checks that must be performed by a notified body and the issues of interoperability tests of the on-board ERTMS with track-side infrastructure.

Providing railway interoperability is strictly related to the introduction of unified rules for the assessment and verification of the ETCS and GSM-R subsystems that are part of the European Rail Traffic Management System (ERTMS). The article describes procedures, standard parameters, requirements and necessary controls that must be implemented to carry out EC Verification of a Control-Command and Signalling On-board Subsystem. Reference is also made to the issues of ERTMS on-board compatibility tests with track-side infrastructure.

*Keywords:* TSI, CCO, ERTMS, conformity assessment, interoperability