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CONTRIBUȚII LA STUDIUL PROCEDURILOR DE OMOLOGARE A UNUI AUTOVEHICUL ELECTRIC ÎN ERA TRANZIȚIEI

Cristina MOCAN, Doru-Laurean BĂLDEAN

CONTRIBUTIONS TO THE PROCEDURE STUDY OF ELECTRIC VEHICLE HOMOLOGATION IN TRANSITION AGE

In the first stage the objective is to improve traffic and decrease noise and vibrations, but also meanwhile the technological megatrends have directed the research and development towards the grater energy efficiency, higher output, improved road safety and lower waste in human society.

To reach all these significant objectives in electric vehicle development it is mandatory to increase the number of clean and digital controlled systems in the urban area. In the near future stage (in space-time), electrical and smart cars will be fully operational and completelly developed for most common transportation tasks. The standards for type approval in various economies are studied in this paper. The actual research applied to the homologation procedure as well as the data obtained by collecting, centralizing and analyzing all found norms and regulations facilitated the developing of procedures. Homologation process is started as soon as car-development is finished and detailed.

A successful procedure is to be fulfilled when there is a type approval for each component, for each system or part or equipment or assembly before the whole vehicle is put to be type approved at RAROM. The present paper and the specific documents that are refered to in it, may nowadays be considered as a strong basis for developing and initiating the homologation procedure.

Keywords: automotive, electric, power-train, motor, vehicle
Cuvinte cheie: automobilism, electric, moto-propulsie, motor, vehicul

1. Introduction

Due to the latest changes in engineering and technology, automotive field gained more and more electric, electronic and digital components and software packages. In the first place the target was to improve traffic and decrease noise and vibrations, but technological megatrends have directed the research and development towards the grater energy efficiency, higher output, improved driving safety and lower waste footprint.

To reach all that significant goals in development is mandatory to increase the number of clean and digital controlled vehicles in the urban area. For some point (in space-time cluster), electrical and digital cars will be fully developed and built for most common transportation requirements. Electrically controled and digital vehicles will overcome the existing automobiles in most of their aspects as follow: energy consumption or fuel efficiency, high standard in comfort, road traffic security, dynamics and kinematics and addapted mobility and versatility. Wi-fi digital smart electric automobiles may facilitate substantial changes in transport standard: by optimising intelligent road croasing and car-to-street management structures, and thus the traffic jams will decrease or even eliminated.

Transportation and traffic are highly complicated and diverse systems, so changing the thermal propulsion group or the hybrid power unit with a fully electromechanical propeller with digital controlled power train is an important shift in the technology. Due to the innovative packages and optimized components and high performance built-in electric and electronic systems, vehicle using, service and maintenance become quite different as in the past. Testing the digital automobiles, the electric powertrain-controllers and intelligent management systems of the vehicles in specific transportation regimes and conditions all-in one require new validating methods and strategies. The main goal consists in the following: optimizing the urban traffic and cargo security with certain system control in operation and utility. This real time proof requests the validation and approval procedures or forms in the integrated production and marketing. Downgrades and mistakes should be viewed as unacceptable because it is mandatory not to lose the taste of the potential users for clean and digital smart automobiles.

Till now on the global stage are some important achievements and results, beside the EU political objectives and specific legislation for optimizing the European law-frame on electric and intelligent power-trains for the next phases of development. In the year 2030 there will be

a different frame-work concerning the engineering, legislation and marketing milestones.

The evolution and marketing of electrically propelled and intelligent cars will be sequential, so there will still be “hybrid power trains” for application in some automotive sector. In this way can be influenced the overall market structure regarding electric engines emergence and development starting from automobile field.

2. Materials and method – laws and regulations

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he standards for type approval in various economies are summarised in Table 1 (Type approval comparisons between Romania and other countries). The table illustrates that functional safety and occupant protection against electric shock and battery safety are mandatory test items in the type approval process in these countries, however vehicle crash testing is not always mandatory.

All EVs applying for vehicle approval in Romania and EU shall comply with the RAROM provisions concerning Type-approval of L-category vehicles (EU Framework Regulation no. 168/2013 - http://eur-lex.europa.eu/legal-content/RO/TXT/PDF/?uri=CELEX:02013R0168-20160101&qid=1498656987152&from=RO) and its subsidiary delegated and implementing regulations of the framework regulation (R 3/2014, R44/2014, R134/2014 si R901/2014 - on the EU legislation site). In Romania (like in EU), the EV type approval procedure is quite comprehensive. It is governed by RAROM’s Department for Type Approvals. The Type Approval Department, DOT, is the RAR Technical Entity.

Table 1

Regulations	Romania	EU	USA	Japan	Korea	Taiwan	China	Hong Kong
Functional safety and occupant protection against electric shock	UNECE Regulation 100	UNECE Regulation 100	FMVSS 305	Japan Attachment 101 and TRIAS 67-2-2008 Japan Attachment 111 and TRIAS 67-3-2008	KMVSS Art.18-2 KMVSS Art.91	103.01.01:640	GB/T18384.1-2001 GB/T18384.2-2001 GB/T 18384.3-2001	UN/ECE R100(01 or 02 series) ☐ ISO 6469-1:2009, ISO 6469-2:2009, ISO 6469-3:2011 ☐ Japan Attachment 101 and TRIAS 67-2-2008, Japan Attachment 111 and TRIAS 67-3-2008 ☐ GB/T 18384-2001 ☐ FMVSS 305 ☐ QC/T 838-2010
Battery safety	UNECE Regulation 100	UNECE Regulation 100			KMVSS Art.18-3	SAE J2464, UL2580 or related/equivalent	QC/T 743-2006 QC/T 742-2006 QC/T 741-2006	(i) Lithium Battery ☐ ISO12405 ☐ IEC 62660 (2010) ☐ SAE J2464 (2009) or SAE J2929-2011 ☐ UN/ECE R100 (02 series) ☐ UL1642 (2005) ☐ QC/T 743-2006 ☐ QC/T 741-2006 (ii) Non-lithium Battery ☐ QC/T 744-2006 ☐ IEC 61982 ☐ QC/T742-2006
Vehicle crash test	UNECE Regulations 12, 94 and 95 (not for 2Le vehicles)	UNECE Regulations 12, 94 and 95 (not for 2Le vehicles)				103.01.01:451 103.01.01:461	Test same as a normal vehicle, but must check electrical system safety before and after crash testing	Not required for submission

3. Type Approval Requirements for EVs in Romania

Based on the mandate given by the Ministry of Transport as a transport authority, the RAR is the competent authority in organizing and keeping track of all types of road vehicles in circulation as well as granting the registry number. The national registration process consists of granting the national registration number. The applicant shall complete the official application for national type registration.

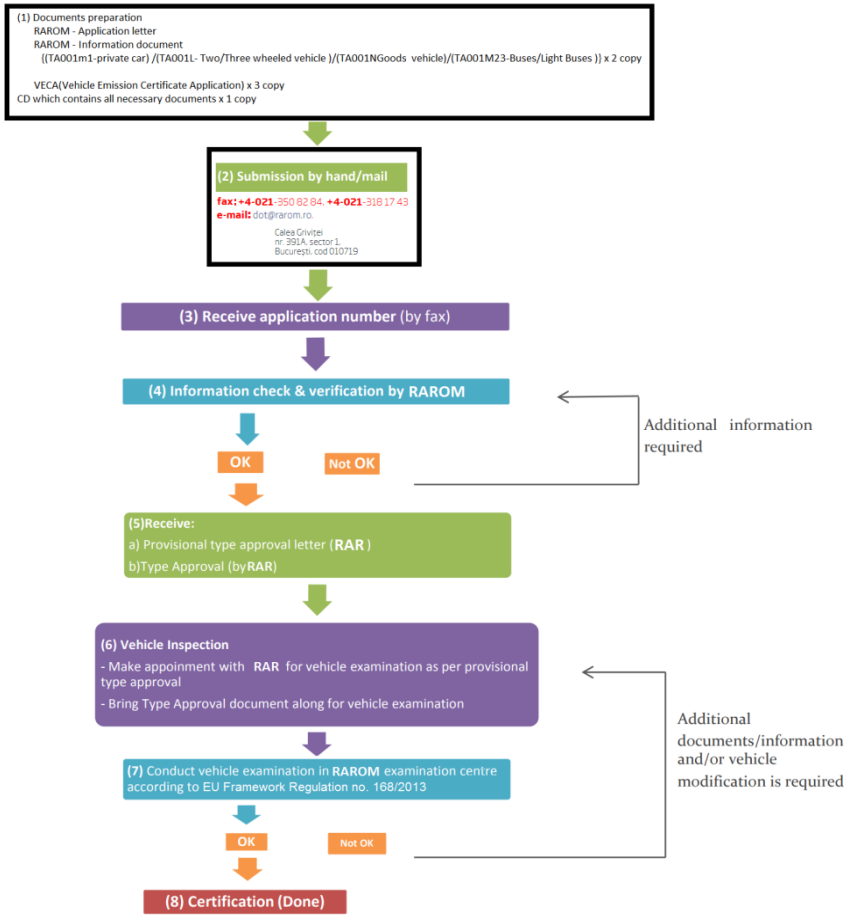

Fig. 1 Flow chart show the type approval procedure for EVs
RAROM-Romanian Auto Registry R.A.; TA-type approval,
CD-compact disc ; RAR=RAROM

4. Transfer and implementation of results

The schematized methodological plan is logically structured in the figure 2.

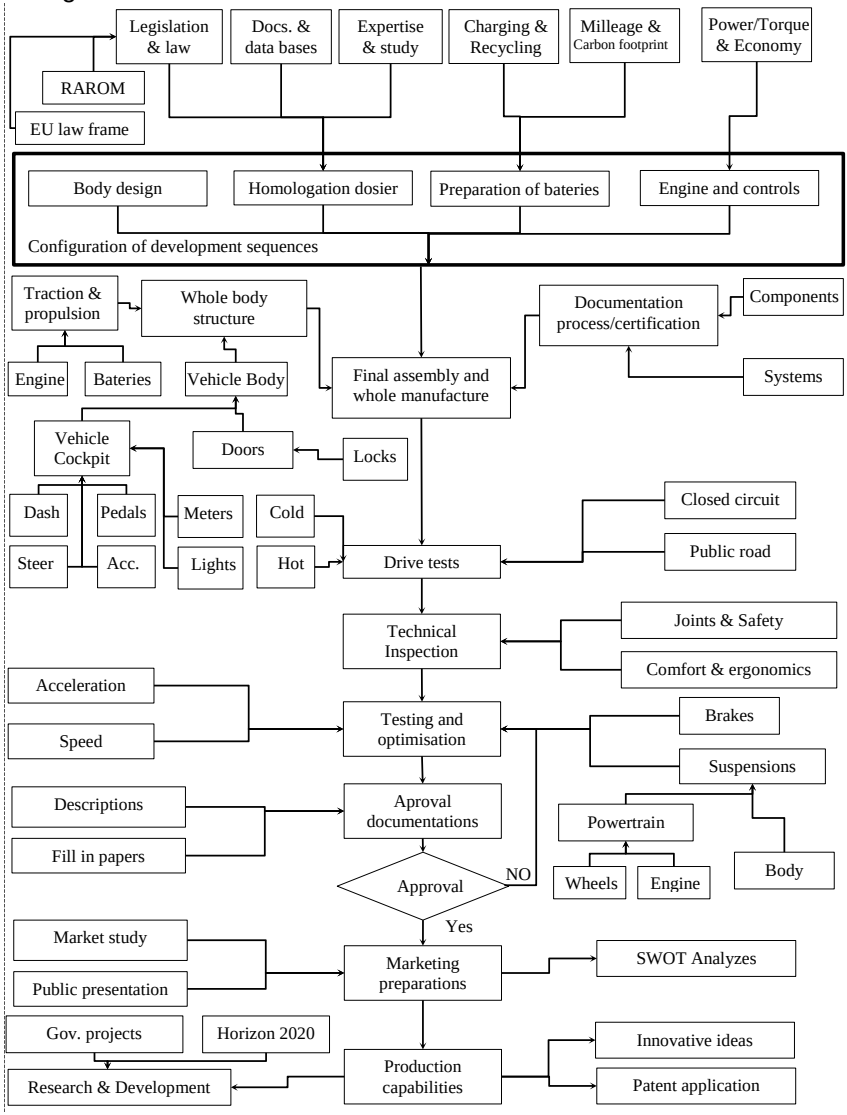

Fig. 2 Schematics for approval protocol

The present research has shown the proper procedure for vehicle type approval is based on tri-polar protocol structure, acording to the figure 3.

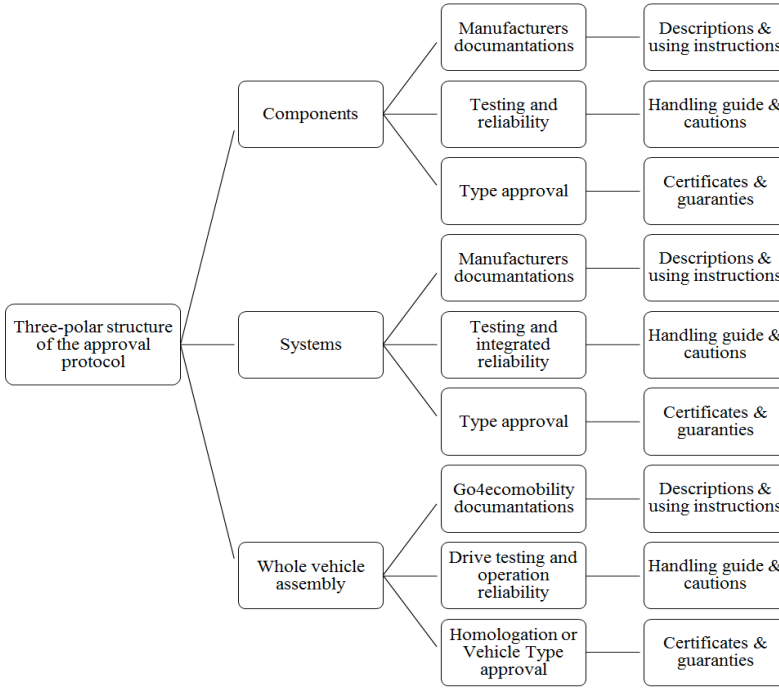

Fig. 3 Structure of applied approval procedures

5. Conclusions and discusions

The application, followed by the related documents, is filed directly with the Registry Service at the RAR headquarters filled in with all the data required to initiate the national registration process.

The actual research applied to the homologation procedure as well as the data obtained by collecting, centralizing and analyzing all found norms and regulations facilitated the formulation of conclusions as follows:

- Homologation process may be started whenever car-development-team is finished with detailing;

- Homologation or vehicle type approval is almost the same thing, so they may be reffered as to be identical;
- For a successful procedure to be fulfilled there is necessary to have type approval for each component, for each system or part or equipment or assembly before submitting the whole vehicle to a type approval procedure to RAROM;
- The present report and the documents that are refered to in it may be considered as a strong basis for developing and initiating the homologation procedure;
- There are presented the most possible tests for a e-vehicle submitted to a type approval procedure.

Advantages of taking the proper steps in approval or homologation process/procedure consist in the following:

- Saving time and money – with the proper experts who facilitate the smooth compliance of three-wheeler development process, removing the threat of costly and time-consuming rework;
- Minimize risks – of product liability claims and non-acceptance of Go4ecomobility products by the approval authority and finally by the market;
- Maintain a competitive edge – by leading the local and EU market in meeting the requirements of the ISO 26262 standard;
- Ensure regulatory compliance;
- Enhance credibility – as a premium company with a strong commitment to safety and quality.

The following objectives have been outlined for accomplishing type approval process:

1 Carrying out the strategy and setting up a package of legislative documents that define the process of European Community (EC) type-approval issued under European Union directives / regulations;
2 Preparation and Establishment of Cooperation with the Type Approval Department, which is the technical entity dealing with the type approval of new road vehicles to be marketed;
3 Applied determinations for effective approval procedures;
4 Practical determination of aspects necessary for the approval process;

5 Preparation of the documentation and initiation of the approval dossier;
6 Elaboration of the final approval dossier of this project and preparation of its presentation.

The originality and innovative contribution of the proposed research theme of the project is reflected in the complex and new approach to the approval process of a L2e vehicle. The novelty of the proposed theme was verified by analyzing the international databases containing rules, regulations, procedures, articles and communications in the field, as well as databases with typical results and annexes.

In addition to the above mentioned, it is intended to propose themes for research and development projects (electric and ecologically powered vehicles) at national and international level (Horizon 2020) to develop the field approached in this project (powering of renewable electric propulsion).

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Cristina MOCAN
Doru-Laurean BĂLDEAN

Departamentul de Autovehicule Rutiere şi Transporturi,
Facultatea de Mecanică, Universitatea Tehnică din Cluj-Napoca
e-mail: dorubaldean@yahoo.com; doru.baldean@auto.utcluj.ro; 0752083337