Lifelong Learning Programme

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TECMEHV

Training & Development of European Competences on Maintenance of Electric & Hybrid Vehicle

# Training & Development of European Competences on Maintenance of Electric and Hybrid Vehicles

Progress Report Public Part

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# Executive Summary

The overall objectives of TECMEHV are to define, develop, implement and support in the medium and long term future the European wide professional Qualification for the electrical and hybrid vehicles maintenance and a e-learning platform within the European HEV industry to learn and understand how to manage HEV.

TECMEHV will present a ‘blended learning’ approach, offering interactive on-line training. The project will focus on the needs of SMEs, and be highly industry specific covering the seven major EHV systems and subsystems such as batteries, electrical motors, energy recovery and braking systems as well as understanding the differences to a classical vehicle in case of accident and as well as understanding energy, managing energy and utilities and peripherals.

Today, there is a market over $2.8 billion in the world in the hybrid-electric vehicle industry. Every day, more and more companies are rising in the EU and the rest of the world who specialize in the treatment of electric and hybrid vehicles, which employ more people, and many are SMEs.

The industry is a substantial user of electricity for motors and drives, electric batteries of different types, heating, cooling and lighting but there is a tendency to view energy costs as fixed overheads.

A key aim of TECMEHV will be to alter this perception and to demonstrate that energy purchase and maintenance should be considered as a variable materials cost, with substantial potential for savings to be made.

TECMEHV project comprises two major activities:

• Definition of the Competence Framework on Electric & Hybrid Ground Vehicles Maintenance, Repair & Operation;
• Development of set e-learning courses on several selected key topics related to the Units of Competence previously identified.

The main beneficiaries of the project results will be EU Electrical & Hybrid vehicle manufacturers, engineers and mechanics; it is also expected to have an impact in other sectors such as electronics and electronic test devices. Results will be transferred to all kind of HEVs.

TECMEHV will establish consistent technical competency levels applicable in several environments such as manufacturing or emergency services for vehicle crash assistance & HEV recycling will be developed, ensuring the safe and sustainable growth of industry, as technology penetrates the market.

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# 1. Project Objectives

The main objective of the TECMEHV project consists of instruments and actions which are necessary to promote and develop the integration of vocational education and training on maintenance and repairing of the new hybrids and electric vehicles.

Besides, it aims at promoting and developing the assessment and accreditation of professional competences in order to encourage the professional and social development of the people and to meet the needs of the productive system.

Its basic principles are the following:

- The personal development.
- To meet the needs of the productive system and of employment on a lifelong basis.
- The participation and cooperation of social agents with public authorities.
- To adapt the training and qualifications to European Union standards.
- The participation and cooperation among the different Public Administrations.
- The promotion of the economic development taking into account the regional needs regarding the productive system.

The development of the project promotes the collaboration of Social Agents with Public Administrations, universities, chambers of commerce and educative entities.

Procedures of collaboration and consultation with the different productive sectors and the social partners have been established in order to identify and update the needs for qualifications, as well as their definition and the definition of the associated learning.

TECMEHV project's major challenge is to develop a qualification and accreditation system to standardize training in maintenance and reparation operations (MRO) for Hybrid and electric vehicles (HEV) for whole European Community and the development of training contents to be offered to HEV MR Operators.

Automotive industry is strongly under pressure to change classic conception of fossil fuel combustion cars by environmental reasons since 90's decade. But now, that pressure is bigger than ever.

Motor industry is being pushed to innovate on this way, and should to develop solutions even more futuristic, ecological, energy efficient and less polluting.

Hybrid and electrical vehicles are increasing their presence from 1997 until now for those reasons.

In the near future, very restrictive laws about pollution quotes or energy efficiency will stop fossil fuel combustion TECMEHV / Training & Development of European Competences on Maintenance of Electric & Hybrid Vehicles car's production and big amount of hybrid and electric cars will be in our cities, and also infrastructures needed to use them (power supply stations, etc.). Therefore, it will be needed an upgrading and updating of competences for HEV MR Operators. They must update

their knowledge to this new wave of technology in vehicles: new kind of batteries, sensors, motors, etc…

It will be essential that the people involved in repairing and maintenance operations are enough trained.

Competence framework and training framework will help to ensure consumers get the very best support and that this new technology will be introduced to the marketplace efficiently.

First of all, TECMEHV project will be centered in automotive hybrid and electric vehicles sector to ensuring the safe and sustainable growth of the new automotive industry, but next step will be full spectrum of electric vehicles (motorbikes, vehicles of all wheel combinations, including military variants, heavy goods vehicles and buses) and professionals (emergency services and breakdown recovery operators, roadside assistance teams and retailers).

TECMEHV project will develop a competence framework according to ECVET to ensure homologation for whole European Community territory.

Once the competence framework is developed, a training framework will be created in order to enable existing technicians and professionals (end users) to extend their skill set to HEV MR Operations.

The overall aim is development of an e-learning platform and supporting on-line materials in several languages according to competence framework defined and developed. E-learning platform is the best way to ensure high range for dissemination of knowledge.

Both, CF and TF, will be tested to ensure total quality and functionality in agreement with objectives.

The future of European automotive industry may depend on all pieces fit: HEV automotive manufacturing, HEV supply energy chain and HEV competences for MR Operators.

# 2. Project Approach

TECMEHV project comprises two major activities:

**Definition of the Competence Framework on Electric & Hybrid Ground Vehicles Maintenance, Repair & Operation**

This first area comprises the definition of a European Level Competence Framework (CF), according to the definitions of the European Qualifications Framework (EQF).

This task will start with the evaluation of the actual state of technology: systems currently used, materials, methodologies, logistic chain, standards & regulations, etc.

The technological trends in this field will be also identified for its further consideration.

This information will then be used for the formal definition of the CF using a top-down methodology:

- Identification of the main Units of Competence (UC). A UC is the smallest unit that can be assessed and recognized. UC's must be adhered to in training and assessment to ensure consistency of outcomes. UC's represent discrete workplace outcomes;
- Detailed definition of each UC in terms of: Unit Descriptor, Employability Skills, Application of the unit, Elements, Performance criteria, Range statements, Required skills and knowledge and Evidence Guide.

This methodology for the definition of the CF is aligned with the EQF guidelines and recommendations. The relevance, quality and applicability of this CF will be validated by submitting it to the evaluation by a panel of 12 experts (three experts per each of the partner's countries, two from the Industry and one from the Academia)

**Development of a set of e-learning courses on several selected key topics related to the Units of Competence previously identified**

This area comprises the following tasks:

- Setup of a web based Learning Management System to host the online modules.
- Creation of a selection of multilingual online training modules based on the Social Constructionist Pedagogical Model. These courses will be initially developed in English.

After being submitted to an internal evaluation carried out by some partner's staff not involved in the project and the subsequent improvements the modules will be translated to the partnership languages (Italian, German, French and Spanish).

The multilingual curses will then be subjected to pilot testing on each country. This will involve between 15 to 20 beta users on each country.

The aim of these courses is to create awareness on the target group on the key aspects involved in the maintenance of ground electric and hybrid vehicles.

Another important aspect is the sustainability of this initiative; this will be assured by the following actions:

- The TECMEHV products will be integrated into the VT offered by the partners. They will also be made available for other organisations to ensure its sustainability and increase the knowledge base on the target sectors;
- The consortium will continue to work together after the end of the project and promote TECMEHV.

All partners will continue to valorise TECMEHV after the project has ended, with the aim of optimising its value and enhancing its impact.

# 3. Project Outcomes & Results

TECMEHV project comprises two major activities: Definition of the Competence Framework on Electric & Hybrid Ground Vehicles Maintenance, Repair & Operation and the development of a set of e-learning courses on several selected key topics related to the Units of Competence previously identified.

In order to have an initial basis for development of the two major activities, firstly a **state-of-art development** of electric and hybrid vehicles and future tendencies is described, in particular concerning the European situation. Together with a framework of **existing Standard and Regulations** for electric and hybrid vehicles and related components, will form the analysis of the of the **key competences** contents to be handled, the methodologies to be used and the target groups to be addressed.

The Definition of the Competence Framework will include the **Identification, definition, and training contents & evaluation criteria for each Unit of Competence.**

On the other side, another project result will be a **completely tested e-learning course**, based in an e-learning platform, and the contents of the different courses needed to achieve key competences in E&HV MRO translated from English to Spanish, French, Italian and German.

# 4. Partnerships

The project consortium, comprising 5 partners and 2 associated partners from 5 European countries, brings together a wealth of experience, expertise and resources within the areas of: training programmes, e-learning, professional qualifications advice, research & development, automotive industry knowledge, automotive aftermarket maintenance, demonstrating the critical mass of complimentary resources that will enable the project to achieve its targeted aims and objectives.

Together, consortium members cover completely the entire supply chain for the project expectations and they ensure continuity and future evolution. All the partners previously have a vast understanding of the needs of the industry.

Each partner has a clearly defined role within the project and will contribute specific expertise that will enable the project's success:

• ASCAMM Technology Center (Spain) – Key Skills: Project management, training, e-learning, research & development in HEV, environmental responsibility, energy saving technologies;

• Associazione Tecnica dell'Automobile ATA (Italy) - Key Skills: strong Knowledge of automotive environment and tendencies, strong knowledge on HEV, links with supply chain and other associations across Europe, regulations and compliance, information communication;

• UDE Duisburg-Essen University (Germany) - Key Skills: e-learning platforms, training, e-learning, research & development, environmental responsibility;

• EPFL École Polytechnique Fédérale de Laussane (Switzerland) - Key Skills: e-learning platforms, training, e-learning, research & development, environmental responsibility

• NORAUTO (France) - Key Skills: Training, industrial development, industrial workshops, information communication, end users critical mass;

• STA (Spain): Trade association, links with supply chain and other associations across Europe, regulations and compliance, strong Knowledge of automotive environment and tendencies, strong knowledge on HEV;

• Centro Ricerche FIAT (CRF) S.C.p.A - Key Skills: elearning, environmental responsibility, energy saving technologies, strong capabilities in research & development, , regulations and compliance, information communication.

All these organisations have a high profile and reputation for excellence within the targets sector. A pan-European approach is essential as the necessary expertise and resources cannot be found within a single European region and requires the integration of resources from across Europe. The consortium has complimentary business interests that will provide a rapid and robust route for exploitation and have come together to provide a balanced match of sectoral, market and technological skills to address the project objectives.

The represented countries all have a large automotive industry and the partners have close links to automotive industry, trade associations, companies and organisations not only in their own country but in the European Community.

# 5. Plans for the Future

During the first 15 months of the project work has been carried out in order to have an initial basis for development of the two major activities, firstly a state-of-art development of electric and hybrid vehicles and future tendencies is described, in particular concerning the European situation. Together with a framework of existing Standard and Regulations for electric and hybrid vehicles and related components, form the analysis of the of the key competences contents to be handled, the methodologies to be used and the target groups to be addressed. Secondly, work is being carried out in order to define and implement the learning platform.

Plans for future include detailed documentation of the e-learning platform contents and development of the e-learning platform itself, lead by EPFL. Once the contents are agreed, translation to Spanish, French, Italian and German will be carried out.

Internal and external validation of both the Competence Framework and the learning platform will also be developed through pilot testing and improvement, lead by industrial partner NORAUTO, in order to assure quality and suitability of the results.

All project partners will also boost the efforts for disseminate the objectives and outputs of the projects according to the development of activities and will also reach an agreement on exploitation of the results and future valorization of the project.

# 6. Contribution to EU policies

TECMEHV is a Multilateral Development of Innovation project which contributes to the following EU policies:

**Developing Vocational Skills considering the labour market needs – New Skills for New Jobs.**

This project effectively improves sectoral identification and anticipation of skill and competence needs and their integration in VET by means of the joint involvement of companies, university, VET institutions and Research Institutions on the identification of new needs and the definition of a Competence Framework and its related multilingual online training modules. This will be the beginning of a long term activity to face the immediate and future needs on the job market on the specific sector of ground vehicles maintenance, repair and operation.

With this initiative we are clearly fostering the involvement of the different stakeholders in making VET and qualifications systems more responsive to the needs of the labour market taking into account systemic changes such as the technological changes on the propulsive systems on ground vehicles from the Internal Combustion base through the Hybrid to the Fully Electric propulsion base.

**Implementing ECVET for transparency and recognition of learning outcomes and qualifications.**

The activities that this project is planning to do are clearly intended to support the development of national and sectoral qualifications and / or qualifications systems by incorporating ECVET, according to the Recommendation of the European Parliament and of the Council establishing the ECVET system TECMEHV will be designing and applying operational and transferable methods and guidelines for the design of qualifications in units of learning outcomes with allocation of ECVET points, based on the ECVET technical specifications.

Additionally to the above activities, the present project also includes the design of VET programmes with flexible devices for validation, transfer and recognition of learning outcomes, using ECVET principles.

ECVET is a European system of accumulation (capitalisation) and transfer of credits designed for vocational education and training in Europe. It enables the attesting and recording of the learning achievement/learning outcomes of an individual engaged in a learning pathway leading to a qualification, a vocational diploma or certificate.

It enables the documentation, validation and recognition of achieved learning outcomes acquired abroad, in both formal VET or in non-formal contexts. It is centred on the individual, based on the validation and the accumulation of his/her learning outcomes, defined in terms of the knowledge, skills and competences necessary for achieving a qualification. ECVET is a system designed to operate at the European level, interfacing with national systems and arrangements for credit accumulation and transfer.