Training - Hybrid & Electric Powertrains

HEGMP-EN-P | Face-to-face only | 4 days

This course provides knowledge on the new directions engine manufacturers are taking for individual cars' motion

Level
Knowledge

Public
Engineers and technical staff wishing to increase their knowledge of electric hybrid automotive powertrains

Objectives
Attendees will be able to implement the following skills:

- Draw up a state-of-the-art review of hybrid powertrains, incorporating the general context of hybridization and the different forms of hybridization in road vehicles,
- Identify the criteria for sizing batteries and electric motors suitable for hybrid vehicles,
- Specify the main features and key functional parameters of the components of hybrid architecture,
- Define the operation of a hybrid powertrain and the associated development constraints.

Pedagogical & technical resources

- One of our best-sellers.
- Interactive talks, based on real examples and components.
- It covers all main technical fields of hybrid powertrains.
- Orders of magnitude are clearly given.

Assessment of achievements

- Trainees are assessed throughout the training through practical application phases and interactions with the trainer
- A final on-the-spot evaluation may also be carried out at the end of the course and/or at the end of each module using tests designed to verify the learners' understanding and assimilation of the knowledge linked to the training objectives

Prerequisites
No prerequisites are necessary to follow this course

Responsable
IFP Training instructors, with expertise in the field and trained in modern teaching methods adapted to the specific needs of learners from the professional world

Program

ELECTRIC HYBRID POWERTRAINS — 1 day

Factors leading to such technologies emergence (interest and stakes).
Two categories of hybrid architectures: serial, parallel.

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Parallel architectures.
Single shaft, reversible starter generator in the accessories drive (STT + Adex), full hybrid.
Dual shafts, hybrid wheels, power shunt (DR), n mode power shunt (DRnM).
Consumption improvement functions: Stop and Start, regenerative braking, energy optimization, consumption measurement method, performances comparison, pollution.
New units: combustion engine, electrical machine, inverter, converter, booster, battery.
Overview, technico-economic balance and conclusions.
Electric vehicles.

ON-BOARD ENERGY STORAGE SYSTEMS — 0.5 day

Electrochemical battery: operating principle, characteristics and performances of the different technologies (lead-acid, cadmium-nickel, hydrogen-nickel, lithium-ion, lithium-polymer).
Ultra capacitor: principles, performances.
How it is inserted into the vehicle.

POWER ELECTRONICS — 0.5 day

Power components: Mosfet, IGBT, ...
Power electronics structures: DC-DC, DC-AC converters, ...
Power characteristics, installation restrictions, thermal and vibratory aspects. Electro-magnetic compatibility.

ELECTRIC MOTOR — 0.5 day

Electric motor different technologies: operating principles, characteristics, performances, evolution.
Installation restrictions: compactness, cooling.
Examples of applications to vehicles.

SYSTEM OPERATION - MANAGEMENT PRINCIPLES — 0.5 day

How to manage electric motors and converters? Which physical principles for which result?
Main functions, secondary functions.

HYBRID PROPELLERS & ENERGY MANAGEMENT — 0.5 day

Energy flux and energy supervision.
Meaning for serial, parallel and serial/parallel hybrids.
Objectives and restrictions: consumption, pollution, state of charge management, regenerative braking, stop/start functions, thermal engine boost, drive approval.
Techniques: empirical controls, application to a series vehicle, improvements offered to empirical controllers, optimum controllers.
Synthesis and controllers validation: use of system models, off-line optimization methods and adaptation and optimization online.
Application examples to vehicles.

THERMAL MANAGEMENT — 0.5 day

Thermal management of electrical main components. Installation restrictions.

VEHICLE INSTALLATION — 0.25 day

Manufacturing process of a complete system: storage system and drive chain dimensioning.
Installation restrictions, passenger compartment cooling.

To French entities : IFP Training is referenced to DataDock ; you may contact your OPCO about potential funding.
Please contact our disabled persons referent to check the accessibility of this training program : referent.handicap@ifptraining.com

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