

# Chapter 44

## Impact of Advances on Computing and Communication Systems in Automotive Testing

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### **ABSTRACT**

*A huge amount of information is used nowadays by modern vehicles, and it may be accessed through an On Board Diagnosis (OBD) connection. A technique using the already installed OBD system to communicate with the vehicle together with a Global Position System (GPS) provides reliable data which allow a detailed analysis of real on road tests. The proper use of some affordable equipment, which stores information to be post-processed with simple well-known software (like Google Maps and a spreadsheet), makes the reliable comparison of performances, emissions and consumptions of vehicles following different road cycles achievable.*

*Different kinds of circulation circuits (urban, extra-urban and highway) were analyzed, using the capabilities of OBD II installed on the tested vehicles. OBD provides an important set of information, namely related with data on the engine, fuel consumption, chassis and auxiliary systems and also on combustion efficiency. The use of GPS in all the road tests performed provides important information to further determine the more sustainable from all the different solutions tested, considering the different situations imposed on each circuit.*

*It is a fact that bench tests or a chassis dynamometer allow a fine control of the operation conditions; however the simulation is not as real as on the road. So the present methodology will allow the possibility to perform tests on the road, allowing enough control on vehicles and providing complete information*

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*of the chosen route and of the trip history. This is a possibility that ensures new tools with more reliable data which can give faster answers for the development of high efficiency, economic and environmentally neutral automotive technologies.*

## **INTRODUCTION**

Moving people and goods is one of the most common activities nowadays. In fact, a significant part of the energy used in the world (about one third) is consumed by the transportation sector.

Looking to the present energy consumption, and taking into consideration all the past errors in energy strategy by placing all our bets on fossil fuels, it turns clear that we must begin to seriously consider other energy sources.

People are changing their habits, and the actual tendency is to enlarge the geographical radius of actuation of their lives, travelling faster, further and more often. If in more advanced societies there are some strategies that allow a small decreasing in mobility, like people working at home, using technological tools to be distant but in the office, there is also a large increase of transports use on some societies, like China and India who discovered the automobile capabilities and are using it much more intensively.

This trend accentuates the energy dependency for the transport sector, and increases the environmental problems, mainly on Global Warming, with the raise of carbon dioxide emissions and other green-house-effect gases(GHG).

There are already some solutions to solve some of the fixed energy consuming problems. However, when it comes to moving energy consumption, like in transportations, there are some clues, but still no guaranteed solutions. Tests in engines and in vehicles are the only path to get proper knowledge about the success of those energy sources possibilities.

There are several possibilities to conduct this type of research: using an engine test bench, a roller test bench, or on road tests. Each of them has advantages and associated problems. The use of an engine test bench allows the study of

the engine on the desired conditions, with great accuracy and repeatability. However it presents some constrains when extrapolating the results to the real driving conditions, associating chassis environment and road and driver interferences. The use of a roller test bench incorporates the vehicles' interferences, but does not take into account the aerodynamic influences; it is not as accurate as the engine dynamometer and it is not possible to define the representativeness of each cycle regarding the real road conditions. Therefore, road tests are the most reliable procedure when it comes to the capacity to simulate the real circumstances of road, driver and environment. The difficulties are the ones associated with an absent laboratory.

With the here proposed methodology, it is suggested to move the laboratory with the vehicle, assuring some accuracy on the results by taking advantage of the fact that the vehicle is already equipped with a great variety of sensors. The communication protocol named OBDII (On-Board Diagnosis II) allows the reading and acquisition of a great amount of data, corresponding to the engine behavior under certain road and atmospheric conditions, concerning the vehicle demanding performance.

To complement the engine and vehicle data with information about road conditions, a Global Positioning System (GPS) is used, performing a simultaneous acquisition of all parameters, in order to know that a specific vehicle behavior corresponds to a certain road situation, since it is possible to mark the GPS coordinates on the map with the help of Google Earth software.

In this chapter, a methodology is presented to analyze the performance of a vehicle subjected to real on road and climatic conditions, which is relevant for the research of alternative propulsion systems in vehicles, or the use of alternative fuels replacing all or a part of the mineral fuel. This kind

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