DESIGN and MANUFACTURING of an ELECTRIC SPORTS CAR PROTOTYPE

2012-2015

Figure: A novel electric car (EVT S1)

ABSTRACT

Due to the diminishing fossil fuel and strict emission standards, electric vehicles are becoming more popular day by day. In many foundations, light electric vehicle prototypes are being built; however, their cost is generally very high. In this study a novel sports electric car prototype is designed and manufactured with very low cost. The car is designed for considering mass production with the **four sub-project** as follows:

1- **Chassis:** In this project novel approaches for design and manufacturing of an electric vehicle chassis and its fixtures are presented with very low cost. The chassis is tub type and its original structure is formed regarding manufacturing simplicity, lightness, robustness, and low cost. The design philosophy of the chassis is discussed in detail. Finite element analysis (FEA) of the chassis is performed for different crash, impact loading scenarios, and torsional rigidity. Also, original fixture designs for low cost manufacturing are introduced in this study.

Project Leader: Assoc. Prof. Dr. Engin Tanık
Researchers: Assoc. Prof. Dr. Volkan Parlaktaş, Nahit Babaarslan

2- **Suspension-steering:** In this project, novel approaches for analysis of the double wishbone suspension mechanism are presented. In the literature, to the best of our knowledge there is no analysis study available for the double wishbone mechanism that is performed "analytically". Initially kinematic model of the double wishbone mechanism is established. Then, a kinematic analysis methodology is presented. This analysis procedure is carried out analytically. Finally, by using the methodology proposed in this study, kinematic syntheses of front and rear double wishbone suspension mechanism are performed and optimized according to the specifications of the vehicle to which these suspensions are implemented. Mechanical design of the suspension is done with FEA and then manufactured.

Project Leader: Assoc. Prof. Dr. Engin Tanık
Researchers: Assoc. Prof. Dr. Volkan Parlaktaş

3- Body: In this project, design and manufacturing philosophy of the body of car electric prototype is proposed. This body has a relatively simpler structure than the other examples in literature, hence, is advantageous in terms of production costs. All design details of the body, which are designed completely with computer aided design software without using a clay model, are taken into consideration. Aerodynamic performance of the body has inspected with flow analysis simulation. 1/18 and 1/5 scale models are manufactured using 3D printer. Design is enriched, and functional designs of the door, luggage and windscreen areas are completed. Kinematic and static force analyses of the trunk door and hood are performed. Finally, the body and its components are manufactured.

Project Leader and head designer: Assoc. Prof. Dr. Engin Tanık
Researchers and designers: Assoc. Prof. Dr. Volkan Parlaktaş, Raşit Karakuş, Turan Soyözen, Anıl Direnç Korkmaz

4- Electric-electronic: Control of electric power and communication are important aspects for an electric vehicle. In this project, systems of many electric vehicles were analyzed before starting the electric system design of the car. Advantages and disadvantages of different systems were investigated. System requirements of the car were specified according to desired vehicle performance. Some devices and components were selected according to the requirements. While designing new hardware and software such as displays, vehicle control unit, DC_DC converter; compatibility was taken into consideration for the rest of the vehicle electronics system.

Project Leader: Murat Erdoğan
Researchers: Assoc. Prof. Dr. Engin Tanık, Raşit Karakuş, Serkan Benli

Detailed information and technical specifications of the car is available at:
h*ttp://www.evtmotor.com.tr/eng/*