European Association for the Development of Renewable Energies, Environment and Power Quality (EA4EPQ)	*International Conference on Renewable Energies and Power Quality* (ICREPQ'10) Granada (Spain), 23th to 25th March, 2010

ELECTRIC VEHICLE BASED ON STANDARD INDUSTRIAL COMPONENTS

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Extended abstract

This paper deals with the complete design of a battery powered electric vehicle (BEV) based on components that have been selected on the basis of choosing the subsystems more standardized and widely used in industry. This methodology has been used successfully in other fields of renewable energies as photovoltaic pumping systems. In comparison with dedicated components, the use of standard components has the following advantages:

- High reliability. They are highly tested components which have demonstrated an optimal performance in all types of adverse conditions in the industry.
- Low price, because its production is very high and they have very different applications.
- Broad range of products and suppliers.
- Availability of components virtually anywhere in the world. These components can easily be purchased or repaired in the majority of countries, providing an important technological independence that can enable geographic extent of these vehicles.

The basic components of a BEV are: rechargeable battery, power converter and electric motor. The components selected for this BEV are: VRLA batteries, AC induction motors and standard frequency converters (SFCs).

The BEV is configured with two electric motors coupled by gears to rear wheels and controlled with two independent SFCs that perform an electric differential (ED). The ED have the advantage of replacing loose and heavy mechanical differentials and transmissions. Its main features are that there is no mechanical link between the drive wheels and the traction power is separately applied to each wheel by the speed controllers.

The main advantages of this configuration are:

- The ED can be performed without steering angle sensor and wheel speed sensors.
- Regenerative braking is performed.

The BEV designed is in accordance with the European directive 2002/24/EC, category L6e (light quadricycles).

The design specifications are the following:

[1] Maximum speed: 45 km / h.

[2] Maximum weight (excluding batteries): 350 kg

[3] Maximum power: 4 KW

[4] Maximum slope at low speed: 8%

[5] Maximum initial acceleration at flat route: 0,83 ms^{-2} (The increased speed is 15 km/h in 5 seconds)

[6] Range in conditions of constant maximum speed and flat route: 75 km.

The final design has the following components:

- Welded steel chassis (total weight: 234 Kg).
- Bodywork of moulded fibreglass.
- Battery pack: 18 x NPC17-12 series-connected VRLA Yuasa batteries.
- Power train: two 2,2 KW - 3000 rpm - 50 Hz standard AC induction motors.
- Power controller: two VZAB2P2 Omron V1000 frequency converters.