Retrofit conversion

cornel ilie anghel
STADA I

- ideea de pornire este :

“ce facem cu masinile noastre ?...”

scoate termicul de pe ea :

- \- o masina (autovehiculul) cu motor termic poate fi convertita la tractiune electrica 100%, sau mai bine spus ***"merita"*** aceasta conversie daca indeplineste urmatoarele criterii (criteriile mele):
- are o masa redusa 1000-1300kg << fara sistemul termic de tractiune se incadreaza in 900-1150kg
- dimensiuni reduse (clasa mini sau cel mult clasa compacta)
- costurile de conversie sunt cu 50% mai mici decat achizitia unei masini noi (cu tractiune electrica)
- iti place mult pentru ca e masina ta ...de mult!

ce se poate face ?:

- Articole tehnice, cu caracter stintific, despre conversia masinilor pe petrol:

Electric Conversion of a Polluting Gasoline Vehicle into an Electric Vehicle and its Performance and Drive Cycle Analysis

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***Abstract*—This paper reports a study carried out for electric conversion of a polluting gasoline car into an electric vehicle. The performance evaluation and drive cycle analysis of the electric vehicle were studied and presented. For the conversion, a new electric vehicle powertrain was proposed and developed by integrating a battery, controller and an electric motor with the vehicle's gearbox system, after removing the internal combustion engine. The new powertrain mechanical parts were designed and developed for the integration. A pre-conversion performance test was conducted for tailpipe emissions and fuel economy on chassis dynamometer which followed the path of a driving cycle. The electric vehicle was configured and fixed at the top gear having a gear ratio of 0.90:1. The post-conversion performance tests were carried out on the dynamometer. The average energy consumption of the electric vehicle was 94.71 watt-hour per kilometer. The percentage contribution of drive modes (acceleration, deceleration, cruising) to input power, torque and output power were estimated using a computer program developed for the study and results were analyzed and presented. In totality, the study and test results verified the**

for conversion and transfer of energy from the energy sources to the EV wheels. The powertrain characteristics (torque versus speed) of an EM differ from those of ICE. In order to possess satisfactory performance, it is necessary for an EV to have the right electric powertrain and match it with the transmission [2, 3]. Extra attention and care must be given while selecting the right EM and powertrain system with appropriate gear ratios [4]. Many researchers attempted to study EV powertrain system through various models using techniques and tools like Matlab/Simulink [5]. The models helped to carry out hardware subsystems selection, design and gain an insight of the subsystem operations. However, they lacked the insight of practical approach and problems associated with the real-world application. In the paper [6], the author attempted the performance study of a converted hybrid electric vehicle (HEV) in the Indian context. However, a little was reported about the performance of the electric powertrain system used. In the literature, actual performance studies of the EV powertrain system were less reported. Detailed characteristics of the load current, torque,

Fig. 2. Mounting Parts of the EM

conversion. The emission analyzer bench was equipped with a non-dispersive infrared detector (NDIR) for the measurement of Carbon monoxide (CO) and Carbon dioxide (CO_2), chemiluminescence detector (CLD) for the measurement of NOx, flame ionization detector (FID) for the measurement of Hydrocarbons (HC). A GPS data logger was used to generate data for the vehicle kinematic behavior during the coast-down test on a level road. A National Instruments (NI) cDAQ-9174 system with the NI-9219 module, LabView, and a Fluke-i410 probe was deployed to acquire the input voltage and current respectively. The dynamometer computer measured and recorded other vehicle parameters such as torque (T), tractive force (F), mechanical power (kW), vehicle speed (v). All the test equipment were set to 1 data per second (DPS) and

$g K_w \sin\alpha$ = Tractive force fraction towards overcoming road gradient (grade resistance force)

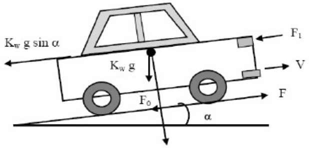

Fig.3. Resistance forces acting on a moving vehicle

F_0 = Speed-independent tractive force fraction (rolling resistance force)
F_1= Co-efficient for the linear speed-dependent fraction (aerodynamic force)
F_2 = Co-efficient for the non-linear speed-dependent fraction
K_w* (dv/dt) = Acceleration resistance force
v = Vehicle speed (km/hr)
n = Variable exponent $1 \leq n \leq 3$ (to 1 decimal place)
K_g = Base inertia of the chassis dynamometer
$K_w^* = (K_w - K_g)$ = inertia to be simulated electrically
dv/dt = Acceleration (m/s^2)

Electric Conversion of a Polluting Gasoline Vehicle in to Electric Vehicle – article by Robindro Lairenlakpam, 11 March 2020 - ResearchGate

ce se poate face ?:

- Articole tehnice, cu caracter stintific, despre conversia masinilor pe petrol:

Converting a Conventional Vehicle into an Electric Vehicle (EV) 3

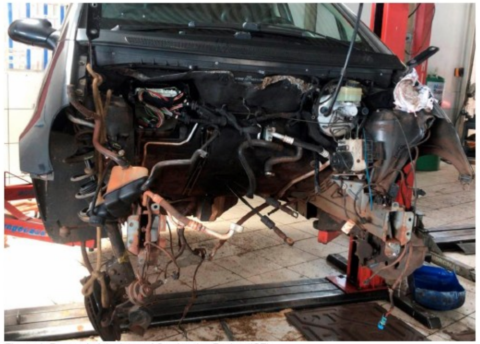

Figure 1. Removal of the Internal Combustion Engine (ICE).

Topology

The adopted topology is shown in Figure 2, and consists of a battery bank connected to a controller, which controls a brushless direct-current (BLDC) engine. When the driver accelerates, the withdrawal of energy from the source (battery) is increased, and this energy is delivered to the engine, increasing its rotation [2].

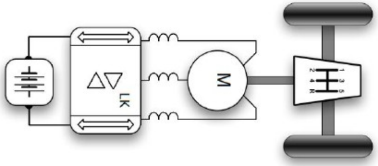

Figure 2. Traditional topology of an EV.
Elaborated by the authors, based on reference [3]

Converting a Conventional Vehicle into an Electric - Brasilian Archives Technology 2019 - ResearchGate

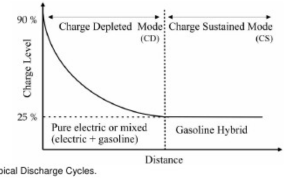

Figure 5. Typical Discharge Cycles.

Source: Electrification Coalition, 2009 [6].

Figure 5 shows that only part of the total energy is available, i.e. a fully charged battery may actually be below 100% of the total charge level, and will be considered discharged even if its charge is above 0%. As an example, a battery with 10 kWh of total capacity would only have 6.5 kWh of available energy. Moreover, this amount would degrade with use, the latter being quantified by the numbers of deep cycles (starting at 90% charge level and ending at 25%) and shallow cycles (the number of times the battery charge state varies). It is important to stress that degradation in shallow cycles is smaller than in deep cycles, and the temperature at which the battery is subjected when it is out of operation influences its longevity [4]. There are different battery technologies, and it is common to use measurement terms such as power density (or power per kilogram of battery - W/kg) and energy density (or energy per kg of battery - Wh/kg). Figure 6 compares the energy and power densities of different types of battery technologies [7]. In the Class A conversion, we used a 10.8 kWh lead-acid bank of batteries, shown in Figure 7.

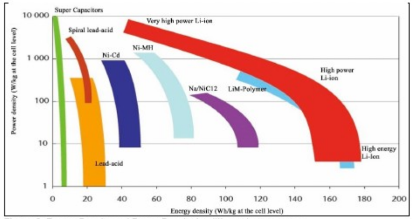

Figure 6. Energy Density and Power Density for different battery types.
Source: IEA (International Energy Agency), 2009 [7].