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Recent Developments in All Terrain Electric Vehicle: A Review

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Abstract: Modern EV (Electric Vehicles) are much capable to carry load and having efficient battery pack in order to last the electric power for long duration. Lithium-ion batteries makes it possible which are reliable power trains for ATVs and EVs. Previously there was no better options than lead acid batteries. But the recent Development makes the lithium-ion batteries more powerful and better option for EVs. Life of battery pack is also improved, hence most of the automobile companies are dealing with the Electric vehicles. They have shown their interest in manufacturing of Electric Vehicles. But still cost of vehicle is high as compare to the fissile fuel vehicle. Recent technologies are very impressive and having much potential to make EV cheaper, eco friendly and reliable for development of EV.

In this paper we have discussed the research which is based on Electric Vehicle Components and its peripherals. Several researchers and their studies are taken into consideration for the development of this review. Conclusive statement is based on the crux of all reviewed papers.

Keywords: (EV) Electric Vehicle, Battery, Power Controller, DC Motor

I. INTRODUCTION

Our global society is dependent on road transport, and development trends project substantial growth in road transport over the coming decades. According to a study commissioned by the World Business Council for Sustainable Development (2004), light-duty vehicle ownership could increase from roughly 700 million to 2 billion over the period 2000–2050. Globally, light-duty vehicles account for approximately 10% of global energy use and greenhouse gas (GHG) emissions (Solomon et al. 2007). These patterns forecast a dramatic increase in gasoline and diesel demands, with associated energy security concerns as well as implications for climate change and urban air quality. [1]

Among available transport alternatives, electric vehicles (EVs) have reemerged as a strong candidate. The European Union (EU) and the United States, among others, have provided incentives, plans, and strategies, at different levels of ambition, for the introduction of EVs (European Commission 2010; Greater London Authority 2009; IEA 2009; U.S. Department of Energy 2011). One of the more ambitious targets is proposed by a consortium of the International Energy Agency (IEA) (2009) and eight countries (China, France, Germany, Japan, South Africa, Spain, Sweden, and the United States), which aims to reach a combined total of 20 million full and plug-in hybrid EVs by 2020. Meanwhile, battery-powered EVs are becoming an important component of automotive manufacturers' strategies. Both Mercedes and Ford have clear ambitions in this area (Daimler AG 2010b; Ford Motor Company 2011). The first generation of mass-produced EVs has just entered the market (e.g., the Mitsubishi i-MiEV, Nissan Leaf, Renault Kangoo, GM Volt, and Ford Electric Focus).

EVs offer advantages in terms of powertrain efficiency, maintenance requirements, and zero tailpipe emissions, the last of which contributes to reducing urban air pollution relative to conventional internal combustion engine vehicles (ICEVs) (Wang and Santini 1993). This has led to a general perception of EVs as an environmentally benign technology. The reality is more complex, requiring a more complete account of impacts throughout the vehicle's life cycle. Consistent comparisons between emerging technologies such as EVs and their conventional counterparts are necessary to support policy development, sound research, and investment decisions. [1]

II. LITERATURE SURVEY

Troy R. Hawkins, Bhawna Singh, Guillaume Majeau-Bettez, and Anders Hammer Strømman, "Comparative Environmental Life Cycle Assessment of Conventional and Electric Vehicles". In their study they develop and provide a transparent life cycle inventory of conventional and electric vehicles and apply our inventory to assess conventional and EVs over a range of impact categories. They find that EVs powered by the present European electricity mix offer a

10% to 24% decrease in global warming potential (GWP) relative to conventional diesel or gasoline vehicles assuming lifetimes of 150,000 km. However, EVs exhibit the potential for significant increases in human toxicity, freshwater eutrophication, and metal depletion impacts, largely emanating from the vehicle supply chain. Results are sensitive to assumptions regarding electricity source, use phase energy consumption, vehicle lifetime, and battery replacement schedules. Because production impacts are more significant for EVs than conventional vehicles, assuming a vehicle lifetime of 200,000 km exaggerates the GWP benefits of EVs to 27% to 29% relative to gasoline vehicles or 17% to 20% relative to diesel. An assumption of 100,000 km decreases the benefit of EVs to 9% to 14% with respect to gasoline vehicles and results in impacts indistinguishable from those of a diesel vehicle. [1]

Pramoda Gode, Georg Bieker, and Anup Bandivadekar, "Battery capacity needed to power electric vehicles in India from 2020 to 2035". In their work, they have estimated the battery manufacturing capacity that will be required for EVs, by year, up to 2035, under two future scenarios. They have then discussed what that would mean for the industry's development in India. The rest of their paper is organized as follows. First, they have defined the two scenarios and outline the data sources and methodology used to forecast EV sales. Next, they need to describe the steps involved in determining the capacity of EV battery packs in the future. Following that, they estimate the total battery capacity required up to 2035. Then they conclude with a summary of their findings and a discussion of the policy implications. [2]

C C Chan, "Electric Vehicles". Their paper reviews the present status of electric and hybrid vehicles worldwide and their state of the art, with emphasis on the engineering philosophy and key technologies. The importance of the integration of technologies of automobile, electric motor drive, electronics, energy storage and controls, and the importance of the integration of society strength from government, industry, research institutions, electric power utilities and transportation authorities are addressed. The challenge of EV commercialization is discussed. [3]

Fuad Un-Noor 1, Sanjeevikumar Padmanaban 2, Lucian Mihet-Popa 3, Mohammad Nurunnabi Mollah 1 and Eklas Hossain 4, "A Comprehensive Study of Key Electric Vehicle (EV) Components, Technologies, Challenges, Impacts, and Future Direction of Development". Their paper is focused on reviewing all the useful data available on EV configurations, battery energy sources, electrical machines, charging techniques, optimization techniques, impacts, trends, and possible directions of future developments. Its objective is to provide an overall picture of the current EV technology and ways of future development to assist in future researches in this sector. [4]

Dale Hall and Nic Lutsey, "Effects of battery manufacturing on electric vehicle life-cycle greenhouse gas emissions". Their briefing reviews recent research regarding greenhouse gas emissions from the manufacturing of lithium-ion batteries for electric vehicles. They have analyzed their research in the overall context of life-cycle emissions of electric cars as compared to conventional internal combustion vehicles in Europe. Finally, we discuss the primary drivers of battery manufacturing emissions and how these emissions could be further mitigated in the future. [5]

Z S Gelmanova, G Zhabalova, G A Sivyakova, O N Lelikova, O N Onishchenko, A A Smailova, S N Kamarova, "Electric cars. Advantages and disadvantages". The article considers the positive and negative aspects of the use of electric vehicles. A rough calculation of the energy efficiency and average cost per month was made. Also priorities to avoid the existing problems in the market of electric vehicles were set. [6]

C Iclodean 1, B Varga, N Burnete, D Cimerdean, B Jurchiş, "Comparison of Different Battery Types for Electric Vehicles". Their study presents the autonomy of an Electric Vehicle that utilizes four different types of batteries: Lithium Ion (Li-Ion), Molten Salt (Na-NiCl₂), Nickel Metal Hydride (Ni-MH) and Lithium Sulphur (Li-S), all of them having the same electric energy storage capacity. The novelty of this scientific work is the implementation of four different types of batteries for Electric Vehicles on the same model to evaluate the vehicle's autonomy and the efficiency of these battery types on a driving cycle, in real time, digitized by computer simulation. [7]

Jennifer Todd, Jess Chen, Frankie Clogston, "Creating the Clean Energy Economy, Analysis of the Electric Vehicle Industry". In their study they have explained that, all the oil consumed in the U.S., 70 percent is used for transportation. Further, passenger vehicles use 70 percent of transportation oil. Globally, a rising middle class in China and India is causing demand for passenger cars to balloon, and with it, demand for oil. By 2050, there may be as many as 1.5 billion cars on the road, compared to 750 million in 2010. This type of demand represents both a challenge and an opportunity to capitalize on new vehicle technologies, and in the process, reap substantial economic development benefits. In a world where oil is a limited resource, an alternate source of transportation fuel – electricity – is not only a smart investment, but as some would say, it is an inevitable one. Further, the switch to electric vehicles will generate

demand for existing jobs and create new jobs as well. As study after study confirms, job growth in electric vehicle industries will outweigh any reduction of jobs in traditional fuel industries, resulting in net job growth. Electric vehicles create additional economic development opportunities by improving quality of life, reducing energy spending, and decreasing reliance on foreign oil. [8]

Zoran Stevic and Ilija Radovanovic, "Energy Efficiency of Electric Vehicles". In their study, the most important possibilities for increasing energy efficiency of electric vehicles would be considered, regarding energy savings accumulated in the vehicle itself and increasing the range of performances of the cars with given initial resources. Some of the possibilities that should provide such a progress nowadays are:

- Using energy under braking
- Using waste heat energy
- Additional supply by solar cells
- Improved mechanical energy transmission system
- Improved cars shell design
- Increasing of efficiency of power convertors
- Special design of electric engines
- Using supercapacitors, fuel cells and new generation batteries
- Route selection on the criterion of minimum consumption in real time
- Parameter monitoring inside and outside of the vehicle and computerized system control with optimization of energy consumption

Today, the problem of energy becomes so important that an entire industry is turning towards clean, renewable energy (solar energy, wind energy, etc.). Prototypes of hybrid vehicles with the announcement of mass production scheduled for the near future have become everyday occurrence. In addition, many cars are designed to use only electricity as motive power, which reduces emissions to zero. [9]

David Coffin and Jeff Horowitz, "The Supply Chain for Electric Vehicle Batteries". Their paper explains the importance of EV batteries, describes the structure of the EV battery supply chain, examines current limitations in trade data for EV batteries, and estimates the value added to EV batteries for EVs sold in the United States. [10]

Henry Lee, Alex Clark, "Charging the Future: Challenges and Opportunities for Electric Vehicle Adoption". Their paper analyzes the additional advances that will be needed, if electric vehicles are to significantly penetrate the passenger vehicle fleet. [11]

Marek Palinski, "A Comparison of Electric Vehicles and Conventional Automobiles: Costs and Quality Perspective". Their report covers the research area of electric vehicles dedicated for personal transportation and its relevant market including the necessary to know background information about the topic. Ongoing, the researched assumptions are later on put into test in the form of a questionnaire focusing on finding out about the awareness of electric vehicles among the public nowadays. The final statement that is going to be approved or rejected is the electric vehicles as the future of the global car market. [12]

Ann Holms, "A Technical Research Report: The Electric Vehicle". Their report explains how an electric vehicle works and compares the electric vehicle to the internal combustion engine and hybrid vehicle. The report provides some of the advantages and disadvantages of the electric vehicle. In addition, a brief future view of the technology is given. [13]

III. CONCLUSION

By studying all the literature available on the electrical Vehicles in this paper, it is found that the development of EV needs High power battery pack to generate required torque. Also, the longer travel range must be achieved. Several researchers have stated the importance of EVs. But the main advantage of EV is found its less maintenance cost and pollution free travel. Further Conclusive statements are as follows.

- 1) Electrical Vehicles are having lithium-ion battery pack. Hence, they are costlier.
- 2) Efficiency of Electric Vehicle can be achieved better than Petroleum fueled vehicles.



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