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Electrical Road Transportation System

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Abstract – *Electrifying vehicles is seen by many as a possible solution to reduce environmental emissions and the dependence on fossil fuel. Unfortunately, most environmentally friendly energy storage systems, such as batteries, have less energy density compared to fossil fuel, which will have a negative impact on the vehicle range.*

A battery with enough capacity for long distance transports will therefore often imply a substantial increase in cost and weight, and reduced transport volume. An alternative would be to continuously transfer energy from the road to the vehicle both for propulsion and charging. A development of an electrified road system (ERTS) between cities would mean that most of the route could be driven on electricity from the road and the remaining distance can be driven on energy from potentially

Keyword-system-of-systems; innovation management; road transportation; electrical vehicles;

1. INTRODUCTION

Road transportation is one of the most fossil-fuel-dependent sectors, accounting for 23 percent of the world's greenhouse gas (GHG) emissions and a large portion of Local air pollution. It has proven most difficult to curb the fossil fuel dependency of vehicles by replacing the fuel or deploying a technological alternative to the internal combustion engine that has satisfactory performance. Consequently, the need for technological transformation in Road transportation is urgent, especially in order to reach policy goals of cleaner air and reduced GHG emissions. Many of these radical (i.e. discontinuous) innovations, such as battery electric vehicles (EVs) and fuel cell electric vehicles (FCEVs), have received public financing as they have the potential to address environmental or societal challenges. These innovations have initially been developed through R&D activities and then further validated in pilot and demonstration projects. In the next phase, these innovations are expected to reach commercial markets. Consequently, the amount of public financing has been reduced as the innovations are expected to attract increased support from industry in response to customer demands. The electric road system (ERTS) has emerged as one of the few realistic alternatives for providing sustainable transportation in many regions, particularly for heavy transport.

ERTS is defined by dynamic power transfer from the road to the vehicle while the vehicle is in motion and can be realized through technologies operating underneath the vehicles (i.e. inductive and conductive power transfer) or above the vehicles (i.e. conductive overhead lines) .The vehicles should be hybrids with an alternative power source to enable the flexibility needed for independent vehicle operation, the major benefit compared with other transportation modes such as trains, aircraft, and ships.

1.1 Background

Increasing global pollution and with Peak-oil approaching or possibly even reached calls for new means of transport, non-dependent on fossil fuels. The huge power capacity, enabled by the energy density in the oil, has accustomed and spoiled the automotive-world and raised the competition for new competing technologies, such as the Electric Vehicle (EV).

There is a major challenge to meet the demands placed on a new vehicle such as regarding cost, efficiency, range, and functionality. Great resources are spent to increase the EV range by increasing the vehicle efficiencies and the battery capabilities. Despite this, the energy storage capacity of the batteries is not enough for long-distance transport of EVs and even output power could be a limiting factor. Larger batteries are not necessarily the solution since they require a longer time to recharge or access to charging stations with extreme charge capabilities. Moreover, the battery is a substantial part of the total cost and weight of the EV, which reduces the cargo load capacity, and thereby also the monetary gain for the otherwise less energy demanding vehicle. To make the EV less dependent on the battery, especially for long distance heavy transport, and at the same time reduce the vehicle cost, a possible solution could be to transfer power to the vehicle from the roadway.

Electric Road Systems (ERS) can be defined as roads supporting dynamic power transfer to the vehicles from the roads they are driving on. An ERTS could connect cities and allow the bulk distance to be driven on external electric power instead of using fossil fuels. The propulsion of the short remaining distance outside the ERS network could either be based on internal combustion engine (ICE), or on energy stored in small, on-board batteries optimized for city routes. With this solution, both the costs and the weight of the batteries can be kept small. In addition, there is no need to stop and recharge since this is possible while driving.

2. SYSTEM WORKING

ERS could be based on energy transmission to the vehicle from above, from the side, or from under the vehicles. The idea of transmitting energy from above is the

most mature technology, it has been used in e.g. trolley buses for many decades. Such a solution is suitable for the heavy transport segment but it excludes passenger vehicles since the current collector would be unrealistically long. Transmitting energy from the side of the road would be suitable for most kinds of vehicles but the potential number of lanes to be electrified would be limited.

Furthermore, there are different ways to transmit energy from an ERS to the vehicles and two of the more commonly discussed solutions are conductively and inductively. In a conductive system, energy is transferred by establishing a physical contact between the vehicle and a conductor built into the road. Consequently, the technology requires a current collector, also known as a pick-up, which follows the electrified road and acts as the interface between the road and the vehicle. With the flexible highway vehicles, unlike trains that are bound to follow the rails, the pick-up needs to be active and capable of following the ERS with the ability to connect and disconnect depending on the driving behavior and road conditions.

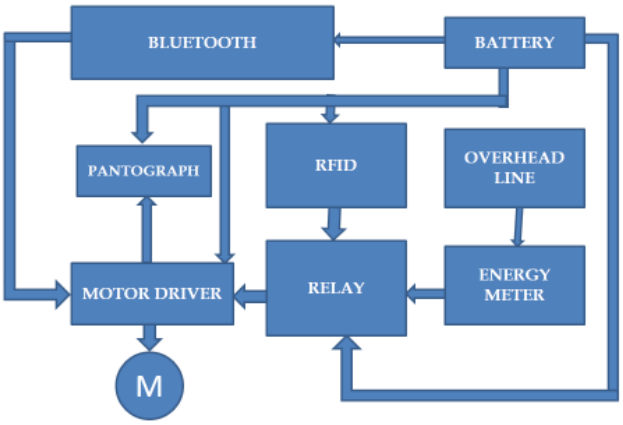

Fig -1: Block diagram of project

3. METHODOLOGY

Generally the electric transporting system are consider in traction system. Around the world wide the electric traction system are more efficient for transferring goods. Passengers etc., than conventional diesel engine or IC engine drives. Controlling, breaking are more complicated in engine drive but in EVs are easier and pollution free, cost effective. So we are considering to drive the heavy transport vehicle on road by using OH line system and now this OH line system use to drive trains so why not we are using this system on road transportation. The heavy transport are use this electricity by using the OH catenary and pantograph. That vehicle are use electricity and pay for used energy. That system are beneficial for heavy EHVs .we are conceptually prepared for this system operation.

Electric road transport system that the current collet device are the name of pantograph that collect the current from overhead line and transfer to energy meter that measure the parameter of energy, voltage, current, power, rating and glow up the how much energy we can use in the period of driving that relay control the pantograph for the connect or not connect to OH catenary and relay get to operate when access are used to permission to connect or use electricity. Than the electric supply flow towards the motor circuit and to controller control the motor operation.

3.1 Energy meter

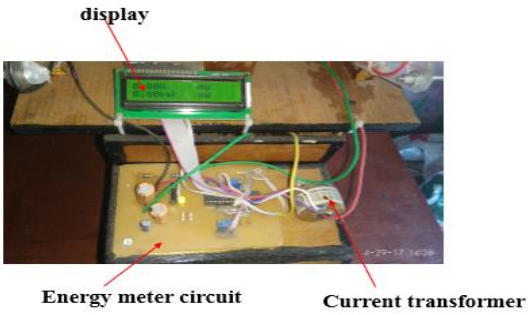

Fig –3.1(a) typical picture of energy meter

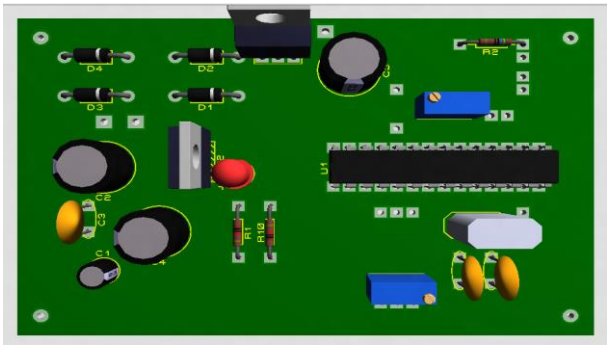

Fig –3.2 (b) simulation board of EM

Electronic meters display the energy used on an LCD or LED display, and some can also transmit readings to remote places. In addition to measuring energy used, electronic meters can also record other parameters of the load and supply such as instantaneous and maximum rate of usage demands, voltages, power factor and reactive power used etc. They can also support time-of-day billing, for example, recording the amount of energy used during on-peak and off-peak hours.

3.2 Relay

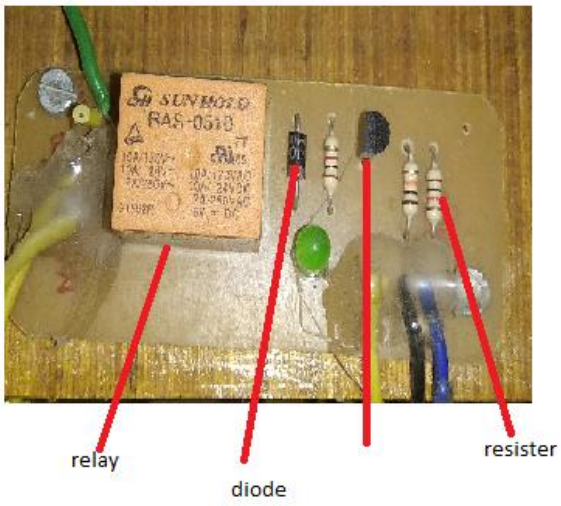

Fig –3.2 relay model

A relay is an electrically operated switch. Current flowing through the coil of the relay creates a magnetic field which attracts a lever and changes the switch contacts. The coil current can be on or off so relays have two switch positions and they are double throw (changeover) switches.

3.3 RFID

RFID tagging is an **ID system** that uses small **radio frequency identification devices** for identification and tracking purposes. An RFID tagging system includes the tag itself, a read/write device, and a host system application for data collection, processing, and transmission.

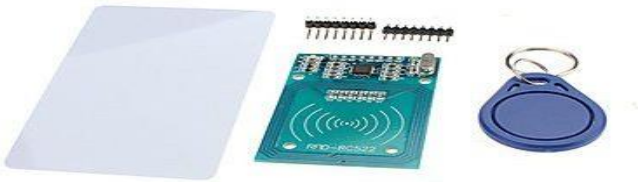

Fig-3.3 concept of RFID module

3.4 Bluetooth

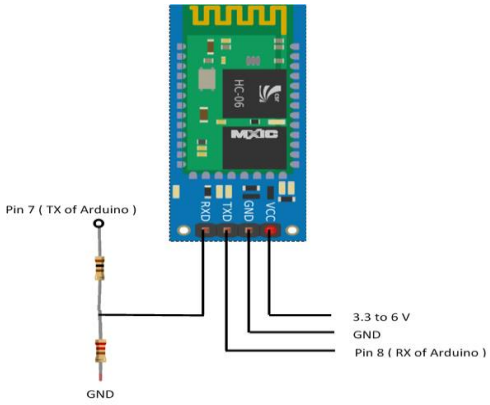

Fig – 3.4 concept of bluetooth module

This module is an easy to use Bluetooth SPP (Serial Port Protocol) module, designed for transparent wireless serial connections. The Serial port Bluetooth module is fully qualified Bluetooth V2.0+EDR (Enhanced Data Rate) 3Mbps Modulation with complete 2.4GHz radio transceiver and baseband

3.5 Pantograph

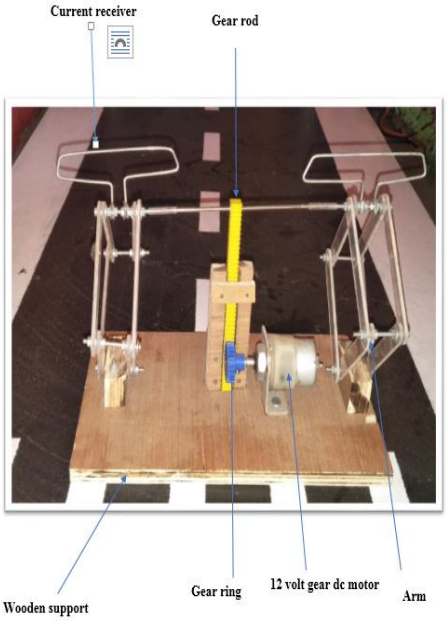

Fig -3.5 concept pantograph module

Electric Road Systems (ERS) can be described as electrified roads that support dynamic power transfer to the vehicles from the roads they are driving on. The basic principle is to power an electric engine within the vehicle from an external

power source that is built into the road infrastructure, see Figure 1. The electrical power is transmitted while the vehicle is in motion, through a pick-up assembled to the vehicle in a similar way as for a trolley bus. The roads would be accessible for both vehicles with ERS-propulsion as well as conventional fossil fuelled vehicles. Further on, the ERS-vehicles would be equipped with a small battery and a potentially smaller internal combustion engine (ICE), which allows the vehicles to drive also on conventional roads outside the ERS network

4. RESULT &CONCLUSIONS

Today electric technologies compete well in market.
We are concluded that this project not only energy efficient but also it reduces the environmental pollution.

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