"AUTOMATED OR MANUAL SWITCHING OF FUEL ENGINE TO ELECTRIC MOTOR"

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ABSTRACT

A hybrid electric vehicle is one, which uses fuel power and electric power to run vehicle. Sometimes necessity comes in so as to run a vehicle even on exhaustion of fuel, in which the hybrid electric vehicle models fails to satisfy the need. The proposed project model aims at satisfying such a need. often, when the fuel level comes to reserve, the driver as no other option than to refuel the vehicle. in such a case, the proposed model can be incorporated in vehicle so as to provide an uninterrupted driving by automatic switching from fuel engine to electric drive.

1. INTRODUCTION

Several economic and environmental factors are contributing to increasing interest in alternative vehicle technologies. These factors include rising global demand for oil, concomitant increases in fuel prices and anthropogenic climate change. Rising global demand for oil has economic consequences. Increasing demand has a direct economic impact via increased commodity prices as well as a number of geopolitical implications that create political challenges for countries that rely on imported oil for economic activity. Moreover, evidence of the increasing dangers posed by climate change adds to the urgency to reduce the greenhouse gas (GHG) emissions from all sources. Hybrid electric vehicle (HEV) technology and its various applications have made significant market gains in recent years and form an important part of the fuel economy equation. Initially only introduced in North American, European and Japanese markets in the mid-1990, HEVs are now starting to gain markets in developing and transitional countries, including China and Brazil.

2. Block Diagram

The block diagram representation of the implemented model is shown in Fig.1

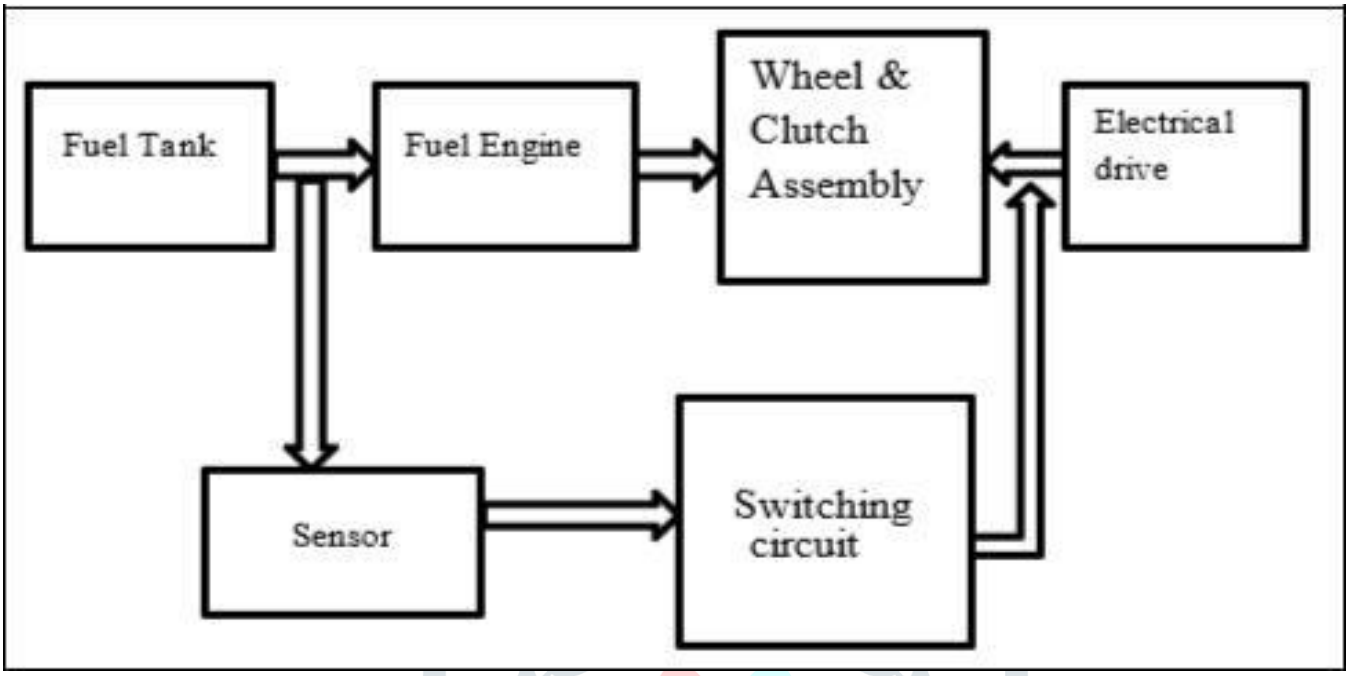

Fig 1: Block diagram

The block diagram describes the fuel engine being run by the fuel in fuel tank. The fuel engine is coupled to the wheel and clutch assembly to bring about the motion in the vehicle. A fuel level sensor senses the minimum level of fuel in the fuel tank, when fuel level comes in reserve condition the fuel level sensor actuates a switching mechanism in the auto clutch to switch over to the electric operated system. The electrical engine then gets coupled to the wheels of the vehicle to bring in the same process of traction.

3. WORKING

The block diagram as shown in Figure 1 contains a storage tank. The storage tank is filled with fuel. A float type sensor is kept immersed in the tank in order to indicate the reserve level of fuel in the tank. A PMDC motor has been used to portray the role of an internal combustion engine. The PMDC motor of the 12V, 45rpm specifications is attached to one side of the freewheeling hub. This becomes the fuel engine drive of the system. When the fuel is present in the tank, the hub runs with the rotation given in by the fuel engine drive. When the fuel level reduces to the minimum value, the sensor actuates a signal for switching and the switch over takes place to the electric drive system. The electric drive system consists

of a PMDC motor connected to the hub. During the movement of the hub upon switching to electric system, the fuel engine drive stops automatically. The speed of this PMDC motor is achieved by armature voltage control method. A speed control knob has been provided which is nothing but a potentiometer. Apart from the automatic detection of the exhaustion of fuel and switching, a manual switch also has been provided, so that the electric drive mode can be achieved manually. To slow down the movement or stop the hub, speed control knob is used. Here dynamo is coupled to motor due to which the battery again charged when vehicle is running on electric motor.

4. SWITCHING CIRCUIT

The circuit consists of four basic blocks, being;

- Battery and voltage regulator circuits
- Electronic circuit
- A fuel level sensor

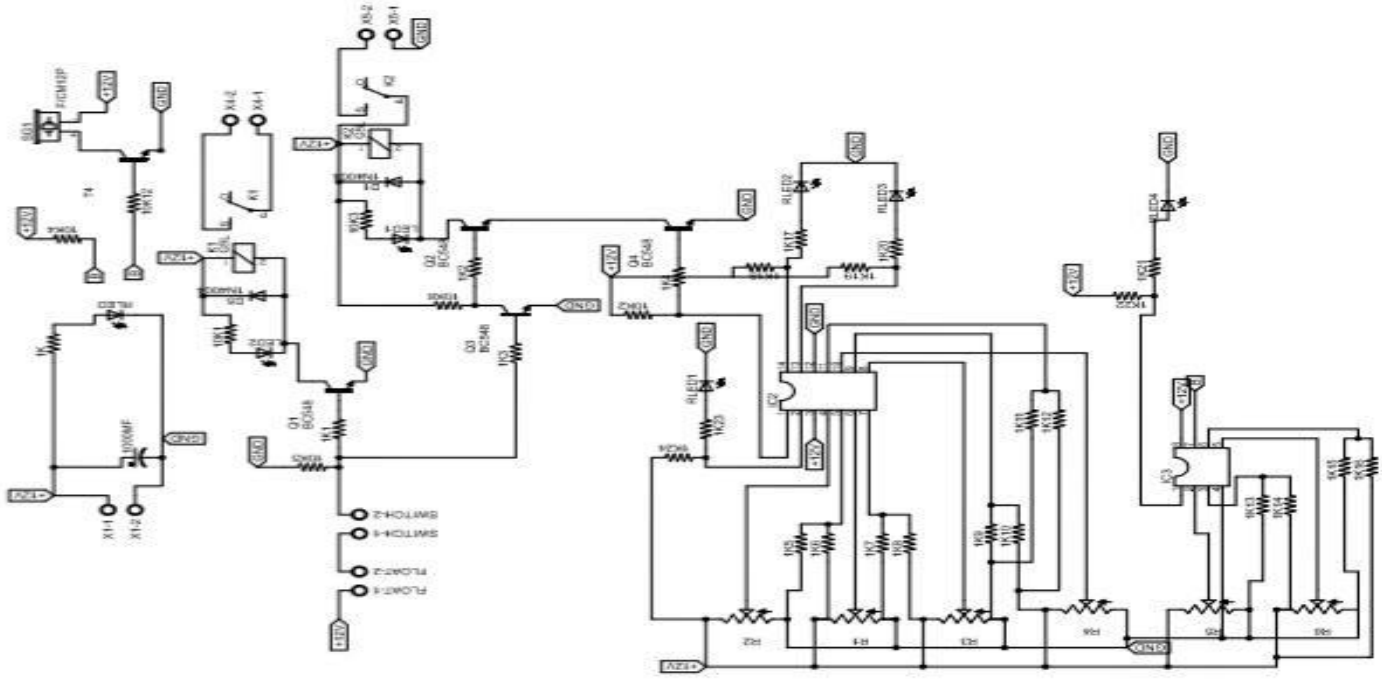

Fig 2: Circuit Diagram for Switching Model

The battery used here is12V, 9Ah battery that runs all the power devices in the circuit which includes the motor and the transistors. The lead acid battery used here is a rechargeable one and is capable of providing a maximum current of 0.15A. The fuel level indicator used here,

is to actuate the electric motor once the fuel level comes to a minimum preset level. The indicator consists of floating circular contacts and two metal contacts at the bottom of the storage tank. A logic gate, diode and transistor are the components of the logic circuit. The inverter is used, 14 pin IC LM339 and 8-PIN IC LM 393 comparator ICs are used. IN4007 model diodes are used in order to prevent reverse current to the low voltage level circuits.

5. RESULTS AND DISCUSSION

The analysis and result of proposed model is given below, the experiment of model is conducted on the vehicle by using 12V, 9Ah Li-ion battery, 45rpm PMDC motor, radius of the vehicle wheel is 24cm and vehicle run at 4km/hr.

Table 1: The result analysis for proposed model

s. no	Charging level of battery in volts	Speed of the PMDC motor in rpm	Distance covered by vehicle in km/hr.
1	12.7	43.4	3.9
2	12.0	41.2	3.7
3	11.3	39.8	3.5
4	10.6	35.3	3.1

The results given below, when the model is actually incorporated in vehicle of having the specification of 48V, 20Ah. Radius of the wheel is 28cm; speed is 60km/hr. The speed of the motor is 300rpm.

Table 2: The result analysis for actual implementation in two-wheeler

s.no	Charging level of the battery in volts	Speed of the PMDC motor in rpm	Distance covered by vehicle in km/hr.
1	48	290	30.61
2	45.35	275	29
3	42.7	266	28
4	40.06	253	26.7

Here battery is charged when vehicle is running through fuel engine, hence there is possible of discharging of battery. To overcome that dynamo is coupled to motor due to which the battery again charged when vehicle is running on electric motor.Here 12V,6W dynamo is used to increase the charging level of battery up to 30%.

6. CONCLUSIONS

Hybrid electric vehicle technology for both light and heavy-duty applications is commercially available today and demonstrates substantial reductions in tail-pipe emissions and fuel consumption, even when compared to other available low emission technologies. HEVs are particularly effective for urban travel, significantly lowering pollutant emissions. In such a scenario where there is a need for an alternative, the proposed system can be of a great help. This prototype can be further extended to real time vehicles considering all the requirements and specifications. The proposed system provides a method of switching over from the conventional fuel systems to the electric system upon the requirement of the user. Apart from switching and reversing is also provided.

REFERENCES

1.Poria Fajri, B. Asaci, "Plug-in Hybrid Conversion of a Series Hybrid Electric Vehicle and Simulation Comparison."

2.Omonowo D Momoh, Micheal O Omoigui, "An Overview of Hybrid Electric Vehicles, IEEE, Vehicle Power and Propulsion Conference", 2009.

3. C J Goodman, Overview of Electric Railway Traction, Electric traction Systems, 2006.

4. S Jeschke, H Hirsh, Investigations on the "EMI of an Electric Vehicle Traction System, International Symposium on EM Compatibility", 2014.

5.Bingyang Luo, Bo Zhao, Yimin Mo, The Study of Clutch Control Strategy in Starting Process, International Conference on Mechanic Automation and Control Engineering, 2011.

6.H. Shimizu, J. Harada, C. Bland, K. Kawakami, and C. Lam, "Advanced concept in electric vehicle design," IEEE Trans. Ind. Electron., vol, 44, pp. 14-18, Oct. 1997

7.V. W Ouk, "Hybrids: Then and now," IEEE Spectrum, pp. 16-21, July 1995

8.M. Ehsani, K. M. Rahman, and H. A. Toliyat, "Propulsion system design of electric and hybrid vehicles," IEEE Trans. Ind. Electron., vol. 44, pp. 19-27, Feb. 1997.

9.Chen Qingquan, Sun Fengchun, Zhu Jiaguang. Modern electric vehicle technology. Beijing: Beijing Institute of Technology Press, 2002.

10.Chen Qingquan, Sun Fengchun. Basis for hybrid electric vehicles. Beijing: Beijing Institute of Technology Press, 2001.