Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 4255 - 4260
Received 25 April 2021; Accepted 08 May 2021.

Hybrid Electric Vehicle Power Train Configuration with Battery Management System

K Gokul [1], Dr.M.Siva Ramkumar*[2], Dr.A.Amudha[3], Dr.G.Emayavaramban[4,]
Dr.S.Divyapriya[5] P.Nagaveni[6], ,M.SivaramKrishnan[7]
[1]*PG Scholar, Dept of EEE, Karpagam Academy of Higher Education, India*
[2,4,5,6]*Asst Prof, Dept of EEE, Karpagam Academy of Higher Education, India*
[4]*Prof and Head, Dept of EEE, Karpagam Academy of Higher Education, India*
[7]*Asst Prof, Dept of EEE, Karpagam College of Engineering, India.*
sivaram0699@gmail.com

***Abstract*—**An HEV gives a different operating modes in a cycle which is a complete cycle and the operating modes are as follows: it gives the recharging of battery in a situation where acceleration happens and also in continuous braking and also it brings accelerating and cruising kind of operating modes. In the subsystem of electrical system thereconsists of main four parts they are like electric generator, motor and the batteries and DC-DC converter. The modelling of power split system model is given by planetarysubsystem. The transmission of the mechanical motive forceis done by the planetary system to system which done by combining and allocating the motors, engine and generators.57 kilo watts with 670 rotation per minute of gasoline fuel engine is given by the Internal combustion engine by speed governor. The vehicles mechanical parts are given by the vehicle dynamics. The reference signal from the energy management system provides the signal for the drives such as motor drive, generater drive and for the internalcombustion engine which makes the accurate power distribution from all these kind of different sources where it can use both the fuel energy and also can switch between electric motors where if there is no fuel situation or something and there will be a switching over to the electric drive by the internal combustion engine.

Keywords—hybrid, electric vehicle, piezo electric crystal.

I. INTRODUCTION

Hybrid electric vehicle transmits the power through thepower train configuration of the vehicle. There are different power forms are in hybrid electric vehicle. Power train configuration of the hybrid electric vehicle or of different or In a prior stage or certain long period of time the internal combustion engine of fossil fuel engine and a electric transmission with the electric power train used in the hybrid electric vehicle. These two types of system used in the railway systems over a long period.At the first stage of HEVthe power trains are not worked properly due to the fault of electric drives, direct transmissions are replaced by the mechanical transmission not going through the source of supplementary motive power. The first or earliest forms of hybrid electric vehicle is the 'trackless' trolleybus experimentin New Jersey that is between the years from year 1935 to 1948,where it works with the traction current with the help ofelectric wires. The trolleybus does not want the tractioncurrent so it is integrated with the internal combustion engine. But it gives the direct mechanical power train configuration. The revenue services are used by the electric wire because there is no any contact wires. Some power plants are integrated with the concept of trolleybus model ofhybrid electric vehicle in the period after 90's, it is mainly used for the emergency purpose but it does not support the general revenue system.

The potential energy is the main form which is storedand previously converted from the energies including all of its components from the power train. The power trains propulsion uses the following energies not at a time the energies are: kinetic, nuclear, chemical and solar form of energies. Steam locomotive is a best example. Best example in the recent modern world is a electric bicycle model. Another important aspects of the electric vehicle is it can used with the super capacitor with the combination of batterywhich is supplements by the ICE of the vehicle it recharges

the battery and also recharges the power of electric vehicle.Another forms of storage of energy of the power train is the flywheels.
Only ICE type of hybrid electric vehicle is available in the market from 2016 from many other different types if hybrid vehicles. In considering some other types of electric vehicles there are so many things from that there are two types which is named as parallel and a series type of vehicles where series provides power from one source to the other source and the parallel type provides the power to both the motors simultaneously. Primary motive force is provided by either along with the other source which is augmenting those primary source.

On giving a introduction about Simulink which is of the MATLAB based design system which provides the graphical design environment with the programming structure for designing a simulation like modelling, simulating and analysing multidomain dynamical systems. It has full access to the different types of libraries with the graphical set of designing tool and the libraries are of customizable. Simulink always integrates with the other type of MATLAB environment where it can be transfer between them or directly scripted in them. Simulink uses a dynamic designing and programming where it also uses a type of digital signal processing for multidomain simulations.

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 4255 - 4260
Received 25 April 2021; Accepted 08 May 2021.

II. EXISTING SYSTEM

In the existing system of methodology there are three different types of objective functions which are used to find the fleet optimized HEV electric vehicle battery under different circumstances where the ranges under techno economical conditions. The objective functions maximize either the number of PHEVs in the car fleet, PHEVOPT; the TCO-savings in the car fleet, TCOOPT; or distance of electric driving of the car fleet, EDFOPT. Driver's movement pattern is given by a economically based in each case, by assuming the drive's are choosing the HEV'. That is the HEV is choose by the driver in all the cases we must give a higher investment standards when comparing to the CV and it is setting off with the electric driving which runs in a lower cost. And the important major aspect of the HEV is really based upon the cost of the ownership which isinfluenced by a large amount of factors which is of the following like what is the owners income of household, and there are many competitors which depends upon the fame and brand, the information access, different models, new technologies which attracts the customer and the atmosphere. On comparing the TCO only we can assume that how our model of system will perform which is HEV and it is a difficult one to take care of. See for example Al Alawi and Bradley (2013) for a review of HEV, PHEV and BEV market modelling in the US where the most commonly used methods were found to be owner's choice model, agent based model, series time model and with the rate of diffusion. Mainly with the help of GPS the car data sets are calculated in the Swedish vehicles like trip start time, stop time and so on from that they can have the car data movement pattern.

III. PROPOSED SYSTEM

Electric powertrain or power control unit, which is the integral part of the EV/HEV, is consisting of the high voltage battery, DC/DC converter, inverter, and electric motor. We need to evaluate the HEV powertrain configuration in its critical stage of development. By providing the system with the peak of about 150 kilo watts energy is discussed in this paper with the model of early Toyota Prius which is of the model 2006 and there are many conspiracy behind the theory where in this theory and design we can see the elaboration of control techniques. This system is constructed as grid- connected back-to-back inverters driving a 55kW IPM machine to work as the load to the Prius's powertrain. At the end we can able to determine the data collections and the operation modes of the system. Overall, this platform extends an energy-saving solution for powertrain evaluation with the capability of sending the energy from the evaluated vehicle back to the grid compared to traditional dyno and the system power dumps the passive load. On including the theory of kinematics the proportion between the road resistance and the speed of the vehicle with the torque and speed of the powertrain related to the driving cycle will be obtained. Numerical models of ICE, ISG, battery and transmission were established. According to backward- facing approach, fuel consumption of HEV with optimum ICE curve control strategy or electric assisted control strategy was simulated, and dynamic conditions of engine, ISG and battery were obtained. Hence the related torque withthe speed of the system is discussed in this paper and we canmove forward to see how the power train is being configured.

IV. DESIGN METHODOLOGY

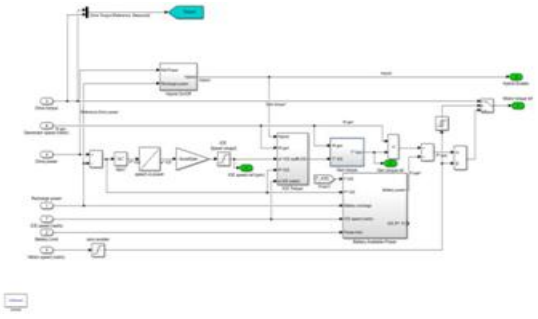

Figure1. Schematics of Circuit Design

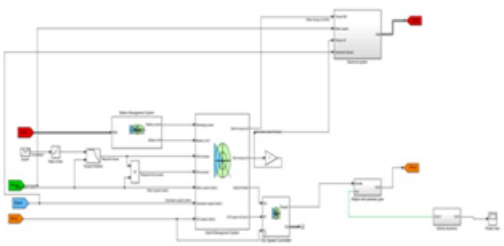

Figure 2. Design of Battery Management System

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 4255 - 4260
Received 25 April 2021; Accepted 08 May 2021.

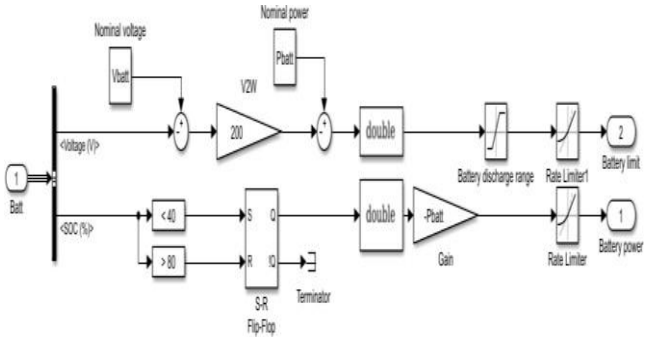

Figure 3. Design of Hybrid Management System

The design of hybrid management system defines about the electrical and mechanical motive forces where it can switch between the internal combustion engine when needed.

The above design describes the entire circuit diagram of this project " Hybrid Electric Vehicle Power Train Configuration With Battery Management System". maintaining correct voltage, current and the state of chargeso on. The above design describes the battery management system Of hybrid vehicle which means that the hybrid electric vehicle will have a battery where based on seeing the functionality, durability and certain other factors of the system we can maintain that without heating, over charging,

The design of ICE speed controller is an circuit of electronics which controls the speed and torque of the electric motor.

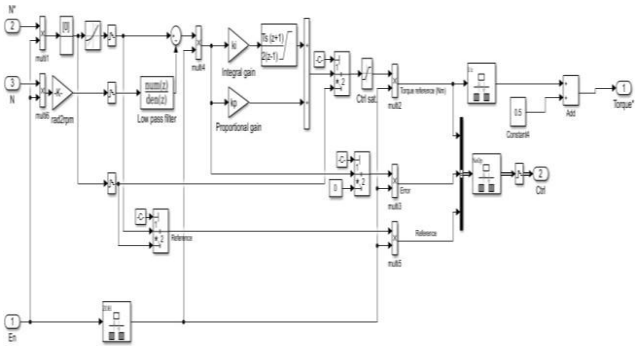

Figure 4. Design of ICE speed controller

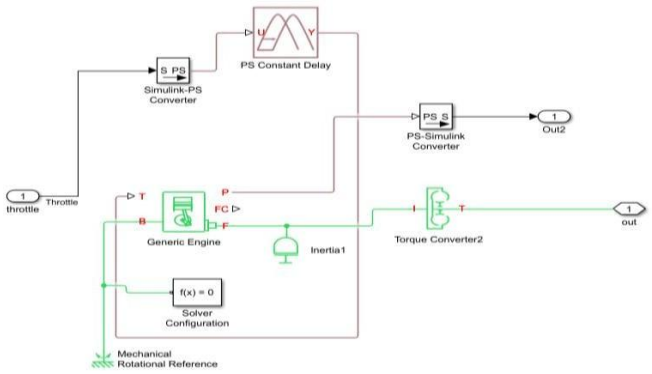

Figure 5. Design of an engine model

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 4255 - 4260
Received 25 April 2021; Accepted 08 May 2021.

It gives the model of an internal combustion engine which is mainly a fossil fuel engine and also it can switch between the necessary function if it wants the electric power.

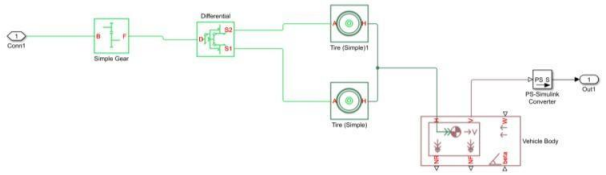

Figure 6. Design of the vehicle's body

This diagram provides the circuit design of the vehicle's body where it consists of gear, differentia, and vehicle body and tires.

V. OUTPUT AND RESULTS

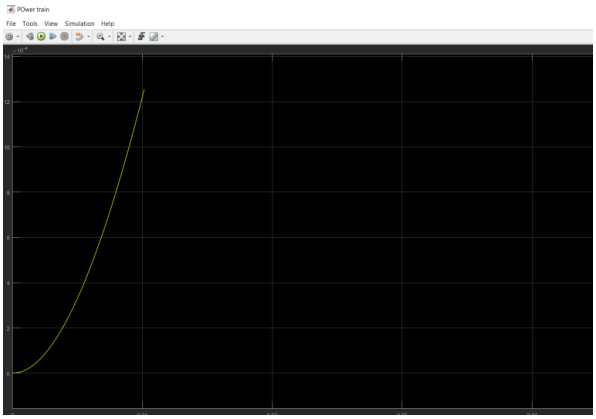

Figure 7. Power train output

The above figure represents the output power train of the vehicle body. We can get the stored potential energy in all the components of the power train. Powertrains may either use chemical, solar, nuclear or kinetic and make them useful for propulsion. The oldest example is the steam locomotive. A common modern example is the electric bicycle. ICEsupplements the vehicle power or recharge the battery from the hybrid electric vehicle where it uses the combination of both the batteries and the super capacitor.

VI. CONCLUSION

The rapid consumption of fossil fuel and increased environmental damage caused by it have given a strong impetus to the growth and development of fuelefficientvehicles. The extensial problems in our planet is keep onincresing so the hybrid electric vehicle promises us to give ainchoate solution to all our future needs. Not only do HEVsprovide better fuel economy and lower emissions satisfying environmental legislations, but also they dampen the effectof rising fuel prices on consumers. In hybrid electricvehicle's we can see both the internal combustion engineand the electrical type of machine to switch between. HEVhas different other components for its working they areBIDC converters , storage of energy systems, motors andMPPT which is used in the case of connecting solar for the electrical energies which is abbreviated as maximum power point tracking. The architecture and the components of the HEV's determine its performance. This paper tells you about all the components, disadvantages, disadvantages, wehave the choice of obtaining high efficiency from theirectional dc-dc converters where it can be obtain by usig MPPTcontroller, the battery life is extends by using the ultracapacitor combining with battery , for a particular lication we can also use the trantion motor. Hence the ulation of the HEV power train is simulated and plemented using MATLAB Simulink.

REFERENCES

1. R. Abousleiman and O. Rawashdeh, "Energy efficient routing for electric vehicles using metaheuristic optimization frameworks," in Mediterranean Electrotechnical Conference motors (MELECON), 2018 17th IEEE, 2018, pp. 298-304.
2. M. Ghariani, M. R. Hachicha, A. Ltifi, I. Bensalah, M. Ayadi, and R. Neji, "Sliding mode control and neuro-fuzzy network observer for induction motor in EVs apps," International Journal of Electric and Hybrid Vehicles, vol. 3, pp. 20-46, 01/01/ 2017.
3. Arancibia, A. and Strunz, K., "Modeling of an Electrical VehicleCharging Station for Fast DC Charging ‖

Annals of R.S.C.B., ISSN:1583-6258, Vol. 25, Issue 6, 2021, Pages. 4255 - 4260
Received 25 April 2021; Accepted 08 May 2021.

,Proc.IEEE Int. Elect. Veh.Conf. (IEVC), pp.1-6 2012.
4. Praveen Kumar and KalyanDash, ―Potential Need for Electric Vehicles, Charging Station Infrastructure and its Challenges for the Indian Market‖, Advance in Electronic and Electric Engineering.ISSN 2231-1297, Volume 3, Number 4 (2013), pp. 471-476.
5. Wenbo Shi, Eun-Kyu Lee, DaoyuanYao, Rui Huang, Chi-Cheng Chu, and RajitGadh, "Evaluating Microgrid Management and Control with an Implementable Energy Management System",Smart Grid Energy Research Center University of California, IEEE International Conference on Smart Grid Communication 3-6 November-2014.
6. M. Verbrugge, D. Frisch, and B. Koch, ―Adaptive Energy Management of Electric and Hybrid Electric Vehicles‖,Journal of Power Sources, 2005.
7. Minghao AI, Linhai QI,―Orderly Charging
Based Electric Vehicle Charging Stations' On- Line Monitoring System‖, CIRED Workshop - Rome, 11-12 June 2014 and brake system," International Journal of Chargertrains,
8. Emayavaramban, G., Amudha, A., Ramkumar, M. S., Divyapriya, S., & Nagaveni, P. (2020, November). Surface Eletromyography Feature Extraction Techniques–A Review. In 2020 4th International Conference on Electronics, Communication and Aerospace Technology (ICECA) (pp. 441-446). IEEE.
9. Amudha, A., Ramkumar, M. S., Emayavaramban, G., Divyapriya, S., Nagaveni, P., Mansoor, V. M., & SivaramKrishnan, M. (2020). Resonant converter L3C for E-vehicle for charing a PV battery. Materials Today: Proceedings.
10. Divyapriya, S., Vijayakumar, R., Ramkumar, M. S., Amudha, A., Nagaveni, P., Emayavaramban, G., & Mansoor, V. (2020, October). IoT Enabled Drip Irrigation System with Weather Forecasting. In 2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC) (pp. 86-89). IEEE.
11. Amudha, A., Ramkumar, M. S., Vijayalakshmi, V. J., Emayavaramban, G., Mansoor, V., Divyapriya, S., & Nagaveni, P. (2020, October). Modeling, Simulation and Design of Luo Converter for DC Micro Grid Application. In 2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC) (pp. 1250-1256). IEEE.
12. Ramkumar, M. S., Amudha, A., Sivaramkrishnan, M., Divyapriya, S., Nagaveni, P., Emayavaramban, G., & Mansoor, V. (2020, October). Micro Grid based Low Price Residential Home to Grid-Modeling and Control of Power Management System. In 2020 Fourth International Conference on I-SMAC (IoT in Social, Mobile, Analytics and Cloud)(I-SMAC) (pp. 1179-1183). IEEE.
13. Rajakumari, R. F., & Ramkumar, M. S. (2020). Design considerations and performance analysis based on ripple factors and switching loss for converter techniques. Materials Today: Proceedings.
14. Divyapriya, S., Emayavaramban, G., Amudha, A., Ramkumar, M. S., Nagaveni, P., & Mansoor, V. M. (2020). Internet of things enabled plug in electrical vehicle based self maximum demand controller for shopping mall. Materials Today: Proceedings.
15. Emayavaramban, G., Divyapriya, S., Mansoor, V. M., Amudha, A., Ramkumar, M. S., Nagaveni, P., & SivaramKrishnan, M. (2020). SEMG based classification of hand gestures using artificial neural network. Materials Today: Proceedings.
16. Ramkumar, M. S., Amudha, A., Nagaveni, P., Emayavaramban, G., Divyapriya, S., Mansoor, V. M., ... & Kavitha, D. (2020). Analysed results of DC-DC converters with softswitching techinques. Materials Today: Proceedings.
17. Mansoor, V. M., Nagaveni, P., Amudha, A., Divyapriya, S., Emayavaramban, G., Ramkumar, M. S., & SivaramKrishnan, M. (2020). Throwing light on lightning. Materials Today: Proceedings.
18. Krishnan, M. S., Dhevi, S. K., & Ramkumar, M. S. (2014). Power Quality Analysis in Hybrid Energy Generation System. International Journal, 2(1).
19. Krishnan, M. S., Amudha, A., & Ramkumar, M. S. (2018). Execution Examination Of Three Phase Ac To Three Phase Ac Matrix Converter Using Distinctive Transporter Based Exchanging Algorithms. International journal of Pure and Applied Mathimatics, 118(11), 609-617.
20. Krishnan, M. S., Sriragavi, S., & Ramkumar, M. S. (2017). Impedance Source Inverter and Permanent Magnet Synchronous Generator For Variable Speed Wind Turbine. International Journal of Computer & Mathematical Sciences (IJCMS), 6(9), 98-105.
21. Sivakumar, N., Kavitha, D., Ramkumar, M. S., Bhavithira, V., & Kalaiarasi, S. (2017). A Single Stage High Gain Converter For Gird Interconnected Renewable Application Using Perturb And Observe. International Journal of Control Theory and Applications (IJCTA) 10 (38) 161, 175.
22. Govindaraju, K., Bhavithira, V., Kavitha, D., Kuppusamy, S., & Balachander, K. Improvement of Voltage Profile and Loss Minimization in IEEE 14 Bus System using FACTS Devices. International Journal of Control Theory and Applications, ISSN, 0974-5572.
23. Sownthara, M., & Ramkumar, M. S. (2014). Wireless Communication Module To Replace Resolver Cable In Welding Robot. International Journal of Advanced Information Science and Technology on, 23(23), 230-235.
24. Krishnan, M. S., Ramkumar, M. S., & Sownthara, M. (2014). Power management of hybrid renewable energy system by frequency deviation control. Int. J. Innov. Res. Sci. Eng. Technol, 3(3), 763-769.

25. R.Sudhakar and M.Siva Ramkumar "Boosting With SEPIC" in 'International Journal of Engineering and Science' 3 (4) pp 14- 19,2014.
26. Emayavaramban, G., Divyapriya, S., Mansoor, V. M., Amudha, A., Ramkumar, M. S., Nagaveni, P., & SivaramKrishnan, M. (2020). SEMG based classification of hand gestures using artificial neural network. Materials Today: Proceedings.
27. Amudha, A., Ramkumar, M. S., & Krishnan, M. S. (2017). Perturb and Observe Based Photovoltaic Power Generation System For Off-Grid Using Sepic Converter. International Journal of Pure and Applied Mathematics, 114(7), 619-628.
28. Fang, S., Hussein, A. F., Ramkumar, S., Dhanalakshmi, K. S., & Emayavaramban, G. (2019). Prospects of electrooculography in human-computer interface based neural rehabilitation for neural repair patients. IEEE Access, 7, 25506-25515.
29. Emayavaramban, G., Divyapriya, S., Mansoor, V. M., Amudha, A., Ramkumar, M. S., Nagaveni, P., & SivaramKrishnan, M. (2020). SEMG based classification of hand gestures using artificial neural network. Materials Today: Proceedings.
30. Ramkumar, S., Emayavaramban, G., Kumar, K. S., Navamani, J. M. A., Maheswari, K., & Priya, P. P. A. (2020). Task Identification System for Elderly Paralyzed Patients Using Electrooculography and Neural Networks. In EAI International Conference on Big Data Innovation for Sustainable Cognitive Computing (pp. 151-161). Springer, Cham.
31. Anitha, T., Shanthi, N., Sathiyasheelan, R., Emayavaramban, G., & Rajendran, T. (2019). Brain-computer interface for persons with motor disabilities-A review. The Open Biomedical Engineering Journal, 13(1).
32. Kumar, S. S., Kavitha, D., Amudha, A., Emayavaramban, G., & Ramkumar, M. S. (2019). ANALYSIS OF NEW NOVELTY MULTILEVEL INVERTER CONFIGURATION WITH BOOST CONVERTERS FOR A PHOTOVOLTAIC SYSTEM WITH MPPT. Mathematical & Computational Forestry & Natural Resource Sciences, 11(1).
33. Viyathukattuva, M., Amudha, A., Ramkumar, M. S., & Gopalakrishnan, G. E. (2019). Relation between Solar PV Power Generation, Inverter Rating and THD. International Journal of Advanced Manufacturing Technology, 9, 4570-4575.
34. Amudha, A., Ramkumar, M. S., & Krishnan, M. S. (2017). Perturb and Observe Based Photovoltaic Power Generation System For Off-Grid Using Sepic Converter. International Journal of Pure and Applied Mathematics, 114(7), 619-628.
35. Latha, M. R., Kuppusamy, S., Amudha, A., Balachander, K., & Ramkumar, M. S. (2017). An Efficient Single Stage Converter Based Pv-Dvr For Improving Voltage Quality. International Journal of Control Theory and Applications, 10(38), 177-193.