IMPROVED HYBRID VEHICLE

Arjun Sharma

Senior Lecturer, Deptt of Mechatronics Advanced Technical Training Centre (ATTC), Bardang Singtam, East Sikkim#737134 (India)

ABSTRACT

Present scenario of environmental and limitations global crude oil supply concern to move automobile at a new level. This need forces o the researchers for a better option of oil. The price of petrolium is also increasing day by day. Technologies like hybrid vehicles appear one of the most advance technology in terms of reduction of petroleum fuel requirement and low running cost. This technology is also environmental friendly. This paper presents a advance hybrid vehicle model. The model is simulated on MATLAB Simulink plateform.

Keywords: Hybrid Vehicle, Electric Motor, Electric Generator, Controller.

I INTRODUCTION

Hybrid-electric vehicles appear to be one of the most advance technologies for reducing fuel consumption, cost and pollution [1]. In steed of, it is quite obious that the kinetic energy generated by the petrolium fueled vehicle after an acceleration can not be utilised when braking. It is one of the best advantage of the hybrid electric vehicle that it can utilise some of this energy (depending of efficiencies), to charge a battery, and to utilise latter. Electric energy stored by battery can therefore be used by an electric motor to power the hybrid vehicle. This can reduce the petrolium fuel requirment and reduce the running cost of the vihicle.

The control of hybrid vihicle is more complex than petrol or deisel engine. because, the control laws have to deal with the state of charge of the battery, which provides the level of remaining electric energy, and with the variable efficiency of each element of the powertrain. optimization of energy management strategies on given driving cycles is often used to derive sub-optimal control laws to be implemented on the vehicle (see among others [2], [3], [4], [5]).

II MODEL OF HYBRID VIHICLE

Model of this hybrid vihicle contains an electric motor, electrical power generator, advance breaking system that can generate electricity at the time of breaking and a system which can store this generated current can be stored in battery for latter utilisation. The block diagram is shown in fig. 1.

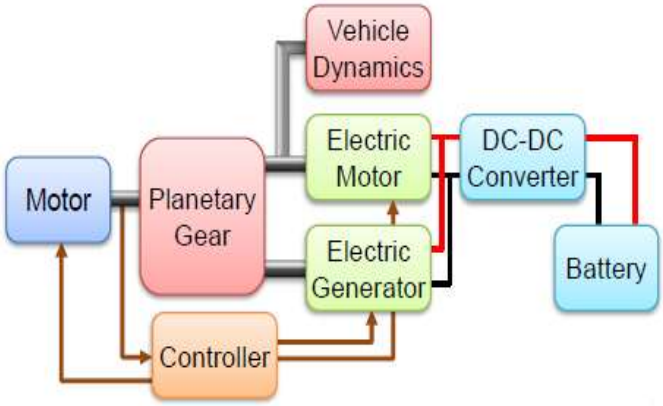

Fig.-1 Block diagram

III SIMULATION

The model is simulated on MATLAB R2013a plateform. Fig. 2 consist the overall simulation diagram of hybrid vihicle simulation.

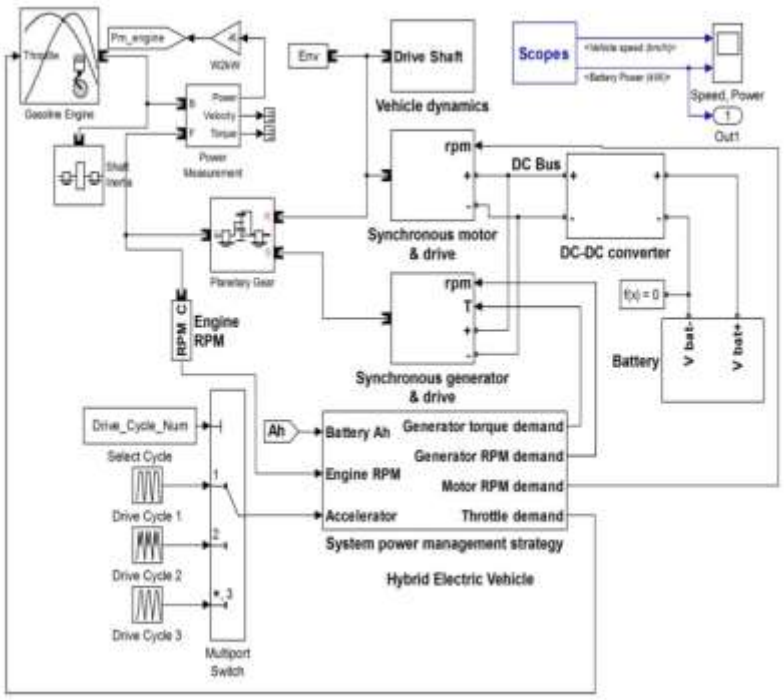

Fig.-2 Simulation of Hybrid Vehicle

Synchronous motor and drive circuit is shown in fig. 3. For better performance the synchronous motor is used to run the vehicle.

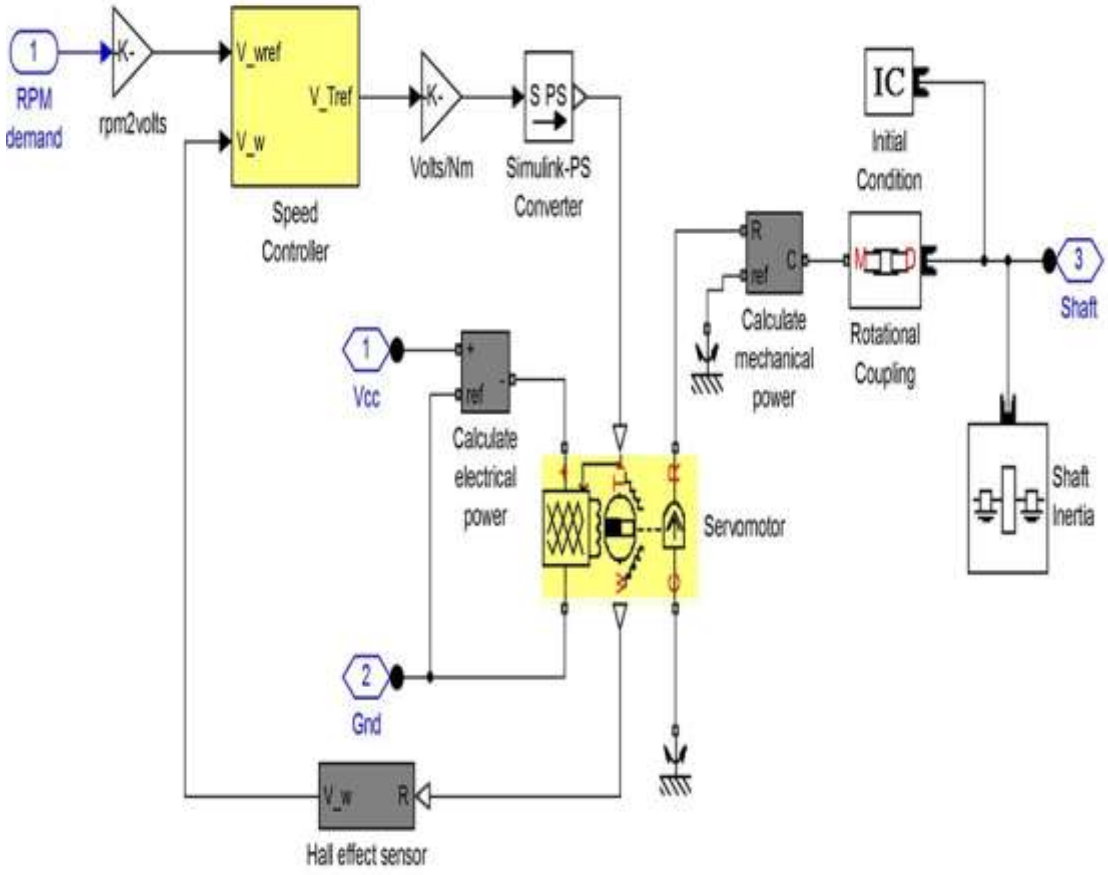

Fig. 3 Motor and Drive Simulation

IV RESULTS

In the fig 4 & 5 the simulation results are shown for different parameters. Fig 4 shows Motor power (kW), Generator power (kW), Engine power (kW), Battery Power (kW) and Vehicle speed (km/h) and fig 5 gives Battery Power and Vehicle Speed.

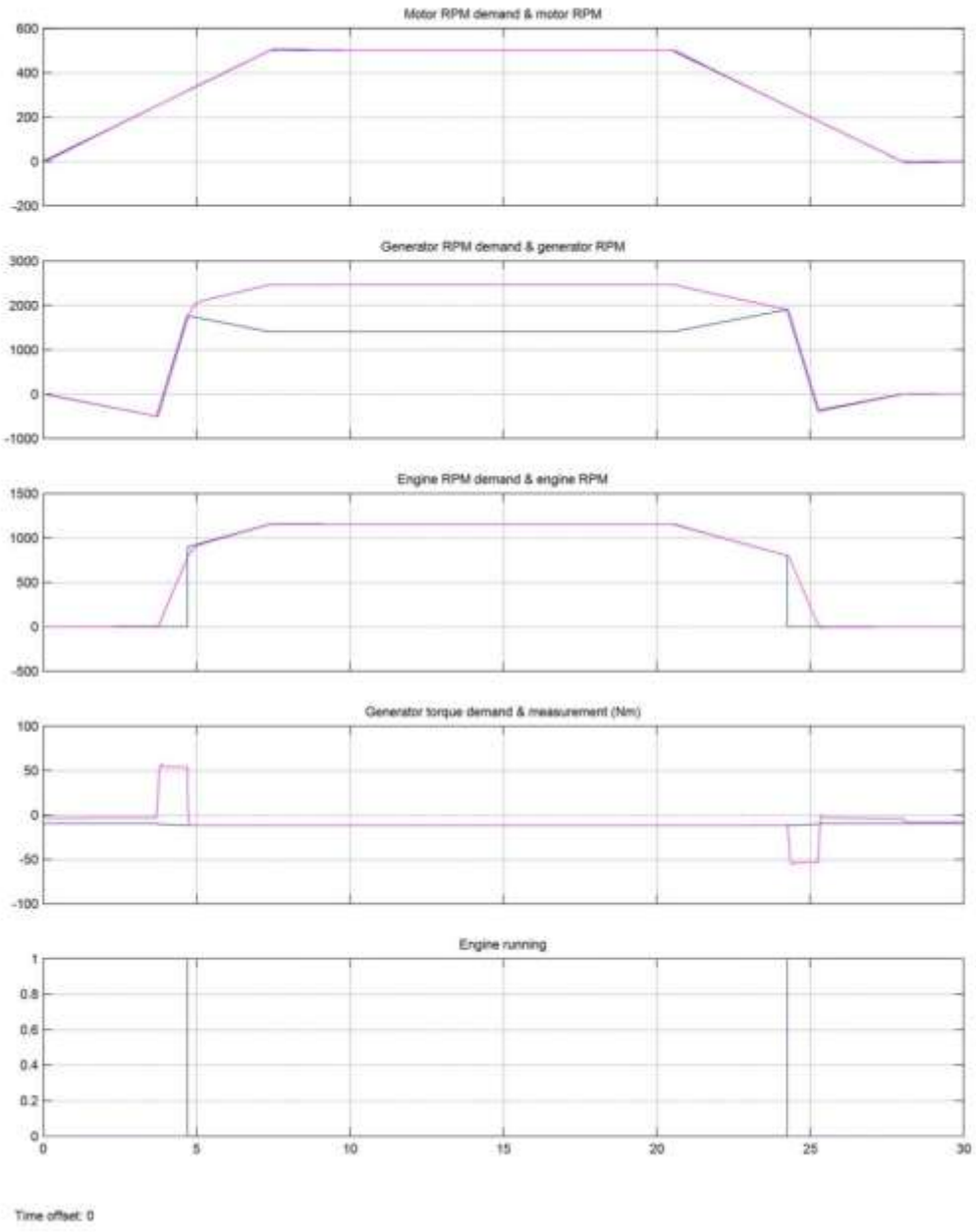

Fig-4 Results 1

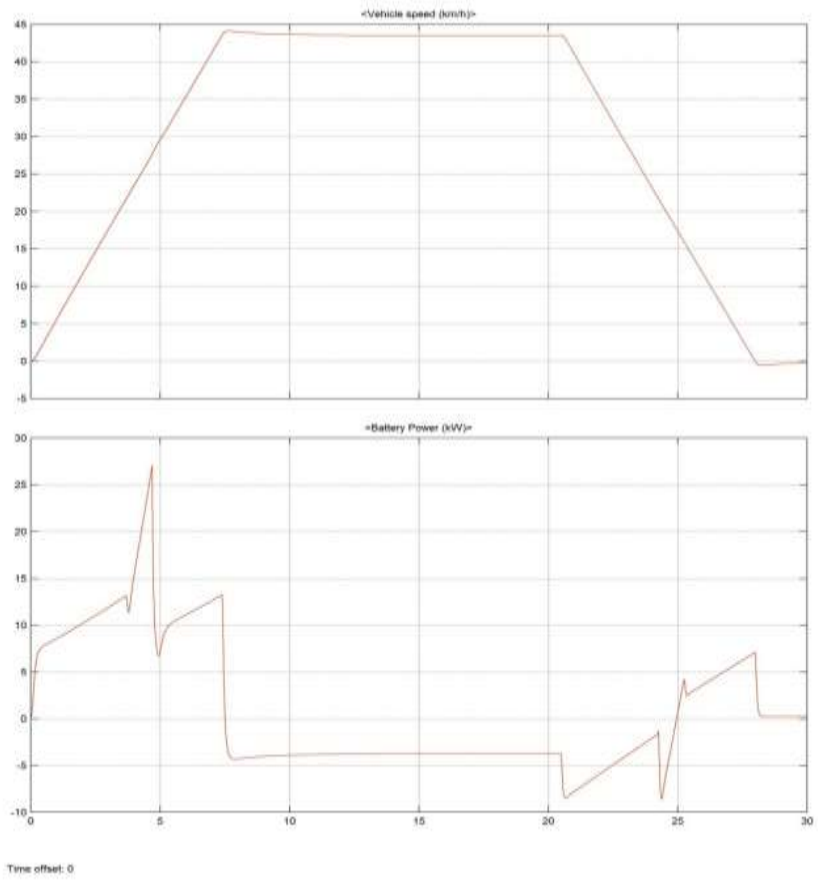

Fig.-5 Results 2

V CONCLUSION

In this paper, has been presented an optimization study applied on a full hybrid vehicle, with classical optimization tool, and an example of a real-time control strategy.

A simple model in MATLAB & SIMULINK has been used with a dynamic programming algorithm. This allows to get the optimal sizes and powers of elements of the hybrid powertrain. After a validation of the optimal trajectory and torques applied on a more realistic model in AMESim. Even if an average value of power can be estimated from online optimization results, the choice of an adequate initial value remains a important task, and power should be controlled regarding to the evolution of the state of charge of the battery.

REFERENCES

[1] German J.M. (2003) Hybrid powered vehicles. Society of Automotive Engineers.

[2] Sciarretta A. and Guzzella L. and Back M. (2004) A Real-Time Optimal Control Strategy for Parallel Hybrid Vehicles with on-board Estimation of the Control Parameters, Proceedings of IFAC Symposium on Advances in Automotive Control AAC04, 502-507.

[3] Scordia J. (2005) Systematic elaboration of online energy management laws for hybrid vehicles, Proceedings of the EVS 21 - Electric Vehicle Symposium, Monte Carlo, Monaco.

[4] Wu B. and Lin C-C. and Filipi Z. and Peng H. and Assanis D. (2002) Optimization of Power Management Strategies for a Hydraulic Hybrid Medium Truck. Proceeding of the 2002 Advanced Vehicle Control Conference, Hiroshima, Japan.

[5] Delprat, S., et al. (2004) Control of a parallel hybrid powertrain: optimal control, IEEE Transactions on Vehicular Technology, Vol. 53, No. 3, pp.872-881.

[6] Guzzella L. and Sciarretta A. (2005) Vehicle Propulsion Systems, Springer.

[7] Bryson E. and Ho Y.C. (1975) Applied Optimal Control, Hemisphere Publishing Corp.

[8] Pontryagin L.S. and Boltyanskii V.G. and Gamkrelidze R.V. and Mishchenko E.F. (1965) The Mathematical Theory of Optimal Processes, CRC Press.

[9] Guilbaud T. (2002) M_ethodes num_eriques pour la commande optimale. Th_ese, Universit_e de Paris VI.

[10] J. F. Bonnans, T. Guilbaud, A. Ket_-Cherif, C. Sagastizbal, D. von Wissel, H. Zidani (2002) Parametric optimization of hybrid car engines. OPTIMIZATION AND ENGINEERING, 334-335, 73-84.

[11] J. Liu and H. Peng (2006) Control Optimization for a Power-Split Hybrid Vehicle. 2006 American Control Conference, Minneapolis, USA.