

Hybrid Source Feed Permanent Magnet Synchronous Motor (PMSM) With Regenerative Braking using Super Capacitor

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Abstract— The vehicle is propelled by the utilization of electric engines. The PMSM motor are controlled up by the batteries. The batteries are charged either by the utilization of photovoltaic module or it is charged by the utilization of electrical plugs. For controlling any vehicle braking is utilized frequently. During which the power is wasted in the form of heat. This happens as a result of the use of frictional brakes. This heat loss is disposed of by utilizing regenerative braking technique. In this kind of electrical breaking the energy is separated back to the fast storing device called super capacitor banks. The super capacitors stores the electrical energy in short order. Because of the over drawing of current by the super capacitor the vehicles lows down instantly. The super capacitors are energized at whatever point the brake is connected. This removed power can be utilized to run the vehicle for couple of more separation or it can be used for energizing the vehicle loads. From this the losses are reduced and vehicle productivity is moved forward.

Key words: Regenerative Braking, Permanent Magnet Synchronous Motor (PMSM), Supercapacitor

I. INTRODUCTION

These days there is a most extreme request of electrical vehicle than the commonplace gas vehicle. Since the electric vehicles has zero emission. These would not transmit flue gases like our ordinary vehicles. To control the dangerous atmospheric deviation the request turns out to be more on electrical vehicle in future. The solar based controlled electrical vehicle has benefits and drawbacks also.

The benefits of electrical vehicle: Eco-friendly; Has greater efficiency; Reduced noise pollution; Less maintenance; Simple in construction; Easy to use; Cheaper.

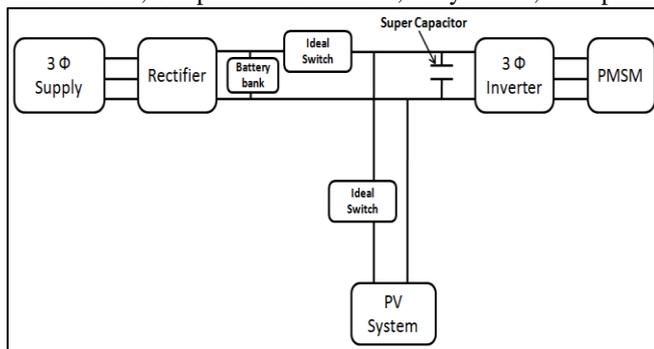


Fig. 1: Block diagram of the system

The drawbacks of electrical vehicle: Requires frequent recharging and maintenance of batteries; Longer charging time; Short driving range and speed; Charging the battery by the use of solar panel takes more time period and available of solar power would not be constant.

II. SYSTEM DESIGN & DESCRIPTION

A. Photovoltaic modules:

The monocrystalline photovoltaic modules are favored for the solar based powered vehicle. Since it has significant focal points. The major advantage of monocrystalline boards over the conventional less expensive polycrystalline boards are: Has more prominent effectiveness; Works well even in shady days; Panel size reduction.

B. Charging system:

Two types of charging systems are used in this vehicle: Battery charging system; Super capacitor charging system.

C. Battery charging system:

The series or parallel connection of battery framework is utilized to power up the vehicle depending upon the accessible of voltage of the battery and the requirement. Normally lead acid batteries are best for the vehicles because of the high level consistency of voltage level maintenance till its low charge unlike other batteries.

D. Super capacitor charging system:

During the regenerative braking of the vehicle the electrical energy is powered back to the super capacitor banks. If the regenerative energy is powered back to the battery it would not be charging instantaneously. Since all kind of batteries takes at least the time period of 2-3 hours. But the super capacitors are topped up instantly in the time duration of 90-120 seconds. Hence the super capacitors would be the right choice for the regenerative power extraction. To attain the maximum required capacity the super capacitor banks are used.

E. MPPT:

This area covers the operation of "Maximum Power Point Tracking" as utilized as a part of solar electric charge controllers.

A MPPT or maximum power point tracker is an electronic DC to DC converter that improves the match between the solar based group (PV panels), and the battery bank or utility grid. Fundamentally, they change over a higher voltage DC output from solar panels down to the lower voltage anticipated that would charge batteries. There are numerous calculation for MPPT. I utilized the power under quick differing climatic conditions however it still exceptionally mainstream and basic than some other strategy.

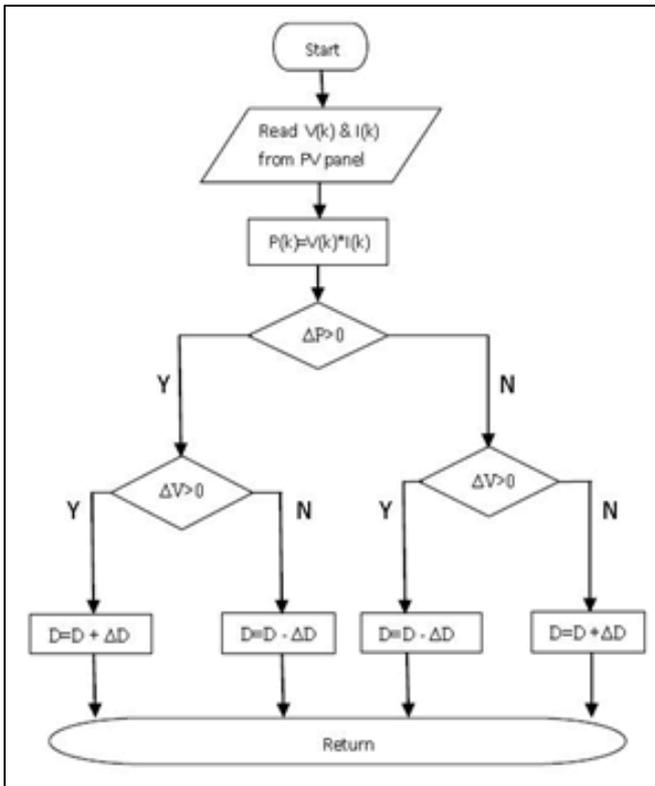


Fig. 2: Flow Chart of MPPT

III. METHODOLOGY

The battery system is charged either by the photovoltaic module in the vehicle or by the power outlets. The photovoltaic module and the battery is linked by the MPPT charge controller, this tracks the maximum power point of the panel (since the solar light is non uniform) and charges the battery effectively. Or else it can be charged by utilizing the power outlets.

The PMPS motor in the vehicle are powered by the battery. At whatever point the brake is applied the energy is wasted as heat energy when the regular mechanical brakes are utilized. Here combination of the frictional brakes the regenerative brakes are utilized. From this wasting of energy is wiped out. The power is separated back to the super capacitors for the further utilization of energy. This can be accomplished essentially by the utilization of progress overswitch. Once the super capacitor banks are charged up the energy stored in it is used to run the vehicle loads or the vehicle for few distance. At the point when the super capacitor banks releases as far as possible the changeover switch in the comparator circuit gets changed over to typical battery framework. Furthermore, the cyclic charging of move of super capacitors makes put at whatever point the brake is connected. In this way the losses are reduced definitely and the vehicle execution could be improved.

IV. RESULT

From the experiment performed we can conclude that the use of photovoltaic solar cells combined with electric type regenerative braking and dynamic inductive charging, both primary and secondary coils resonating at the same high frequency can greatly enhance the range, efficiency and performance of a limited capability electric vehicles.

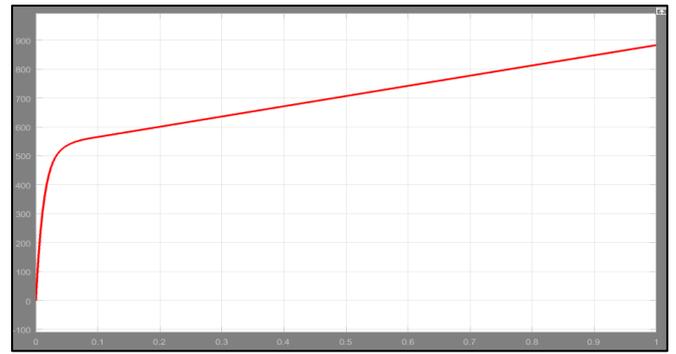


Fig. 3: Supercapacitor

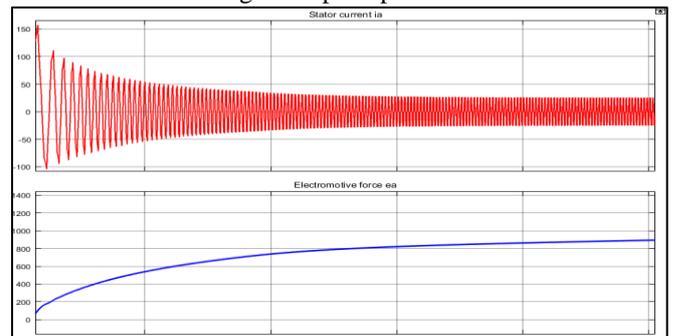


Fig. 4: Graph for stator current

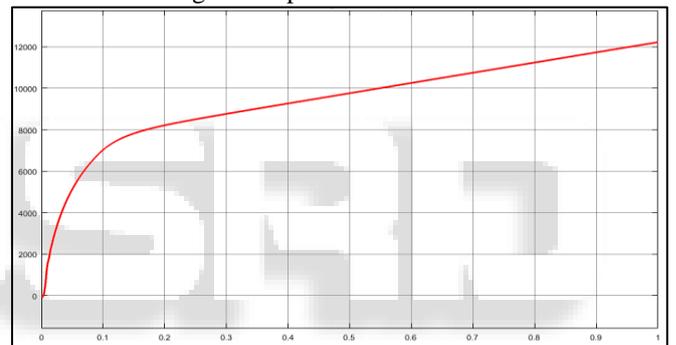


Fig. 5: Graph for rotar speed

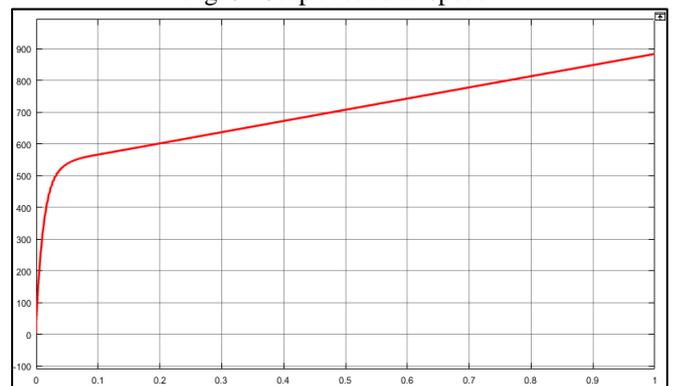


Fig. 6: Graph for boost converter

V. CONCLUSION

The regenerative braking mechanism is essentially utilized as a part of electric furthermore, hybrid vehicle utilized for backing off the vehicle and at a similar time can spare huge amount of energy which is lost during braking. In ordinary braking mechanism 80% of energy is wasted in form of heat and which can be saved by the concept of regenerative braking. Regenerative braking mechanism is a successfully worked strategy which enhances the productivity of the vehicles and longevity permanent magnet motor is favored

because of its high proficiency what's more, ease and furthermore gives most extreme torque to move the wheel at an adequate rpm.

Electronic circuit is utilized which comprise of various voltage controllers to get consistent voltage output and pic controller to synchronise every single other part. It gives the change of simple flag to advanced flag and shows the voltage esteem by lcd. In this project main focus is on renewable source of energy by regenerative braking and solar panels to meet the future needs.

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