

Original Article

Efficient Energy Conservation from Hybrid Vehicle

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Abstract - This report portrays another strategy to produce power from a vehicle and sunlight-based chargers to use for a utility burden. The remainder with which we are left in the division of traditional wellsprings of energy isn't so sumptuous for one to have a good time on this advanced planet. Thus, it's the excellent obligation of every individual specialist to clear an elective way for inventive age of force and more intelligent usage of non-regular energy sources, aside from the use of customary sources like petroleum derivatives and any remaining unrefined petroleum items. A portion of the super traditional asset buyers on this planet is the vehicles that run with unrefined petroleum items like oil, diesel, compacted flammable gas, lamp fuel, and so on. Along these lines, this venture got a kick out of the chance to put my thoughts regarding the shrewd approach to creating power from the dynamic energy that has been moved by the running vehicle and producing power from the sunlight-based chargers. This current work utilizes an exploratory and hypothetical strategy to investigate the impact of rotational powers delivered at a vehicle edge and the system by which a generator unit mounted at the edge of the edge produces energy from rotational powers. Engine, bringing about the age of electrical energy from mechanical energy. That electrical energy is put away in the battery charging unit for thereinforcement. The reinforcement power is moved to the dc transport. From the dc transport that energy is used for the electric vehicle charging. The extra energy source from the sunlight-based charger is likewise given to the dc transport. That overflow energy is given to the inverter unit that power is used for the heap.

Keywords - Power Quality, Grid Connected, Charging Station, Solar Power, Vehicle power, Converters, Battery Management.

1. Introduction

A system generating power from the transport vehicle, in the vehicle's wheel motor is placed and apparatus for capturing electricity comprised of a wheel and a fixed conducting rod, both in electrical contact with the wheel and at least one electrical component or system in which the wheel is rotatable about an axis. The wheel is comprised of a rotatable hub and a rotatable conducting rod within the rotatable hub at least one electricity generating device positioned on the hub and comprised of generally a wire coil fixed within the housing and having an axial bore there through a translatable magnet and at least one wire in electrical contact with the wire coil and the rotatable hub wherein as the wheel is rotated, the translatable magnet laterally translates back and forth within the housing and passing through the wire coil to generate the electric current.

This project provides a clear path in showing the energies that are going wasted without any good purpose, just like useful rivers going in vain mixing up with ocean bodies finally. In this project, we are going to witness a couple of modified new techniques by which we can generate electrical power. Various designs, manipulations, advantages, and disadvantages of different constructions are encountered in this paperwork. Just like the construction of a dam over a river to make use of the river's benefits, we install an electrical generating unit in a vehicle to make use of kinetic energy.

Over the last few years, the safety and reliability of vehicles have significantly improved. In the project transport vehicle waste, kinetic energy from the rotation of wheels is generating electricity and sends the energy for a useful load.

As fossil energy assets are exhausted and environmental change issues are turning out to be more significant, Europe is making new rules for both the energy and transport areas for transport area the principal advancement is because of substitution of gas-powered motor vehicles with the electric vehicles. As power age from irregular environmentally friendly power sources is expanding, answers for incorporating those sources in the electric power matrix are expected to keep up with framework security. The possibility that electric vehicles can interface with the electric lattice to offer subordinate types of assistance, like recurrence guidelines, top shaving, and turning saves is convincing, particularly in wards where conventional structures of capacity, backup, or top stock are inaccessible or costly. Since origination, the monetary suitability of vehicle-to-lattice tasks has been the subject of discussion. A typical weakness of a large portion of the past examinations has been legitimate bookkeeping of lithium-particle battery corruption in the improvement of plans of action. Very as of late, papers on the suitability of V2G were distributed for which the point-by-point record of battery corruption brought about what had all the earmarks of being two



incongruous ends. In this paper, the creators of these two significant examinations mutually accommodate their past decisions by giving clearness on how procedures to make due battery debasement can dependably expand battery duration. The paper likewise audits the related innovation and strategy ramifications of better overseeing battery use in vehicle and electrical lattice applications.

2. Need of Present

Under poor ambient illumination on the roads, any vehicle must and should be provided with some illumination. It is to carry a torch all the time at night while riding a vehicle in dark places. Hence, there should be an alternative source of light for the vehicle, which is risk-free and easy to handle as well. Three sources of illumination for a vehicle in past following

- ✓ Chemical energy - Carrying a lantern powered by any chemical source (kerosene).
- ✓ Electrical energy - Installing an electric bulb powered by an electrical source (battery).
- ✓ Mechanical energy - Installing an electric light source powered by a dynamo driven through the mechanical energy of the vehicle.
- ✓ We want to reduce the above fuel usage and to use the free energy from the wheels.

Expanding the extent of power created by discontinuous sustainable power sources raises sway on power frameworks. The objective of the review was to assess the advantages of "vehicle-to-matrix" frameworks for a mix of discontinuous sources utilizing the Latvian power framework as the case. The energy framework examination apparatus "Energy Plan" was utilized for demonstrating situations. Vehicle-to-framework alludes to the complementary progression of force between an electric vehicle (EV) and a beneficiary that could be, among other potential outcomes, the lattice, a low voltage microgrid, or a structure. Moreover, to request moving and the related diminished power costs accomplished by staying away from top levies on the occasion of appeal, likewise presents the prospect of monetary motivating forces for the shopper, through offering recurrence guidelines and energy storage spaces to the lattice. Besides, the vehicle to grid offers the chance of expanded utilization of restricted renewables. Regardless of these impetuses, a key concern has been the effect of the vehicle-to-grid procedure on the debasement of Lithium-particle batteries – which is integral to both EV and vehicle-to-grid tasks.

Ultimately, there has been a quest for a more proficient and clean vehicle. Due to the persistent diminishing degree of fuel and energy assets, crossover and module mixture electric vehicles are in the spotlight for a long time now. They are being viewed as the fate of transportation with burnable fuel assets exhausting quickly.

3. Objectives

- To witness a couple of modified new techniques by which we can generate electrical power from the rotation of the wheels of the vehicle.
- To utilize the waste kinetic energy from the wheels and generate electricity and use it for the home loads.

The thought is to utilize the power from the inactive vehicles to give load-shedding and pinnacle shaving and numerous different capacities. The vehicle batteries can be completely charged during low-request hours and the stream can be turned around whenever as per the necessities. This can be satisfied by using the idea of a 'brilliant network' which is a power network fit for handling the data, deals with the power stream to satisfy the end clients shifting power interest, and can give a correspondence between age sources and end clients. This idea chips away at the balance of the 'off-pinnacle' and 'pinnacle' requests. The Vehicle can get charged during off-top hours and can sell it back to the framework during the top hour.

4. Scope of the Project

Increments generally efficiency: Through the coordination of the power stream the generally monetary efficiency of the society increments. The vehicles that would some way or another stay inactive when stopped are currently going about as a power stockpiling unit that produce income and ventures, it would somehow or another be spent on power stations are getting saved.

Scope for sustainable power: vehicle-to-grid innovation can further be utilized with sun-oriented vehicles, subsequently, the abundance of power during top doesn't rely upon non-sustainable power sources (coal and petroleum products utilized in power plants). This decreases the weight of the climate and adds to the natural equilibrium.

- ✓ The scope of our project is to develop a user-friendly electrical vehicle to reduce fossil fuels.
- ✓ Thus, with the same technique, even locomotive can also be provided with a dynamo in a harmless construction and draw power from the dynamo which is run by the opposing wind that is produced when it possesses kinetic energy on its motion.
- ✓ These are not toxic from the generation point of view.

5. Review of Various Topologies

A similar investigation among BEVs and FCVs can be performed by considering each progression engaged with getting energy from the matrix to at last utilizing it. It is a standard of thumb that each activity from age to utilization in the energy cycle adds to the general effectiveness also, cost. Decreased number of steps guarantees more prominent proficiency at the place of energy use. Following is a step-by-step effectiveness estimation for both kinds of vehicles. As these estimations are more appropriate for an environmentally friendly power future, it is accepted that the

power used to charge batteries or to go through the electrolysis of water is sustainable.

5.1. Energies That Go To Moving Vehicle

The regular energy sources generally utilized nowadays for transportation are fossils powers, they cause colossal way on climate and environmental change. An unnatural weather change is made mostly due to carbon dioxide which is the fundamental result of consuming petroleum derivatives. Different items like sulfur oxide and nitrogen oxides are likewise one of the explanations for air contamination and corrosive downpour. Feasible power sources are doing an imperative task to conquer the above issues due to oil-based commodities annihilation and the issues of worldwide warming. Sustainable sources, for example, sun-based photovoltaic boards, energy components, and wind turbines are progressively famous. These energy sources are known for their tidiness and manageability.

- The rotatory motion of the wheels of the vehicle.
- Renewable energy from the Solar.

5.2. Sources To Generate Electricity

Our fundamental point is to give mechanical energy to the engine, in this way making the shaft of the engine pivot, making a "Generator guideline" to create power. There are two different ways by which we can give mechanical energy to the dynamo that is introduced and they are as follows

- ✓ By the usage of rotatory movement of wheels of the vehicle.
- ✓ By the usage of wind energy which is contradicting a moving vehicle.

5.3. Generation Of Electricity From Rotary Motion

We will likewise run over enlightenment strategies for prior vehicles and different methods of transportation. In current generators, the turning components are encircled by a huge magnet and curls of copper wire. The magnet is pivoted because of the turning wheels, and this outcome is a strong stream of electrons, accordingly changing over the mechanical energy into the electrical energy.

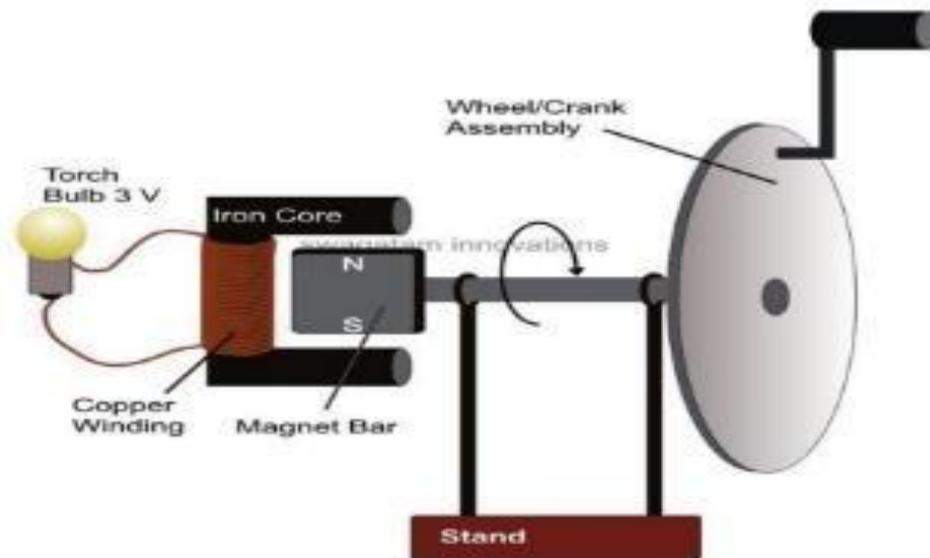


Fig. 1 Generation of electricity from wheels

The figure shows along these lines, likewise, we will give 3 or 4 dynamo sets to a street vehicle, contingent on the number of wheels of the comparing vehicle. Consequently, we're utilizing the energy that has been going to no end in the movement of a vehicle. In this way, produces power by driving a dynamo driven by the rotatory movement of the vehicle that has been moving to utilize a straightforward generator rule. In this survey, the point is to introduce a total standpoint for creative charging foundations.

C. Liu, K. T. Chau, D. Wu, and S. Gao et al. (2013) have proposed the best method for dealing with the environmental quality of oil-based commodity tainting. They furthermore convey incredible difficulties and likely entryways to the power grid, which prompts the introduction of V2H, V2V, and V2G. This has completely

examined the going with critical issues: new ideas applicable to GEVs; structures for V2H, V2V, and V2G operations; showing of local electrical devices; GEVs; as well as the V2H, V2V, and V2G systems, and relevant power hardware and battery advancements for GEVs. Additionally, a case focus on the headway of V2G action has similarly been completed. Finally, the information and correspondence for V2H, V2V, and V2G have been introduced.

M. Brenna, F. Foiadelli, and M. Longo et al. (2014) have proposed, that a significant assessment of V2G organizations has been presented, focusing on authentic circumstances that could happen soon. In particular, starting from a survey of the electric network aggravations done on the Italian spread grid in 2012, extraordinary specialist cases have been hypothesized, introducing basic

documents that give the reachability of the V2G services. The focus presented in this paper has shown that EVs could only work on the PQ of the association where it is conceivable to have various vehicles contemporarily related, which is the case for an air terminal or a retail plaza leaving. Various cases stalled are not opportunities for V2G organizations since they don't have a sufficient number of vehicles related. That is the very thing this means, in these cases, it isn't useful to present bidirectional charging stations with current correspondence systems. An explicit case regards home charging, in which V2G is useful to compensate for a more expanded obstruction on the solicitation of 20 min or to give the power top shaving. S. A. Amamra and J. Marco et al. (2019) have proposed the work presents a high level and enhanced V2G operation for a repeat and voltage support plot considering a naval force of EVs facilitated inside the power cross-section. The system performs day-ahead booking and identifies the intraday plan changes that are required or fiscally captivating to think about various potential outcomes. The arranged arrangement helps in offering smoothed out rule kinds of help, and voltage rule support to the association. EV battery debasement issues are similarly thought of while offering the fundamental subordinate kinds of help. The improvement targets have been maintained by organizing a battery degradation model, to have the choice to restrict the debasement cost and the charging cost through V2G movement. Further, the arranged objectives have been checked with expansive entertainment performed on continuous UK National Grid ruled data. The came-by results doubtlessly show that the proposed plot gives satisfying outcomes under different conditions and is conceivable to be embraced logically circumstances.

6. Existing System

The current framework portrays the powerage of the vehicle, that creating electrical energy is put away in the battery and it's utilized for the inside reason like self-beginning the vehicle, horn, showing light, and so forth.,

The expansion in the utilization of EV could see an expansion in the entrance impact of EV on the utility framework basically in the low voltage organizations. With the rising extent of usage of EVs' batteries as a virtual power source later on electric power, the framework is a chance for making greater utility-free self-supported miniature lattices. The EV charging situation could be executed by two kinds of model-based approaches which incorporate an uncontrolled model and a double tax model.

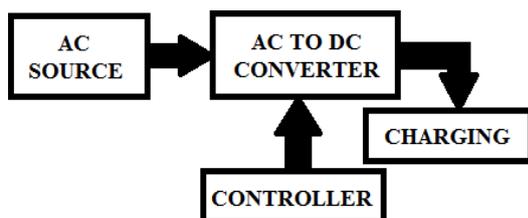


Fig. 2 Existing block diagram

Gadget for turning the gas-powered motor of the machine to start the motor's activity under its power.

The ongoing rolling in from your battery is a DC and that should be switched over completely to AC for the hardware to work for which an inverter is utilized which then gives the current to the loop and subsequently the curl aggregates the charge in it until it can oppose and when the obstruction edge has been crossed, the whole current is released as a flash which prompts start. It could seem like a huge interaction yet in all actuality it takes under one moment to occur. The whole course of making a flash method continually charges and releasing of the capacitor which is utilized for igniting. The explanation is that capacitors can hold a lot of charges and have more obstruction which prompts better starting out and out. The main issue here is, that this is an ordinary approach to igniting and is fine for vehicles running more modest motors.

Fundamentally we utilize electrical power starters for the vehicles and practically all vehicles. There is a separate power hotspot for the starter framework, and it is called the starter battery. Ordinarily, for vehicles, 12v particle batteries are put adjacent to or under the motor jack or beneath the petroleum tank for certain vehicles. An average battery determination could assist you with figuring out the power utilization and scopes of the starter battery.

On account of a power starter, when you press the button, it will send power to the starter engine of the vehicle. This starter engine turns the principal belt or chain of the vehicle and that turns the driving force of the vehicle. When the motor to overturning, the vehicle adds gas, air, and flash and afterward vehicle begins running. In this manner, a power starter works. This adding the way a launch works. However, on account of the kick starter, there won't be a starter engine in the vehicle. All things being equal, when we step on the kicker, it turns the transmission pulley which will turn the belt or chain of the vehicle, which turns the motor. The other arrangement of activity is the same as the electric starter. A starter might be an electric engine, pneumatic engine, water-driven engine, or other.

7. Proposed System

The active energy is seen in all the previously mentioned methods of transportation when they're moving. Figure. 3.1. shows the dynamo unit is introduced in a vehicle wheel.

Accordingly, contingent on the comfort and sort of transportation, the client introduces a reasonable dynamo unit in the vehicle to create, store and use energy. The framework gives a more solid power supply to use the power supply at wherever and whenever to utilize the power to the utility load.

How V2H bidirectional charging works (+ Backup power)

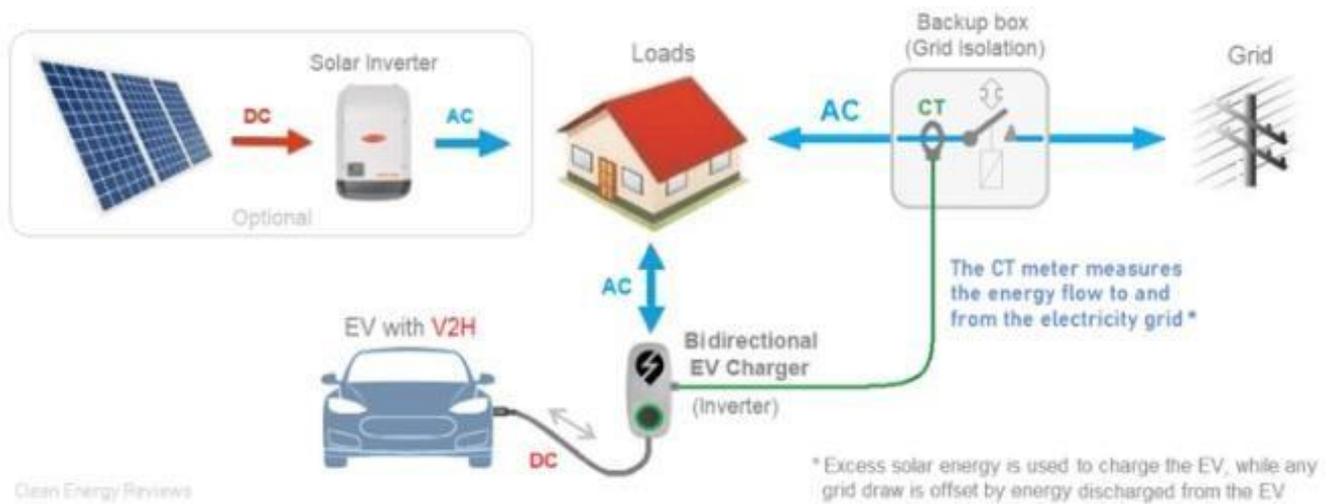


Fig. 3 Vehicle to utility load

Motivating force or decreased power costs, contingent upon the assistance contract. To partake in V2G programs, you will require a bidirectional DC charger and a viable EV. There are a few monetary motivating forces to do this and EV proprietors are given attributes or diminished power expenses to take part. EVs with V2G can likewise empower the proprietor to take an interest in virtual power plants (VPP) projects to V2H empowers an EV to be utilized similarly as a home battery framework to store an abundance of sun-oriented energy and power your home. An ordinary home battery framework, like the Tesla Power wall, has a limit of 13.5kWh, while a typical EV has a limit of 65kWh, which is identical to just about five Tesla Power walls. Because of the huge battery limit, a completely energized EV could uphold a typical home for a few days all at once, or significantly longer when joined with a roof sun-powered.

Vehicle-to-stack or V2L innovation is a lot less difficult as it doesn't need a bidirectional charger to work. Vehicles with V2L have an underlying DC to AC inverter and standard module AC electrical plugs which can be utilized to connect any ordinary family AC apparatuses. In a crisis, additional ropes can be run from the vehicle into a home to drive fundamental burdens, including lighting, PCs, refrigerators, and in any event, cooking machines.

While vehicles with V2L can be extremely helpful for reinforcement power utilizing expansion prompts run chosen apparatuses. It is additionally conceivable to associate the V2L supply straightforwardly to a reinforcement switchboard or even the primary circulation board utilizing a specific exchange switch. A vehicle with V2L can likewise be integrated into an off-lattice sunlight-based power framework to decrease or even wipe out the requirement for a reinforcement generator. Most off-matrix sunlight-based power frameworks contain a bidirectional inverter-charger, which can utilize power from any AC source incorporating a vehicle with V2L. Notwithstanding, do to this securely it would be introduced and arranged by a sunlight-based subject matter expert or qualified circuit tester. More deeply study involving V2L for reinforcement power and to improve off-matrix frameworks.

Vehicle-to-lattice is where a part of the EV battery energy is released and traded to the power matrix when the interest is high in return for a further developed network soundness. Just a small bunch of EVs presently have V2G and bidirectional DC charging ability; these incorporate the later model Nissan Leaf (ZE1) and the Mitsubishi Outlander and Eclipse module half and halves.

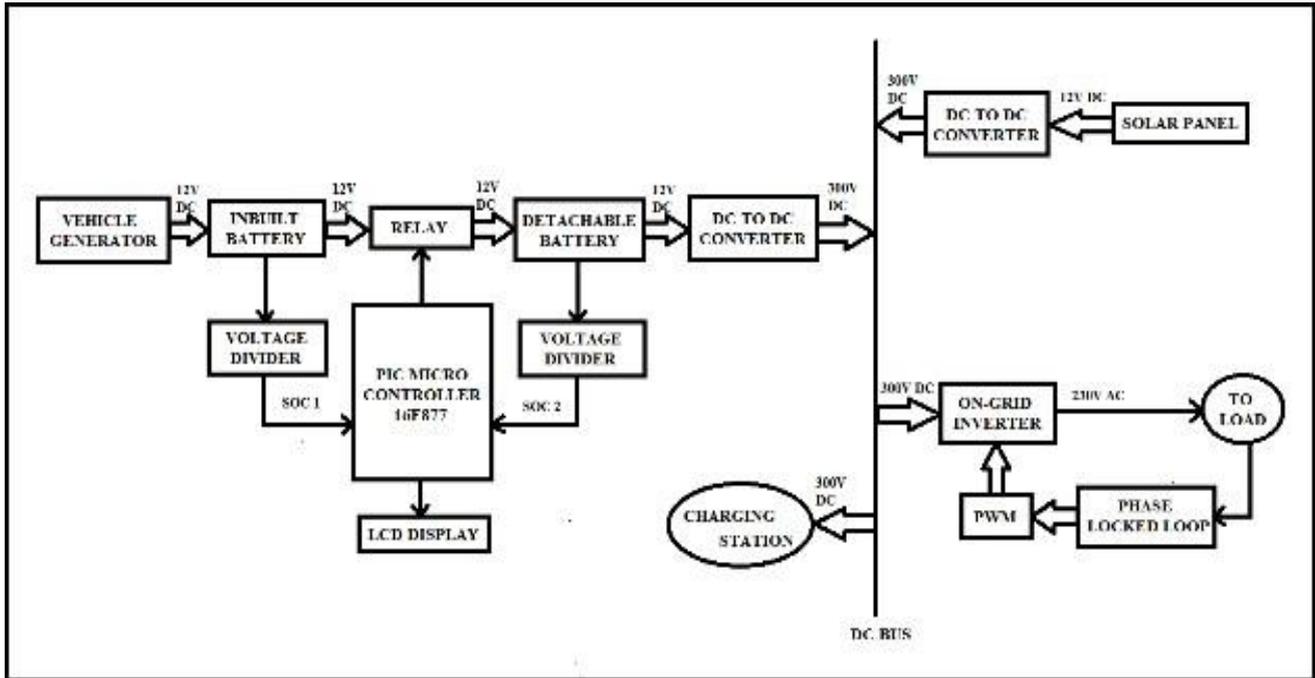


Fig. 4 Proposed block diagram

The figure shows the proposed block diagram of the power generation by using rotating wheels in the vehicle.

The utilitarian square graph of the task comprises of battery, the bidirectional converter includes DC to DC converter, DC to AC converter, Pic microcontroller, Potential transformer, Current transformer, environmentally friendly power frameworks, and the Motor. In this task, we are utilizing the sun-based environmentally friendly power framework (Solar board). The square outline of the shrewd converter with the pic microcontroller for the electric vehicle is displayed in the figure. The bidirectional converter took care of from the battery to the engine drive. Likewise, the battery took care of by the sunlight-powered charger.

We have executed the shrewd converter with the pic microcontroller expected for electric vehicles (EV) applications. Mainly this venture used to change over the

regenerative energy by applying/eliminating the gas pedal into the electrical energy. A unique strategy for the installed energy the board has proposed.

In this framework, we are involving vehicles for the power age, in the vehicle wheels revolution produce dynamic energy that is changed over into electrical energy by utilizing the engine. The producing voltage of this framework is 12 volts for the persistent turn. This creating voltage is helped up by dc-to-dc converter, the lift-up voltage is 300 volts. That is put away in the battery unit or shipped off the DC transport. The put-away energy is utilized for the DC load or ship off the inverter unit to be utilized for the utility burden like home appliances, and charging purposes. The DC transport yield is utilized for charging the electric vehicle too.

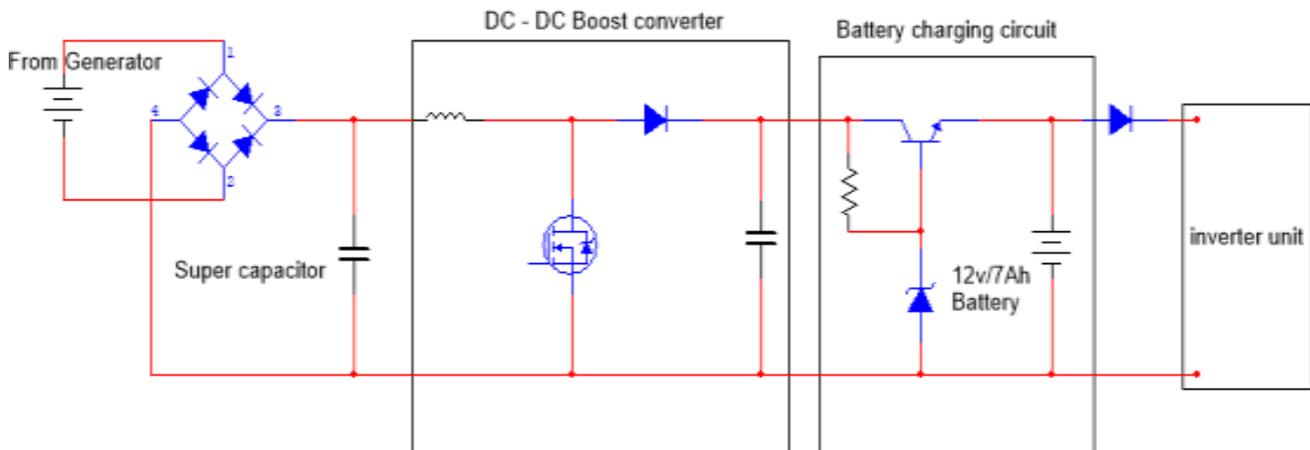


Fig. 5 Circuit diagram

Figure. 3.3. shows the circuit diagram of the power generation of rotating wheels in the vehicle’s overview is mentioned above.

8. Hardware Setup

The figure shows Hardware setup of power generation using wheels took various levels for attaining the final stage. The material required for generating power was purchased partially from both online and nearby stores. Initially, we started designing the converter unit and then we design the supply unit and voltage regulation unit. Finally, we assembled our project power generation from the wheels of the vehicle was completely done.



Fig. 6 Hardware setup

9. Components Table

Here a list of components used in our project was mentioned with their specification in the below table.

Table 1. Components List

S.NO	COMPONENTS	RANGE
1.	PIC 16F877A MICRO CONTROLLER	-
2.	LCD DISPLAY	2X16
3.	RELAY	12V/25 AMPS
4.	BATTERY	12V/7Ah
5.	MOSFET	IRF540
6.	DIODES	IN5408
7.	CAPACITORS	10uf,100uf, 1000uf
8.	VOLTAGE REGULATOR	IC 7805
9.	TRANSISTOR	BC 547
10.	RESISTORS	1K,10K

11.	STEP DOWN TRANSFORMER	12V
12.	INVERTER TRANSFORMER	500 VA
13.	DC-DC BUS	12V I/P & 230V O/P, 180 WATTS
14.	PWM GENERATION	SG3525
15.	DC-DC CONVERTER BOOST	300V
16.	PUSH-PULL TYPE INVERTER	500 WATTS
17.	SOLAR PANEL	10 WATTS/ 12 VOLTS

10. Conclusion

This journal put this idea on- the generation of electricity from the kinetic energy of a Vehicle of any mode of transportation i.e., roadway, railway, waterway. Tried to make witness how to generate power from the rotatory motion of the wheels of a vehicle, while the vehicle is possessing some kinetic energy. That kinetic energy is converted into electrical energy with help of the motor. The generation voltage is boosted up and the electrical energy is going to the inverter. Finally, the electrical power is connected to the utility load. Power generation from wheels is used for the utility load and we can utilize the power for the home or charge the electric vehicle from the DC Bus. The additional energy from the solar panel is also given to the DC Bus. So, definitely, this used to act as a charging station. This generating power is used at the time of parking my vehicle and for tracking purposes at night times. We can use this generating power for a DC load as well as an AC load.

11. Future Work

In the future, we can implement this project in the various modes of transportation like roadways, railways, and waterways. The power generation from wheels projects gives more reliable output power and it is a free cost of energy generation. So, in the future, this project will definitely make a good performance.

In the future this implementation is applied to two-wheeler, cars mean that system produces more energy compare to this system. In the future, this generating power is given to the dc motor and the energy is stored in a battery to run a bicycle as an electric vehicle.

The future implementation of this system will give a high efficient output compared to this proposed system.

References

- [1] Bowers, B. J. & Arnold, D. P., Spherical, rolling magnet generators for passive energy harvesting from human motion, *J. Micromech. Microeng*, 19(9) (2009) 094008. ISSN 0960-1317.
- [2] Dallago, E.; Marchesi, M. & Venchi, G., Analytical model of a vibrating electromagnetic harvester considering nonlinear effects, *IEEE Transactions on Power Electronics*, 25(8) (2010) 1989-1997. ISSN 0885-8993.
- [3] Daminakis, M.; Goethals, J. & Kowtke, J., Enhancing Power Harvesting using a Tuned Auxiliary Structure, *Journal of Intelligent Material Systems and Structures*, 16(10) (2005) 825-834. ISSN 1045-389X.
- [4] Lallart, M.; Anton, S. R. & Inman, D. J., Frequency Self-tuning Scheme for Broadband Vibration Energy Harvesting, *Journal of Intelligent Material Systems and Structures*, 21(9) (2010) 897-906. ISSN 1045-389X.
- [5] Leland, E.S. & Wright, P.K., Resonance tuning of piezoelectric vibration energy scavenging generators using compressive axial preload, *Smart Mater. Struct*, 15 (2006) 1413-1420. ISSN 0964- 1726.
- [6] Lohndorf, M.; Kvisterøy, T.; Westby, E. & Halvorsen, E., Evaluation of energy harvesting concepts for tire pressure monitoring systems, *Technical Digest PowerMEMS 2007*, Freiburg, Germany, (2007) 331-334.
- [7] Mansour, M. O.; Arafa, M. H. & Megahed, M., Resonator with magnetically adjustable natural frequency for vibration energy harvesting, *Sensors and Actuators A*, 163 (2010) 297-303. ISSN 0924-4247.
- [8] Marinkovic, B. & Koser, H., Smart sand -a wide bandwidth vibration energy harvesting platform, *Applied Physics Letters*, 94 (2009) 103505. ISSN 0003-6951.
- [9] Marzencki, M.; Defosseux, M. & Basrour, S., MEMS Vibration Energy Harvesting Devices With Passive Resonance Frequency Adaptation Capability, *Journal of Microelectromechanical Systems*, 18(6) (2009) 1444-1453. ISSN 1057-7157.
- [10] Matsuzaki, R. & Todoroki, A., Wireless monitoring of automobile tires for intelligent tires, *Sensors*, 8 (2008) 8123-8138. ISSN 1424-8220.