

Hybrid Power Generation Using Car Wheels

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ABSTRACT: In this project a new model of electric vehicle with generating wheels and hybrid energy storage system is presented. In proposed system consist of battery as the energy storage system, bidirectional dc-dc converter, PMDC motor. Additional it has some specially designed wheel arrangement in their rear end. Rear end wheels hub replaced with BLDC motor which is act as generator during running condition. Tyre would be mound on rotor side of BLDC motor. The energy storage system in electric vehicles (EV) must supply variable power levels and take regenerative power from braking. Simulation and experimental results validates the control approach of the complete system, and shows better performance.

KEYWORDS: DC Motor, Rectifier, Convertor, Transformer.

I. INTRODUCTION

A motor generator (M-G) set refers to a composite device consisting of a motor and a generator mechanically coupled through the common shaft. Practically a **motor generator set** is a system where a motor and a generator are connected or rather placed in a single circuit. It is a device used to convert electrical power from one form to another. That is mainly it converts electrical power to any other type of power.

Motor generator set are also used to convert voltage, phase and frequency of power. They also find application in isolation of electrical loads from the supply line. Here is a pictorial representation of a MG set. Here a motor and a generator are coupled together using a single shaft; they are wound around a single rotor. Necessary condition for coupling is that rated speed of both motor and generator should be same.

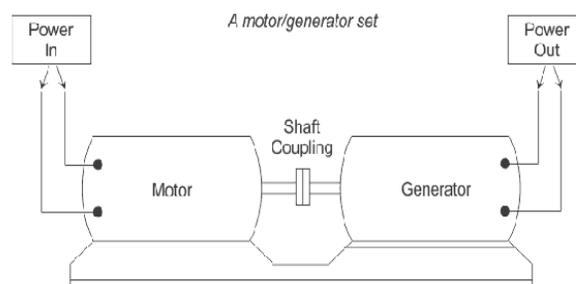


Fig.1. Coupling Between Motor and Generator

From the above diagram we can see that in a typical motor generator set, the power is given externally to a motor and as a result the shaft of the motor rotates the rotor of the generator. That means, motor receives electrical energy input from the supply line. Its shaft rotates and since the generator shaft is mechanically coupled with it, the generator also

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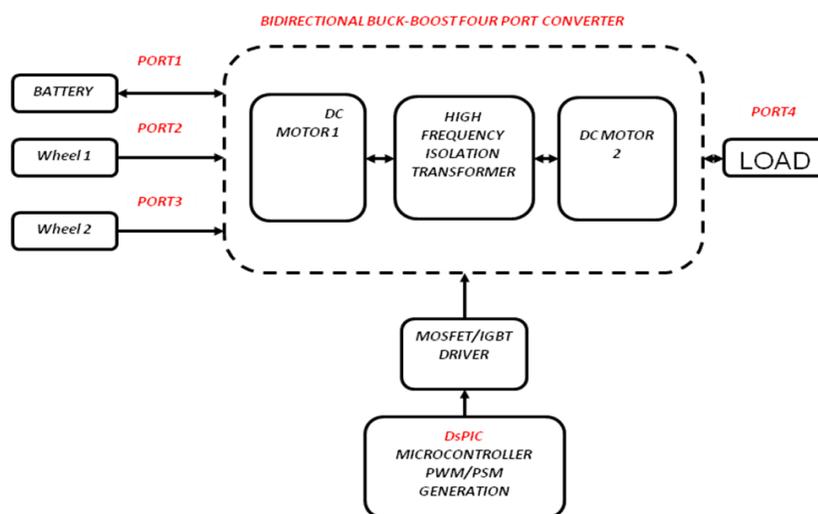
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receives its mechanical input through shaft. Thus generator also creates electrical output power or in other words generator converts the mechanical energy into electrical energy. Thus while the power at the input as well as output side is electrical in nature, the power flowing between the machines is in form of mechanical torque. This provides isolation of the electrical system as well as some buffering of power between the two electrical systems. Now days motor generator sets have been upgraded in many ways. Earlier these were used in the places where speed regulation is required highly like elevators, factories etc. These conversions of power from one form to another can be brought about very easily. They are small and compact in size, losses are less and control is very easy.

II.HARDWARE DESCRIPTION

The proposed power generation method using regenerative wheels in an EV is designed in scaled platform to verify the simulation results with hardware results. The hardware implementation circuit is shown in figure 2.



DSPIC MICROCONTROLLER

Fig.2. Functional Diagram for Power Generation

PIC Microcontroller, are electronic circuits that can be programmed to carry out a vast range of tasks. They can be programmed to be timers or to control a production line and much more. They are found in most electronic devices such as alarm systems, computer control systems, phones, in fact almost any electric devices

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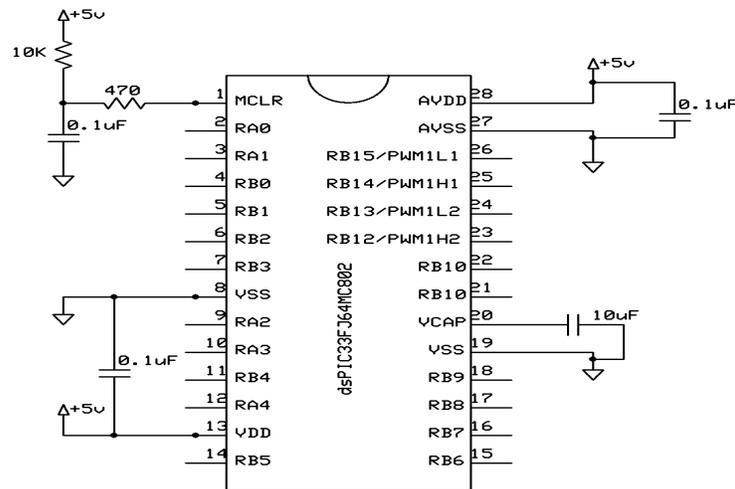


Fig.3. Pin diagram of Microcontroller

Features of DSPIC Architecture

i) Operating Range:

Up to 40 MIPS operation (at 3.0-3.6V)

1. Industrial temperature range (-40°C to +85°C)
2. Extended temperature range (-40°C to +125°C)
3. High temperature range (-40°C to +150°C)

ii) High-Performance DSC CPU:

1. 16-bit wide data path
2. 24-bit wide instructions
3. 83 base instructions: mostly 1 word/1 cycle
4. 16 x 16 fractional/integer multiply operations

iii) On-Chip Flash and SRAM:

1. Flash program memory
2. Data SRAM
3. Boot, Secure, and General Security for program Flash
4. Up to 53 available interrupt sources

vii) Digital I/O:

1. Peripheral pin Select functionality
2. Up to 35 programmable digital I/O pins
3. Wake-up/Interrupt-on-Change for up to 21 pins
4. Watchdog Timer with its own RC oscillator
5. Two and four simultaneous samples (10-bit ADC)
6. Up to nine input channels with auto-scanning
7. Conversion possible in Sleep mode



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MOSFET (IRF840)

The Metal Oxide Semiconductor Field Effect Transistor (MOSFET, MOS-FET, or MOSFET) is a transistor used for amplifying or switching electronic signals. The Power MOSFET switch IRF840 is shown in fig 4.6. A Power MOSFET is a specific type of metal oxide semiconductor field-effect transistor (MOSFET) designed to handle significant power levels. Compared to the other power semiconductor devices (IGBT, Thyristor..), its main advantages are high commutation speed and good efficiency at low voltages. This circuit will actually dictate the commutation speed of the transistor (assuming the power circuit has sufficiently low inductance).

Battery

The rechargeable batteries are lead-lead dioxide systems. The dilute sulfuric acid electrolyte is absorbed by separators and plates and thus immobilized. Should the battery be accidentally overcharged producing hydrogen and oxygen, special one-way valves allow the gases to escape thus avoiding excessive pressure build-up. Otherwise, the battery is completely sealed and is, therefore, maintenance-free, leak proof and usable in any position.

DC Motor

A DC MOTOR is a machine that converts mechanical energy into electrical energy by using the principle of magnetic induction. This principle is explained as follows: Whenever a conductor is moved within a magnetic field in such a way that the conductor cuts across magnetic lines of flux, voltage is generated in the conductor. The AMOUNT of voltage generated depends on (1) the strength of the magnetic field, (2) the angle at which the conductor cuts the magnetic field, (3) the speed at which the conductor is moved, and (4) the length of the conductor within the magnetic field. The POLARITY of the voltage depends on the direction of the magnetic lines of flux and the direction of movement of the conductor. To determine the direction of current in a given situation, the LEFT-HAND RULE FOR GENERATORS is used. This rule is explained in the following manner. Extend the thumb, forefinger, and middle finger of your left hand at right angles to one another. Point your thumb in the direction the conductor is being moved. Point your forefinger in the direction of magnetic flux (from north to south). Your middle finger will then point in the direction of current flow in an external circuit to which the voltage is applied.

III.WORKING AND ADVANTAGES

- As per the block diagram connections are made. Motor 1 is attached to the wheel 1 of car.
- When car starts running the wheel gets rotated which in turn will make the motor 1 to rotate. This motor 1 makes the motor 2 to rotate as they are coupled with each other.
- So here motor 1 will act as motor and motor 2 will acts as generator. From this motor 2 two wires are taken out and connected to the battery.
- So here charging and discharging process are carried out at the same time which will make the battery to increase its life time.
- Since we use the multi-level inverter the harmonics are been reduced and we obtain sinusoidal wave.
- The BDC with the full wave rectifier will produce more voltage than the existing system i.e. the input voltage will twice as that of the output voltage.
- Good power management capability between ac port and battery.
- Soft switching operation is possible without additional resonant circuit.

IV.CONCLUSION

Here by following this easy and simple method we can produce the current which recharges the battery which results in increasing its life time.



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