

A decorative graphic consisting of approximately 15 green 3D cylinders of varying heights and orientations, scattered across the upper half of the page.

# **A report on Suspension-powered EV Charging.**

---

KPIT Technologies Ltd.

# KPIT

## INTRODUCTION

As the world transitions towards sustainable energy solutions, electric vehicles (EVs) have gained significant traction. However, one of the challenges faced by EV owners is the availability of convenient and efficient charging infrastructure. In addressing this challenge, innovative solutions must be put forward, like Suspension-powered EV Charging.

Traditional car suspension systems use shock absorbers and other mechanisms to dampen the impact of bumps and vibrations, ensuring a comfortable ride. However, this process generates huge amounts of pressure as well as motion which remains untapped as a source of energy. We propose a combination of piezoelectric transducers and electromagnetic suspensions to produce energy from these suspension systems. This energy can then be used to simultaneously charge the device or stored for future use.

## MAJOR COMPONENTS

- Atmega328p microcontroller
- 16\*2 I2C LCD
- Bridge Rectifier
- Piezoelectric Sensors
- Copper wires
- Ring Magnetic hollow cylindrical tube
- Rechargeable battery
- Voltage sensor

## WORKING PRINCIPLE

The shock absorbers are fitted with an array of piezoelectric transducers at the surface of the Electromagnetic suspensions. Piezoelectric sensors use the piezoelectric effect in which certain materials generate an electric charge proportional to applied mechanical stress as given by the equation  $Q = d \cdot S$ , where  $Q$  is the induced charge,  $d$  is the piezoelectric constant and  $S$  is the applied mechanical stress. Whenever the suspension system encounters a bump on the road, pressure gets applied on the shock absorbers and our piezoelectric sensors convert that pressure into electricity.

An electromagnetic suspension system is a device that transforms linear motion and vibration from vehicle bumps into electrical energy due to Faraday's laws of electromagnetism. This electromagnetic suspension consists of a Cylindrical Hollow tube in which magnets are placed around the inner surface and a shaft which is made up of iron winded with copper coil with necessary insulation and a supporting metal spring between these two components.

The inner surface of the housing is fitted with permanent magnets. This generates electricity whenever the shaft moves in respiratory motion then it induces magnetic flux. With this differential change in flux, it generates electricity in accordance with Faraday's laws of electromagnetism. A bridge rectifier is used to convert this current into DC. Here, the voltage sensor is used to determine the charge inside the battery. A voltage regulator counters any fluctuations. A microcontroller will be used as a central control unit. It will control the power electronics components including the rectifiers, DC-DC converters and energy storage devices. It will monitor energy levels and manage charging cycles with the help of specialized charging algorithms to maximize efficiency and utilization.

The power is generated from piezo stack and the electromagnetic suspensions are added to achieve more power. This power drives through a bridge rectifier to convert Ac signals to Dc and stores it in a capacitor. This constant energy is now used to charge batteries, Lights, Ac and for infotainment systems.

## BLOCK DIAGRAM

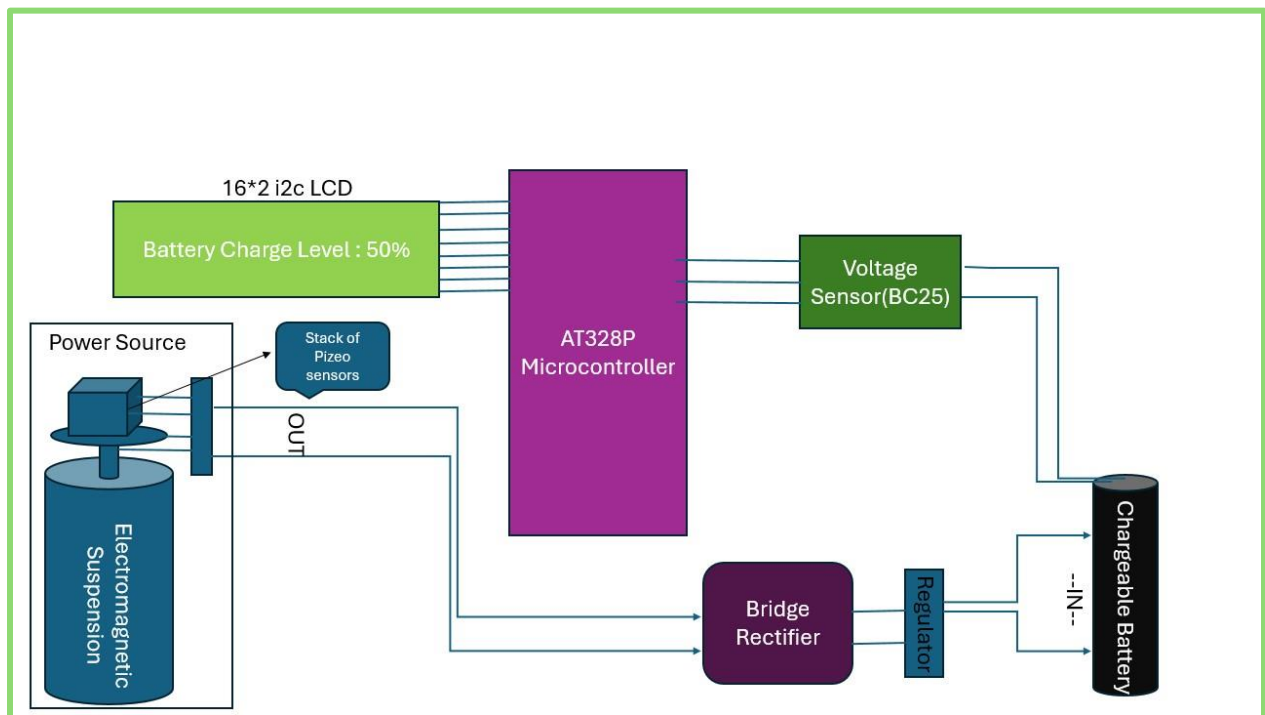


Fig 1: Block Diagram of System

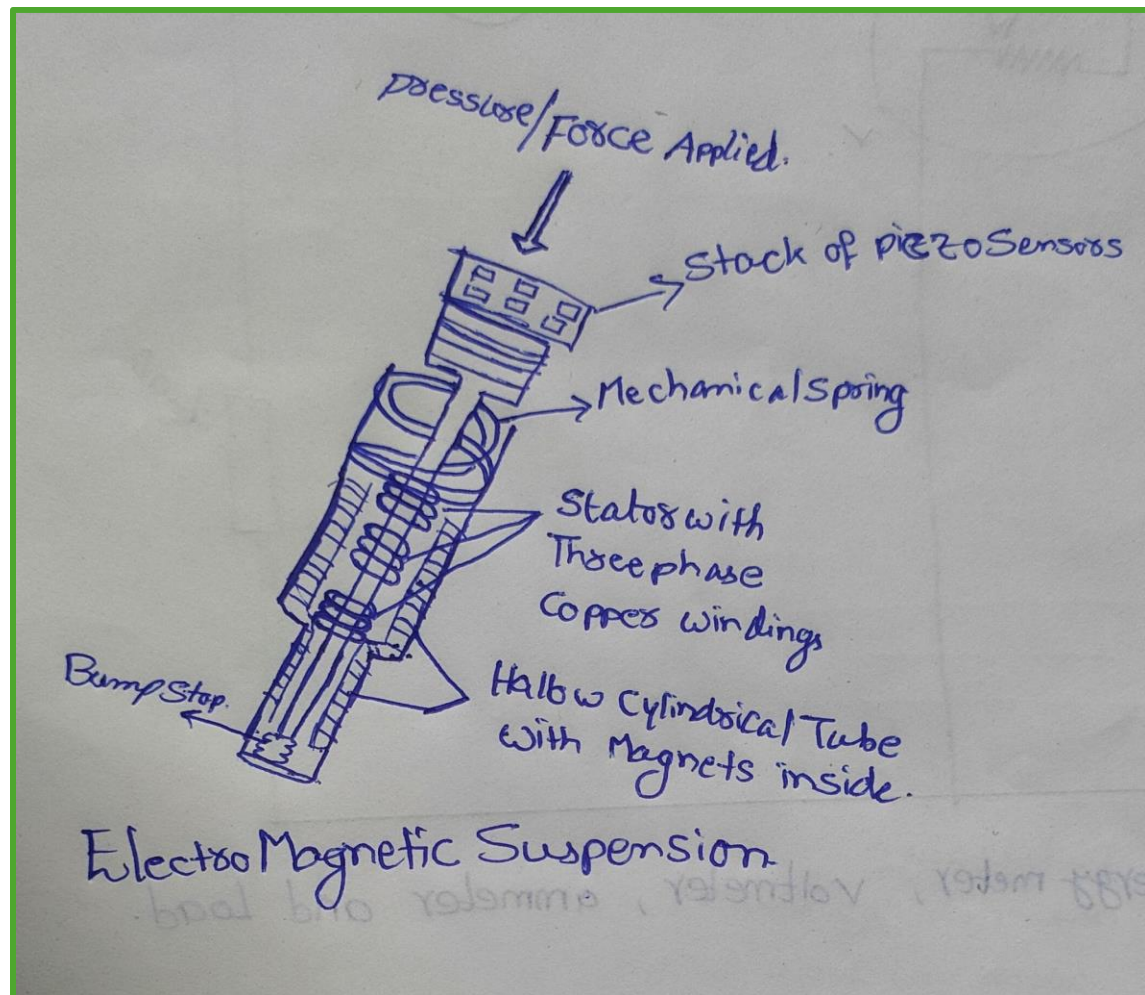


Fig 2: Model of Electromagnetic suspension

## PROJECT OBJECTIVES

- Harvest energy from the suspension system of vehicles
- Recharge EVs on the go using this mechanism
- Monitor and manage energy levels and process Realtime data to optimize the mechanism.
- With this system, we can extend the range of an Electric car and minimize the dependency of the other electronic components inside the car.

## **DELIVERABLE ARTIFACTS**

- A state-of-the art modified suspension system that uses piezoelectric and electromagnetic transducers to generate electricity whenever the suspension is activated.
- A centralized controlling system that monitors and manages recharging of the battery on the go using specialized power-management algorithms.
- The power generated from this system will be further used for recharging the Battery, Headlights, wipers, for infotainment system and for other Electronically controlled Components.

## **REFERENCES**

- [Power Generation Using Electromagnetic Suspension \(nevonprojects.com\)](http://nevonprojects.com)
- [Piezoelectric sensor - Wikipedia](https://en.wikipedia.org/wiki/Piezoelectric_sensor)
- [Paper Title \[Font: Times New Roman, Size:20\] \(ijirt.org\)](http://ijirt.org)
- <https://projects.zeronebd.com/project/details/433>