



# Electro-Kinetic Road Ramp

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**Abstract:** In this paper electro-kinetic road ramp is implemented as renewable energy source. For meeting up the regular demand of energy we need to design a system that will produce electricity without destroying the nature. In this paper we will come to know how man is utilizing kinetic energy to produce electricity. Electro-kinetic road ramp is the method of generating electricity by harnessing the kinetic energy of automobiles that drive over ramp. It is also used to generate power. Input is almost free. So we can call it generating electricity for free. We know that fossils fuels are polluting the environment. So our main focus is towards renewable energy sources which are, non polluting. So this technique is used to produce electricity which can be used in traffic lights and powering streets.

**Keywords:** Alternative energy, kinetic energy, ramp model, electricity

## I. INTRODUCTION

As we all know, renewable energies are considered as proper alternative energy, which reduces carbon dioxide emission. This means renewable energy like wind energy, solar, tidal, biomass, geothermal which are not harmful for environment can be used as alternative. As a car passes over a speed breaker most of kinetic energy is wasted as heat in it. In this paper we will see that the speed-breaker at streets where, huge amount of vehicles kinetic energy is wasting there. By conserving this kinetic energy and generating electricity we can supply this energy to the urban and remote areas for lightning purposes. In June 2009, one of the devices was installed in the car park at a Sainsbury's supermarket in Gloucester, United Kingdom where it provides enough electricity to run all of the store's cash registers. The ramp was invented by Peter Hughes, an electrical and mechanical engineer who is employed by Highway Energy System Ltd. This company says that under normal traffic conditions, the apparatus will produce 30 KW of electricity. Other proposed applications for the road ramps include powering streets and traffic lights, heating roads in the winter to prevent ice from forming and ventilating tunnels to reduce pollution. First of all we need to know about the concept of this technique. If we want to use the kinetic energy which is to be converted in electrical energy, we have to make a mechanical mechanism to rotate a generator. And kinetic energy will come from the vehicles of the road.

## II. METHODOLOGY

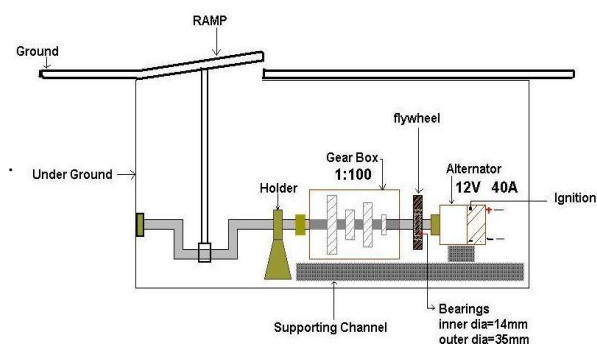
### a. KINETIC ENERGY

Kinetic energy is the movement energy of an object. The kinetic energy of a moving bicycle or car can be converted into other forms of energy. For example, the cyclist could encounter a hill just high enough to coast up, so that the bicycle comes to a complete halt at the top. The kinetic energy has now largely been converted to gravitational potential energy that can be released by freewheeling

down the other side of the hill. Since the bicycle lost some of its energy to friction, it never regains all of its speed without additional pedaling. The energy is not destroyed; it has only been converted to another form by friction. Alternatively the cyclist could connect a dynamo to one of the wheels and generate some electrical energy on the descent.

## III. RAMP MODEL

The ramp is not like usual speed-breaker. It is not harmful for the vehicles or cannot become the cause of waste petrol when a car passes over it. The speed ramp is not dangerous for vehicles at all. It does not only generate free energy, but the energy that has been generated is environment friendly with almost no pollution. On the whole the energy ramp system consists of two parts hardware and software model



ENERGY RAMP STRUCTURE

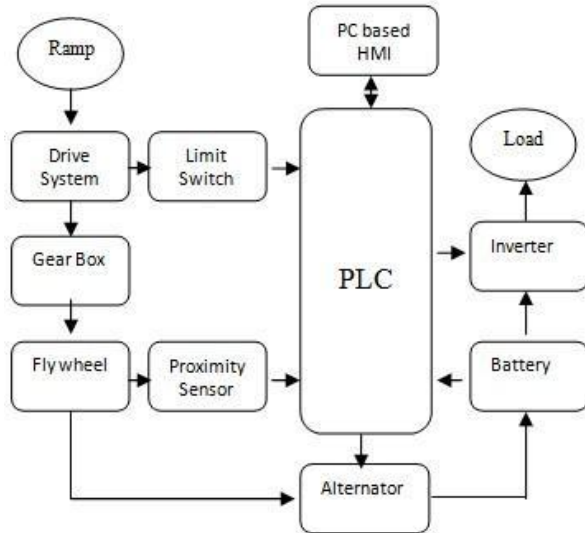
### A. HARDWARE MODEL

The Ramp consists of gear box, flywheel, drive system and alternator. It consists of a slab that is pressed down by the vehicle which produces translation motion. In addition to this a battery is attached to the alternator. An inverter is placed with the battery and a load is attached.



Relays are attached for the purpose of controlling. First one is attached between Alternator & Battery and second is between Battery and Inverter that break the connection.

The third relay is placed between the inverter and the load which indicates the completion of process i.e. when inverter passes 220V it energises the relay and a connection is produced between the Inverter and the Load Bank.



SYSTEM BLOCK DIAGRAM

**B. SOFTWARE MODEL**

A Limit switch is placed below the slab for the counting of the cars. When a car passes over the slab, the limit switch is pressed then the limit switch signals sends to the digital input (1746-IB16) module. Allen Bradley SLC 5/03 PLC is used for monitoring & controlling of the system and a PC-Based HMI is connected with it for displaying the process.

Whole system is fully automated with programmable logic controller PLC. When a car passes over the slab, the limit switch is pressed then the limit switch signals sends to the digital input (1746-IB16) module of PLC. RPM produced in Flywheel is 900 which means  $\omega = 94.2 \text{ rad/s}$

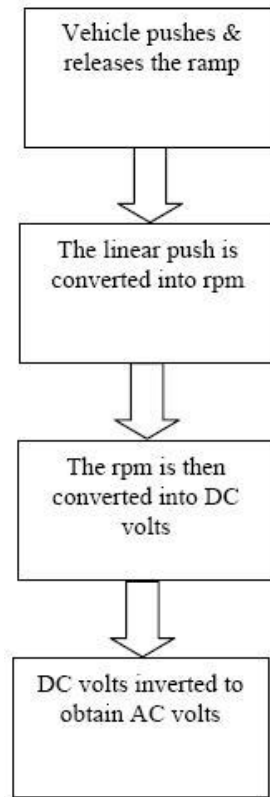
Finally number of cars displayed on the PC-Based HMI. The Software's that are used for Automation are listed below:

- R SLink Classic : Diver installer
  - RSLogix 500 : Ladder Programmer
- The Modules that are used in SLC 5/03 are listed below: 1747-L532 (SLC 5/03 Processor)

- 1746-IB16 (Digital dc Input Modules)
- 1746-OB16 (Digital dc Output Modules)

**C. PROCESS DIAGRAM**

This section will tell about the process of this ramp.



**IV. RESULTS AND DISCUSSION**

One car produces 12-14 volts and 9 amperes in 2 seconds. When one vehicle passed it produces 12-14 volts and 9 amperes in 2.4 seconds. One car produces power of 240 W. Kinetic Energy: K.E produce in flywheel,  $E(\text{rotational}) = \frac{1}{2} I \omega^2$  where  $\omega$  is the angular speed

I am the moment of inertia around the axis of rotation. E is the kinetic energy.

Angular speed:

RPM produced in Flywheel is 900 which means  $\omega = 94.2 \text{ rad/s}$

$I = mr^2$

M = mass of flywheel (3kg) r = radius of flywheel (8inch)  $I = (3\text{kg})(0.08\text{m})^2 \approx 0.02 \text{ kg m}^2$

Input = K.E =  $\frac{1}{2} (0.02)(94.2)^2 = 88 \text{ J}$

Electrical Energy :

Voltage = 12~14 V

Current = 8~9 A

Power =  $V \cdot I = 96 \sim 126 \text{ W}$

Work = power time (peak power is generated for  $\frac{1}{2} \text{ s}$ )  
 $= 126 * 0.5 = 63$   
 $= \text{Output} = 63 \text{ J}$



Efficiency

$$\begin{aligned}\eta \% &= (\text{output /input}) \times 100 \quad [8] \\ &= (63/88) \times 100 \\ &= 71.15\%\end{aligned}$$

## V. FUTURE ASPECT

We can use effective alternators and inverters to get less power loss.

We can use more than one crank to drive more alternators.

## VI. CONCLUSION

It has been analyzed that currently alternate energy produces approximately 11% to our primary energy. Also it has been determined that by using coal, oil and gas sources at the current rate, may cause the global temperature raised by 2 degrees Celsius by the year 2020. For this reason, it is assumed that by the year 2070, 60% of the total energy will be generated from alternate energy sources. Deploying such changes earlier may approach these results to 80%.

Our energy ramp which is the combination of both mechanical and electrical circuitry is an innovative approach in order to decrease the energy crisis globally and to take a step forward to achieve better results.

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