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Techniques for Generation of Electricity from Moving Vehicle

P. Krishnam Raju M-Tech
Assistant Professor,
Dept of Mechanical Engineering
V.K.R, V.N.B & AGK College of Engineering

K. Durga Prasad M-Tech
Associate professor,
Dept of Mechanical Engineering
V.K.R, V.N.B & AGK College of Engineering

P. Narayana
Dept of Mechanical Engineering
V.K.R, V.N.B & AGK College of Engineering

V. Anil Gopi
Dept of Mechanical Engineering
V.K.R, V.N.B & AGK College of Engineering

***Abstract*: "When a train or road runner (vehicle on road) runs at a full speed of 90-120 kms, it creates an air pressure in opposite direction and no one has ever thought to utilize this huge air pressure which is freely and easily available".**

Exploring his technology, we can generate electricity in the moving train/moving vehicle on road, as well as in micro power plant situated by the side of track/road.
To generate power in the moving train/vehicle a small impeller is fixed at the front portion of railway locomotive and similarly on top of each coach of a train or any vehicle moving on road at high speed.

"When a train/vehicle runs, it produces huge quantity of compressed air due to high velocity of the wind and by accumulating this compressed air; we can run turbines or air turbine motors which can produce a considerable amount of electricity, which are placed on each coach. Demonstration of this technology is "simple, eco-friendly and cost effective".

INTRODUCTION:

Power is the rate at which work is performed or energy is converted.

If ΔW is the amount of work performed during a period of time of duration Δt, the average power P_{avg} over that period is given by the formula

$$P_{\text{avg}} = \frac{\Delta W}{\Delta t}.$$

It is the average amount of work done or energy converted per unit of time. The average power is often simply called "power" when the context makes it clear.

The instantaneous power is then the limiting value of the average power as the time interval Δt approaches zero.

$$P = \lim_{\Delta t \to 0} P_{\text{avg}} = \lim_{\Delta t \to 0} \frac{\Delta W}{\Delta t} = \frac{dW}{dt}.$$

In the case of constant power P, the amount of work performed during the period of duration T is given by:

$$W = PT.$$

In the context of energy conversion it is more customary to use the symbol E rather than W.

Power transmission is the movement of energy from its place of generation to a location where it is applied to performing useful work. Power transmission is normally accomplished by belts, ropes, chains, gears, couplings and friction clutches.

Types of powers

1. Mechanical power
2. Hydraulic power
3. Electric power
4. Nuclear power
5. Pneumatic power

DEVELOPMENT OF ELECTRICITY GENERATION:

Electricity generation was first developed in the 1800's using Faradays dynamo generator. Almost 200 years later we are still using the same basic principles to generate electricity, only on a much larger scale. The rotor (rotating shaft) is directly connected to the prime mover and rotates as the prime mover turns. The rotor contains a magnet that, when turned, produces a moving or rotating magnetic field. The rotor is surrounded by a stationary casing called the stator, which contains the wound copper coils or windings. When the moving magnetic field passes by these windings, electricity is produced in them. By

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controlling the speed at which the rotor is turned, a steady flow of electricity is produced in the windings. These windings are connected to the electricity network via transmission lines.

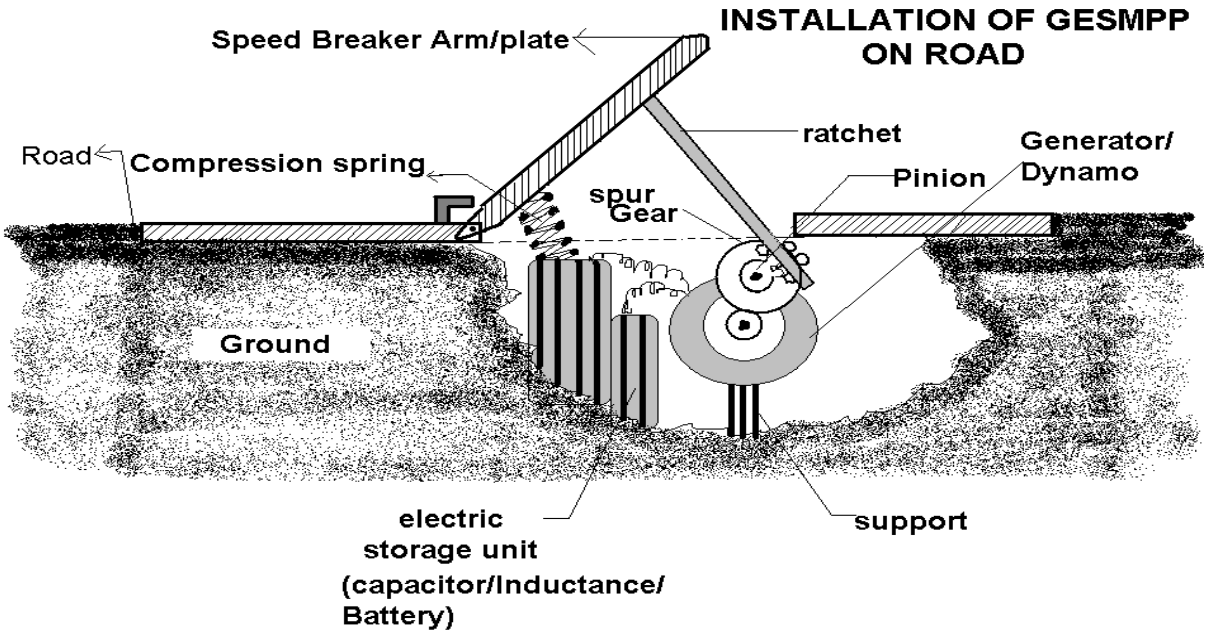
Let us throw some light on the very new and innovative concepts i.e.

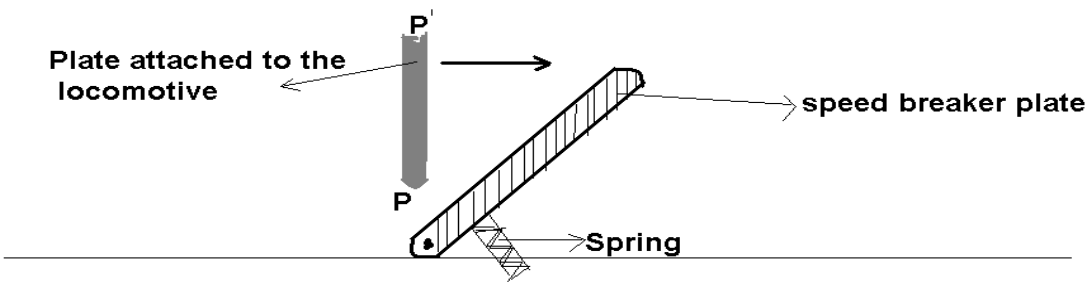
1) GENERATING ELECTRICITY FROM A SPEED BREAKER AND MICRO POWER PLANT SITUATED BY THE ROAD/TRACK.

2) GENERATING ELECTRICITY IN THE VEHICLE USING IMPELLER WHICH IS FIXED AT THE FRONT PORTION OR ON TOP OF EACH COACH

GENERATING ELECTRICITY FROM A SPEED BREAKER AND MICRO POWER PLANT SITUATED :

Primarily producing electricity from a speed breaker is a new concept that is undergoing research. The number of vehicles on road is increasing rapidly and if we convert some of the kinetic energy of these vehicle into the rotational motion of roller then we can produce considerable amount of electricity, this is the main concept of this project. In this project, a speed breaker arm is fitted in between a speed breaker and some kind of a grip is provided on the speed breaker so that when a vehicle passes over speed breaker it rotates the speed breaker arm. This movement of it is used to rotate the shaft of D.C. generator by the help of gear mechanism which is there to provide 1: N speed ratio. As the shaft of D.C. generator rotates, it produces electricity. This electricity is stored in a Battery/Capacitor/Inductance, depending up on the nature of electricity (AC or DC). Then the output of the battery is used to lighten the street lamps on the road. Now during daytime we don' t need electricity for lightening the street lamps so we are using a control switch which is manually operated .The control switch is connected by wire to the output of the battery. The control switch has ON/OFF mechanism which allows the current to flow when, needed.





INSTALLATION OF (GESMPP) FOR RAIL TRACK

GENERATING ELECTRICITY IN THE VEHICLE USING IMPELLER WHICH IS FIXED AT THE FRONT PORTION OR ON TOP OF EACH COACH :

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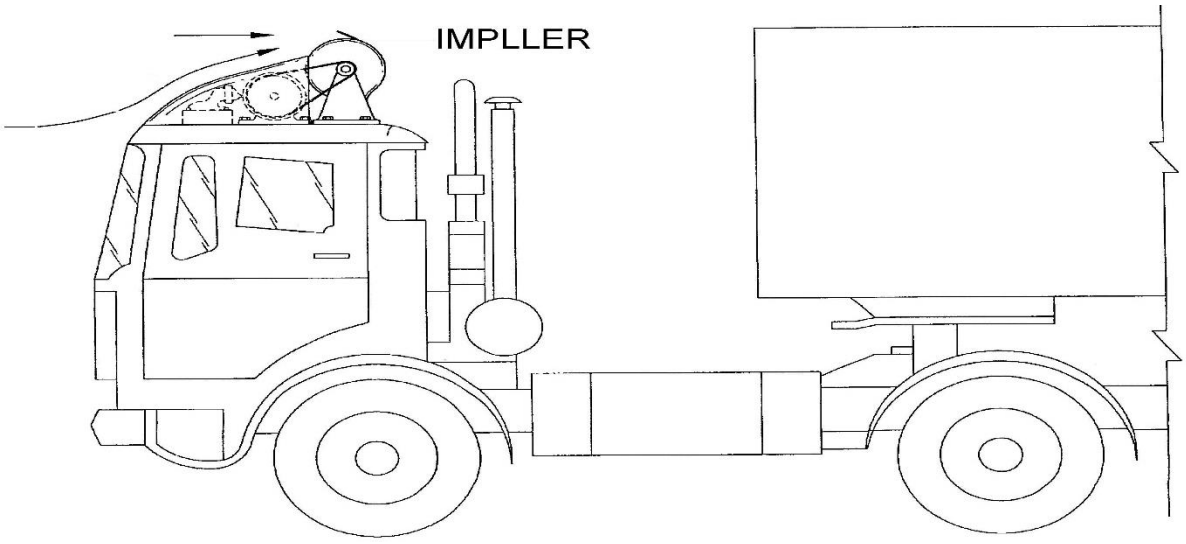
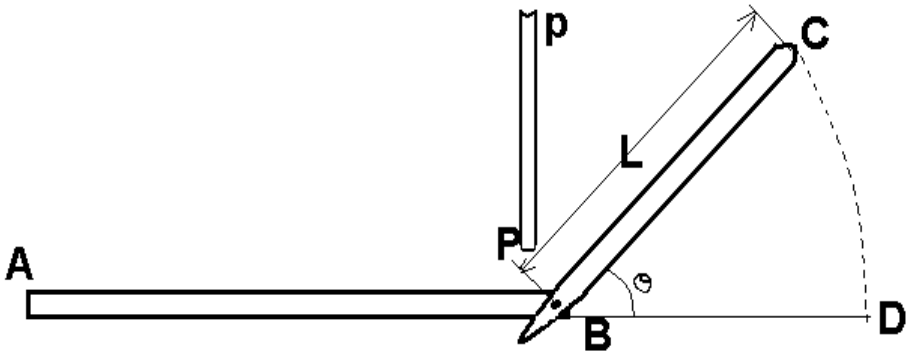
Secondarily generating electricity in the vehicle using impeller is, "When a train/vehicle runs, it produces huge quantity of compressed air due to high velocity of the wind and by accumulating this compressed air; we can run turbines or air turbine motors which can produce a considerable amount of electricity, which are placed on each coach. Demonstration of this technology is "simple, eco-friendly and cost effective".



RELATION BETWEEN RPM OF GENERATOR& VELOCITY OF MOVING VEHICLE

In the adjoining figure, AB is the fixed arm; BC is the speed breaker plate / Hinge plate; Which is hinged to fixed arm AB at point 'B', and making an angle θ with horizontal. 'D' is the extreme point of 'C', when , breaker plate/ hinge plate, in its another extreme position . (i.e.; when θ=0)



Assuming:

1. The length of speed breaker plate = L & Angle made by the speed breaker plate/hinge plate is given as 'θ'
2. Locomotive is traveling' distance in time't'. As the Locomotive is traveling 'd' distance in time 't' its velocity 'v' is given by v=d/t

Consider a bar "pp", attached to the locomotive in its respective position, which is to be stripped over the speed breaker plate/hinge plate.
As the bar "pp" is attached to the locomotive, its linear velocity

Vpp=V=d/t

→The time required by the plate pp to cover 'L' distance of speed breaker plate/hinge plate is

Tpp'= ((L*t)/d) =L/v

We Know that, the time required by the bar "pp", to travel 'L' distance of speed breaker plate/hinge plate is equal to that of taken by 'c' to reach position 'D'.

- Also the speed breaker plate will make an angle 'θ' in same time tpp'
  Then the angular velocity of the plate Wbc= (θ/ (L/v)) = (θ*v)/L

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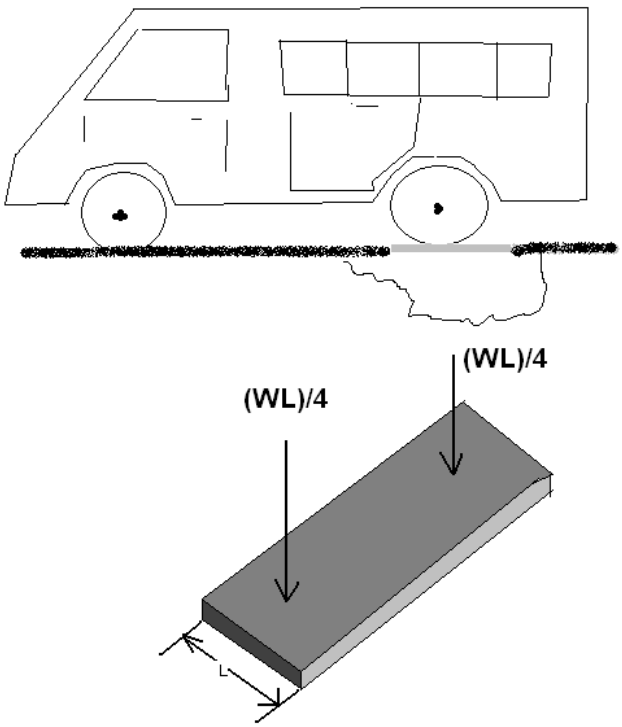
ωbc = θ.v/L --------- 1
Linear velocity of point 'C' is given by
Vc =L.ωbc
=L.θ.(v/L)
=v.θ; therefore Vc=v θ --------- 2
In the adjoining figure, Ratchet is connected to speed breaker arm at point 'C' and meshed to gear/pinion 'G'. Gear 'Gθ ' is mounted on the same shaft of 'G1' as shown. Gear 'G2' is meshed with gear 'Gθ'.

From eq 2, Linear velocity of point 'C' is given by Vc= v0
Neglecting, the angular displacement of ratchet, w.r.t the point 'C', linear velocity of the ratchet is also equal to vc.
→Vr = Vc = Vθ →Vr =Vθ →3
Angular velocity of Gear G1 is given by eq
Vr = r1xω,
Where W1 is angular velocity of Gear G1
→Vθ =r1*ω1
→ω1 =v*θ/r1 ----------4
As Gear G1&G0 are keyed to same shaft
ω1 =θω ---------- 5
As Gear G2 Meshes with gear G0,
ωθ/ω2 = R2/R0 → ω1/ω2 =R2/R0
*N2 =v*θ*ro/r1*r2 /360
V*θ/r1*ω2 =r2/ro
ω2 =v*θ*ro/r1*r2

LOAD ON PLATE WHEN THE MECHANISM IS INSTALLED ON ROAD:

Assume the vehicle is having uniform weight of w kg per unit length. Taking the length of the plate as ' L' , load on the plate when one of the tyres (front or rear) are on the plate is (W.L)/2, as shown in figure.



As the vehicle have inner and outer wheels at both rear and front, the load (W.L)/2 will be shared by both the wheels, i.e. (W.L)/4 each at inner and outer wheel. The plate is supported by reactions R1 and R2 as shown.

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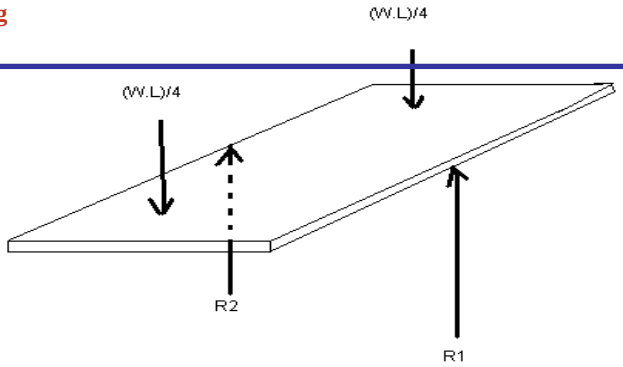
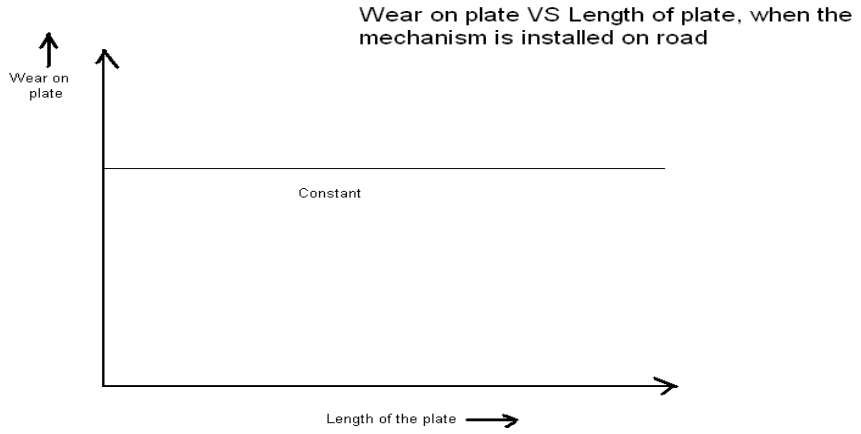
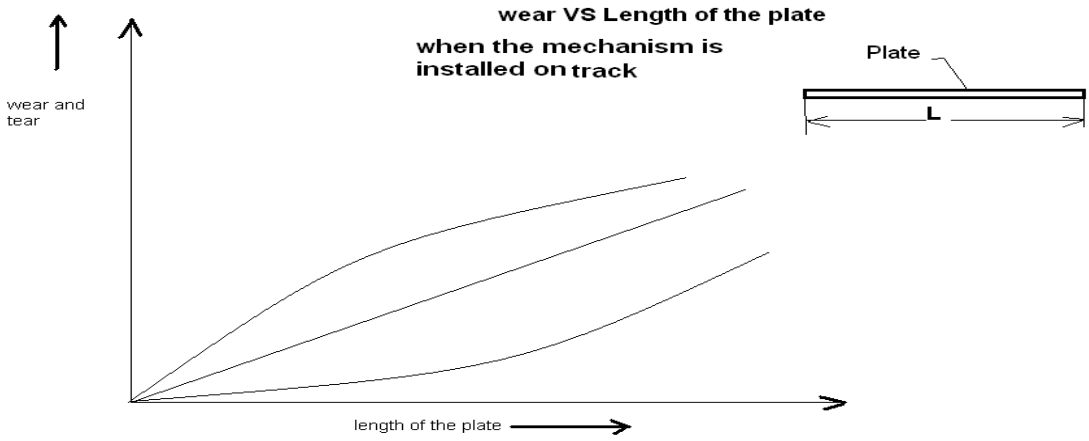


GRAPH SHOWING WEAR VS LENGTH OF PLATE WHEN THE MECHANISM IS INSTALLED ON ROAD:



GRAPH SHOWING WEAR VS LENGTH OF PLATE WHEN THE MECHANISM IS INSTALLED ON TRACK:



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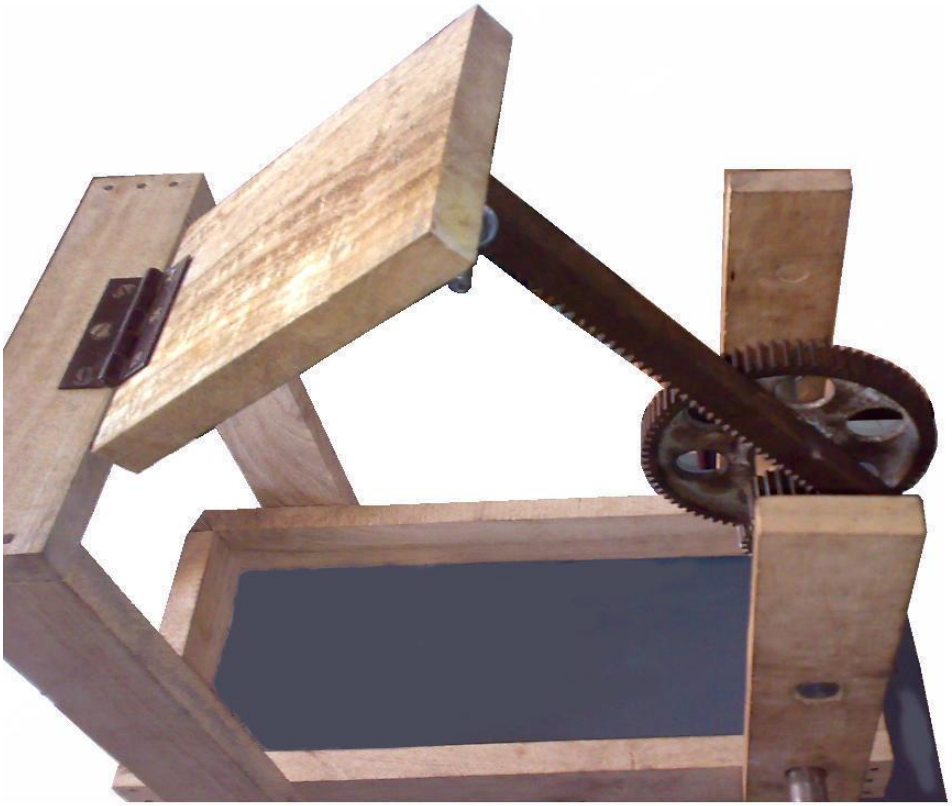
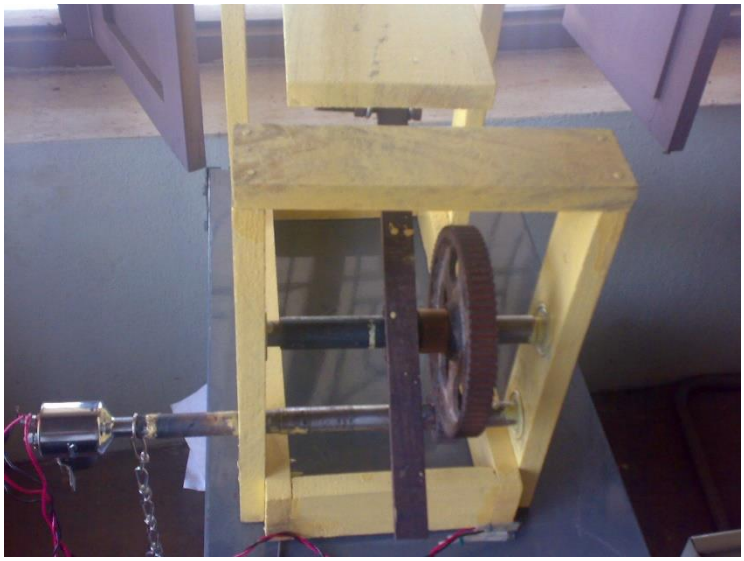
EXPRIMENTAL WORK:





CHALLENGES WE FACED:

- Selecting suitable generator.
- Selection of Gear ratio & springs.
- Achieving proper balance of speed and torque.

SCOPE, MERITS AND USES:

- Low Budget electricity production
- Less floor area
- Easy maintenance

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- Suitable at parking of multiplexes, malls, toll booths, signals, etc.
- Uses: Charging batteries and using them to light up the streets, etc.

CONCLUSION :

Probably " TECHNIQUES FOR GENERATION OF ELECTRICITY FROM MOVING VEHICLE" may be the improving technology. It won' t be long before, people worrying about the energy consumed by small appliances like street lights, digital advertisements, signal lights on road, dash boards on road etc. I have put forth a simple technology but very useful one.

Making this project implemented gives/results in/generates low Budget electricity production, less floor area, no obstruction to traffic, easy maintenance, suitable at parking of multiplexes, malls, toll booths, signals, etc.

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