Design and Fabrication of Power Generation through Speed Breaker

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ABSTRACT: In the present scenario energy is the primary need for human life. Energy is responsible fordevelopment of any country's economy. But in this fast-moving world, population is increasing day by day and theconventional energy sourcesarediminishing.Moreover,thesenon-renewable energy sources are polluting and responsible for global warming. Therefore, to overcome this problem we need to implement the technique of optimalutilization of conventional sources for conversion of energy. So non-conventional sources are needed to be developedfor power generation which are clean environment friendly and sustainable. So, this project includes how to utilize theenergywhichis wasted when the vehicle passes overaspeedbreaker.Ourprojectistoenlightenthestreet utilizingthejerking pressure which is wasted during the vehicle passes over speed breaker in roadside. We can tap the energygeneratedandproducepowerbyusingthespeedbreakeraspowergeneratingunit.Thekineticenergyofmovingvehiclecan be converted into mechanical energy of the shaft through rack and pinion mechanism, then this mechanical energycanbeconvertedintoelectricalenergyusingdynamowhichwillbesavedwiththeuseofabattery.Theenergywesavecan be used in the night time for lighting street lights. Therefore, for this arrangement we can save lot of energy whichcanbeusedforthefulfilmentoffuturedemandsandifimplementedthenitwillbeverybeneficialforgovernment.Theprincipleinvolvedispotentialenergytoelectricalenergyconversion.Whenthevehiclemovesovertheinclinedplates.It gains height resulting in increase in potential energy, when the breaker comes down, then rack moves and rotate thepinion which is connected to shaft. The output of this shaft is coupled to a dynamo to convert potential energy intoelectricity.

Keywords:
Design,simulationandfabrication,renewableenergy

I. INTRODUCTION

Intoday'sgrowingworld,theuseofrenewable energyisincreasesasnonrenewableresourcesaredecreasing.Pollutionandglobalwarmingareincreasingbyusingmoreconventionalsources.Inmy paper, I have talked about the power generation through speed breaker and every component andmechanisminvolvedinmakingit.Asweareseeingtheconsumptionoftheenergyiscontinuouslyincreasing,andelectricityproductionisconstant.Duetowhichthereisshortageofelectricity.AccordingtoWard'sautojournal,1.2billionvehicleshavebeencalculatedin2021. Thismeanswehaveagoodopportunitythatwecansavetheenergyproductionforthis.

Ontheotherhand,pollutionsuchasnoisepollutionandairpollutionisincreasingandbadlyaffectingourlifeand mother earth. The need for energy has created many powers stations due to which the pollution isincreasing even more. So, we did and figured out from our idea per thought that we can generate effectivepowerwiththehelpofthespeedbreakersystemwithoutanyfossilfuelswithoutanyharmfulgases.

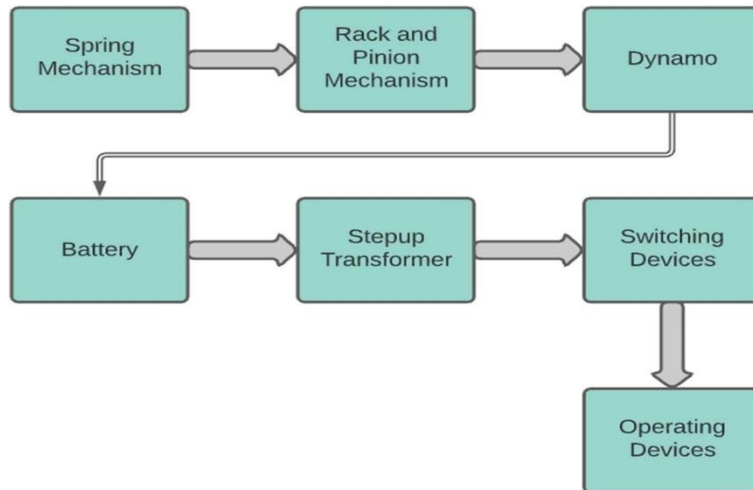## II. PROPOSED METHODOLOGY

1.1BlockDiagram:

Fig.1.blockdiagram

1.2 DesignandConstructionDetails:

i.   Cadsoftware
a)   Autocad   b) Catia
ii. Rack & Pinion, Spring, Shaft, Slidingrackrail, ElectricDynamo
iii. Woodenboard/Ironsheet, Battery, PCBboard

1.3 Design Procedure:

First, we will prepare a base on which the whole mechanism will rest. With the help of square pipe, the baseofrectangularshapeisprepared.Useweldingorclampstojointhepipes.Ontopofthatrectangularbase,we willpreparethebaseofthespringmechanism.Andmakethehumpmovablewiththehelpofslidingrackrail.Rackisattachingtotheslidingrackrailthenduetomotioninrack,itrotatesthepinioninrotatorymotion.Pinionwill attach directly to the dynamo and the output of the dynamo will be directly connected to the battery andthepowerstoredinthebatterywillbeusedforstreetlights.
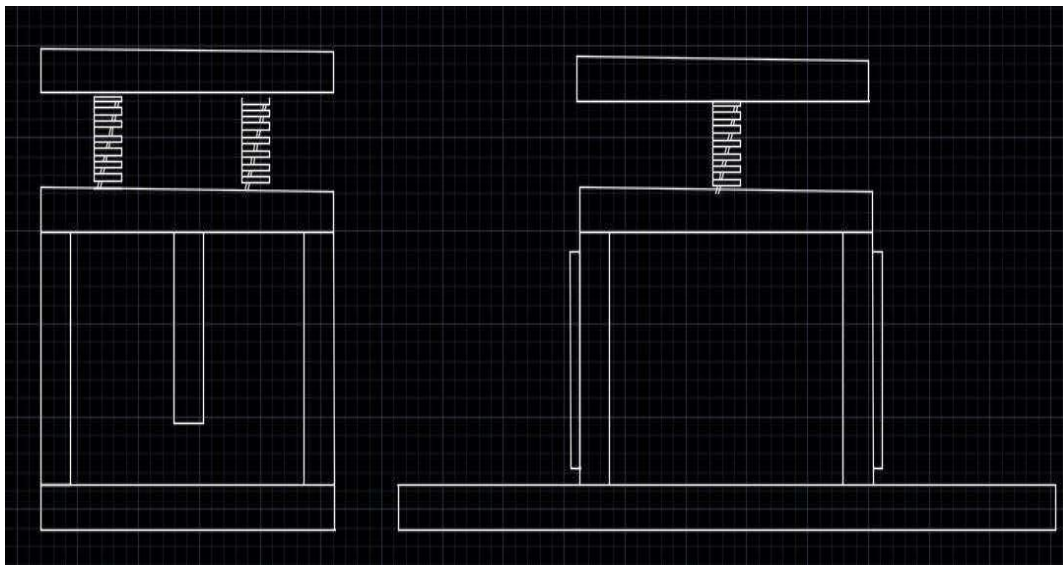

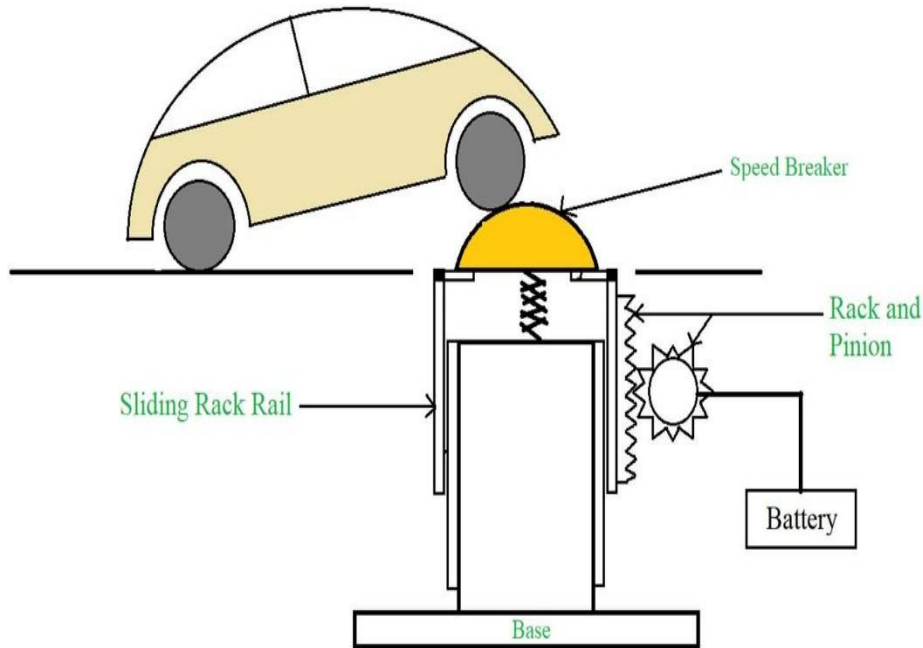**Fig.2designofspeedbreaker**

1.3 Working Procedure:

Fig.3workingmodel (Source Wikipedia)

Whenthevehiclesaremoving,ithaskineticenergyandifthevehicleisatheight,ithaspotentialenergy whichisbeingwasted.Thispotentialenergycanbeutilizedtoproducepowerbyusingaspecialarrangementwhichis called "Power Hump". It is an electro-mechanical system which works on electrical and mechanicaltechnologyandgeneratespower.Whenavehiclepassesthroughaspeedbreaker,thepowerhumpmovesinadownward direction, due to which the spring is pressed and the rack moves downward. Rack has teeth thatmesh with pinion gear. The reciprocating motion of the rack causes the rotating motion in the pinion. Thepinion is connected to the shaft and the same shaft is also connected to the dynamo. When the shaft rotateswiththecertainRPM,ittransfersMechanicalEnergytothedynamo.Thismechanicalenergyisconvertedintoelectricalenergybecauseofthedynamo.Thegeneratedpowercanbeamplifiedandstoredbyusingdifferentelectricaldevicessuchasbattery.

III.   CALCULATION
1.   **Power Calculation:**
Letusassumethat,
Themassofthevehiclemovingoverthespeedbreaker, (m)=200KgHeightofthespeedbreaker,(h)=15cm
Weknowthat,

W=mg(weightofthevehicle)where,m=massofvehicle
g=accelerationduetogravity
☐ W=200×9.8=1960N
Distancemovedbyspeedbreaker,(d)=15cm

Workdone,(W)= weightofthevehicle× distancemovedbyspeedbreaker

☐ W =1960×0.15=294joule
Power, (P)= work done / second
☐ P=294/60=4.9≈5watts
Power developed for 60 min = 300 wattAndPowerdevelopedfor24hr.=7.2kW
Hence,oursystemproduces250Vvoltageand24Acurrent

2.   **Obtainedresult:**Weareusing5-wattLEDbulbsbecausegivessamebrightnessasincandescent.Inonekilometer50bulbsareneeded
☐ Totalpowerrequired= 5×50=250watt
Thispowergeneratedbyvehicleissufficientfor10streetlightsinnighttime.

IV   ACTUAL PROJECT DESIGN

(a)   (b)

V ADVANTAGES

1. Lessareaisrequiredforinstallationofthepowersystem.
2. Pollutionwillnotgenerateasitisrenewableenergy.
3. Transportationandmaintenancewillbeafavorand anydamagecanbeeasilyrepaired.
4. Accidentsontheroadwilldecrease.
5. Byusingthissystem,electricitycanbeeasilygener atedthroughouttheyear.
6. Powercanbegeneratedatverylowcostandfutured emandcanbeeasilymet

VI RESULT

Obtainedresult: Weareusing5-wattLEDbulbsbecausegivessamebrightnessasincan descent.Inonekilometer50bulbsareneeded

$\square$ Totalpowerrequired= 5×50=250watt

Thispowergeneratedbyvehicleissufficientfor10stree tlightsinnighttime.

VII CONCLUSION

The demand for electricity will increase in the coming time and if seen, it is increasing every day.

Speedbreakerpowergenerationisabletoreducethisde mandtosomeextent.Theaimofourresearchthatwesho uldmakeasystemwhichisnotpollutingandenergycanb eproducedwithoutmanpower.Therearemanycountrie swhereelectricityisnotpresentproperly,sowiththehel pofthis,thepowershortageshappeninginthecountryca n be removed. This research paper can also be modified when we directly connect pinion to dynamo, so astominimizethedifficultiesandcomplexities.

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