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Designing a Conventional Mobile Phone Charger using Bike Exhaust gas

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Abstract:
Exhaust charger (EC) is a device which produces power from the exhaust gas of two wheelers. The main objective is, we can use the waste and unwanted exhaust of the two wheelers and convert them into a useful power source to charge a mobile phones without disturbing the main battery of the vehicles. The usage of Smart mobile phones are increased now-a-days and the user needs to charge their mobiles frequently, with the help of our exhaust charger on can charge their mobile easily. A secondary battery is employed to store the energy from the exhaust. This paper concentrates on how the wastes are converted into a useful source of energy.

Keywords: Exhaust charger, Exhaust gas source, Mobile charging, reduce main battery load, secondary battery

I. INTRODUCTION

The exhaust gas is the product of the combustion of fuel in the engine of the vehicle this gas consists of sulphur dioxide, carbon di oxide & carbon monoxide hence we cannot reuse it, but work can be generated from the exhaust gas which is at optimum velocity likewise the ideology of turbocharger, exhaust charger generates work and converts it as the electrical energy which can be used to charge the mobile phone hence we named it as exhaust charger. The output of the engine exhaust gas is given to the input of the generator blades, so that the electrical energy produced. This electrical energy is used to store the battery. This power, the alternate power must be much more convenient in availability and usage. The next important reason for the search for the effective, unadulterated power are to save the surrounding environments including men, machine and material of both the existing and the next generation from pollution, the cause for many harmful happenings and to reach the saturation point. The most talented power against the natural resource is supposed to be in electric and solar energies the best suit the automobiles.

II. LITERATURE REVIEW

Some of the ideologists have designed a charger like this, which converts the wind energy to electrical energy, while the vehicle is running but it does not work under when the engine is under idle condition, hence the exhaust charger stores energy also in the idle condition of the vehicle therefore it is more efficient than that of the other source chargers.

III. DESIGN OF EQUIPMENT AND DRAWING

3.1 COMPONENTS USED
1) Generator
2) Rectifier
3) Capacitor
4) Voltage regulator(IC 74805)
5) 9V Li-ion battery
6) One way diode
7) Blade

Generator

Generator which converts mechanical energy to electrical energy and it produces direct current. A 12V AC Generator is the perfect one to produce the electricity. This Generator is usually placed at the end of the tail pipe of the two wheelers. The Generator is supported by a two fixed pin joints at the surface and the wire supply also bring from that joint. These Generators are specially made to withstand the heat and carbon from the exhausts.

Rectifier

A Rectifier is a type of equipment used to control the electric current. Bridge rectifier is employed.

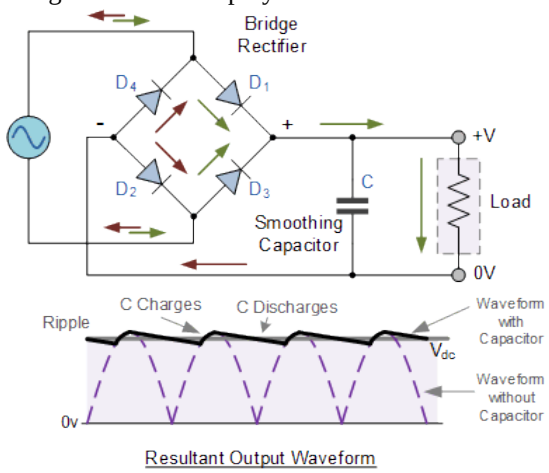


FIG 1.1 BRIDGE RECTIFIER

Capacitor

Capacitor is a component which is used to store the power. 1000μF Radial leaded Capacitor withstands high temperature extended life time.

Voltage Regulator

Voltage regulator is equipment which keeps the output voltage constant even when the input voltage varies.**7805** is a **voltage regulator** integrated circuit. It is a member of 78xx series of fixed linear voltage regulator ICs and it is very flexible. ”78” means it provides positive voltage regulator & “05” means it

provides +5V output voltage. So 7805 will provide a +5V output voltage.

Table 1.1 Volatge Regulator Specifications

Pin No	Function	Name
1	Input voltage (5V-18V)	Input
2	Ground (0V)	Ground
3	Regulated output; 12V (9.2V-12V)	Output

One way Diode

Diode is used to pass the current flow only in one direction. It does not allow the current flow back.

Blades

Blades are usually made of material with high melting point and high thermal conductivity material. A Special projection is established in the blades to control the back pressure to the engine. It is responsible for extracting energy from the high temperature, high pressure gas produced by the combustor.

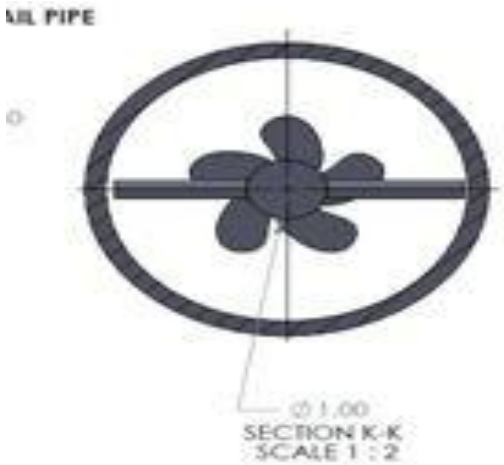


FIG 1.2 TURBINE BLADES CAD MODEL

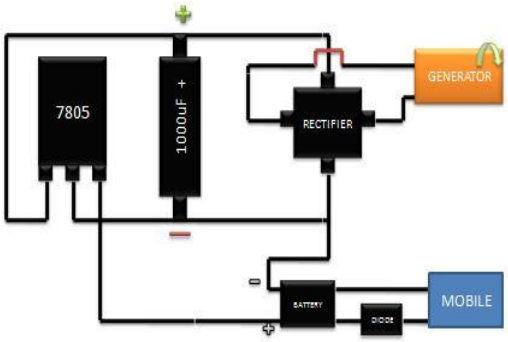
Secondary Battery

9V Battery is fixed as a Secondary battery source to store the energy produced from the EC and further use when the engine is in off position or at low engine RPM.

IV. EXHAUST CHARGING PROCESS

The Generator is fixed at the exhaust pipe with a turbine like blades. The turbine blade is place in a position like setup in the pelton wheel, so that the exhaust air strikes only the blades and move off. The electrical components are fixed in the circuit board along with a 9V battery. By this, the energy is stored in the battery and the mobile can be getting charged continuously. The charger plug is brought to the dashboard panel and the mobile can be plugged in.

V. CIRCUIT DIAGRAM



➢12V DC GENERATOR – PRODUCE POWEER
➢BRIDGE RECTIFIER -- AC TO DC
➢CAPACITOR 1000uF – ENERGY STORING & MAINTAIN POWER SUPPLY
➢VOLTAGE REGULATOR(7805) -- CONSTANT OUTPUT VOLTAGE
➢BATTERY(4V) – STORING PURPOSE
➢DIODE – PREVENTS REVERSE FLOW OF CURRENT

FIG 1.3 COVENTIONAL MOBILE CHARGER USING BIKE EXHAUST GAS

VI. SAMPLE GRAPH

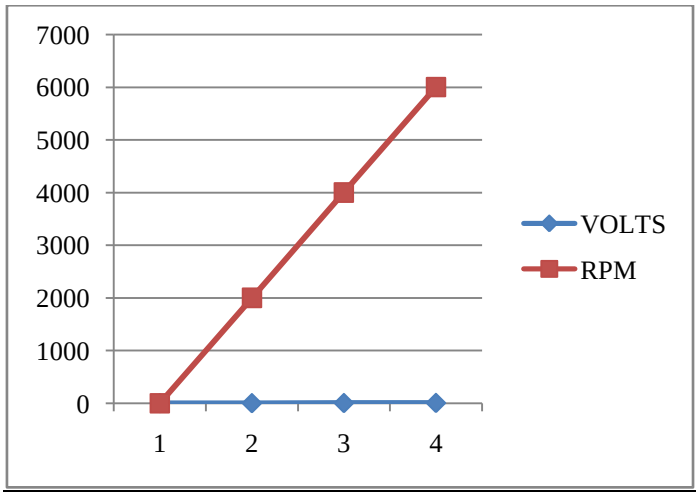


FIG 1.4 Plot between Volts Vs RPM

- If the engine RPM varies the exhaust gas pressure also varies.
- The pressure plays an important role in rotating the blades.
- So the high pressurized exhaust gas rotates the blades well and gives a way to produce high voltage of current.
- From the graph X-axis power output in Volts & Y-axis Engine speed in RPM

PROTOTYPE MODEL (SOLIDWORKS)

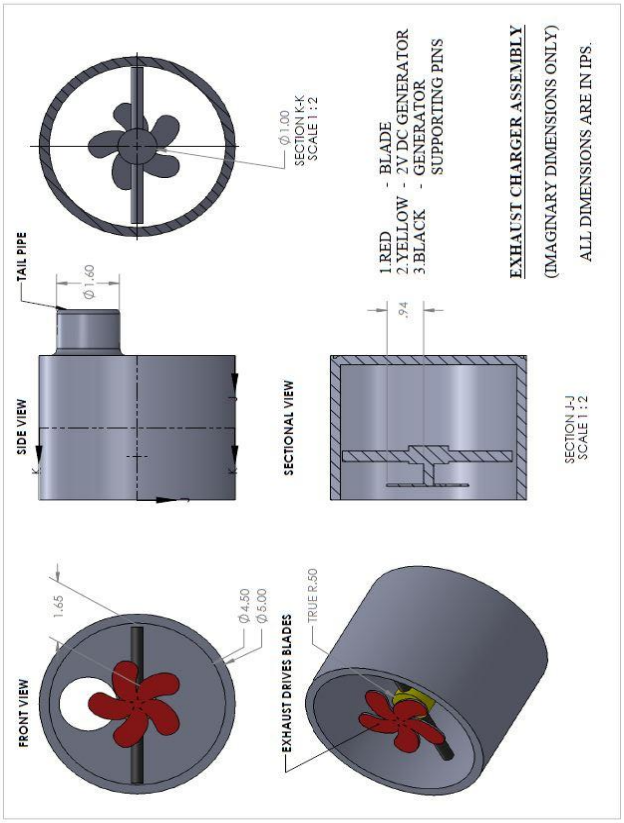


FIG 1.5 PROTOTYPE MODEL OF EXHAUST GAS CHARGING

VIII. EXPERIMENTAL SETUP

a)

b)

FIG 1.6 a), b), c) Experimental setup in Two wheeler Vehicle with Simple Cut sectional View

A Turbine is placed in the path of exhaust in the silencer. An engine is also placed in the chassis of the vehicle. The turbine is connected to a generator, which used to generate power by converting kinetic energy into electrical energy. Base upon the airflow the turbine will start rotating, & then generator will also starts to rotate. The generator power is store to the battery after rectification. The rectified voltage can be inverted and the battery power can be considered for the users comfort.

IX. CALCULATION

Maximum power of bike = 8.3bhp
Fuel efficiency of bike = 65.8 km/h

FORMULA

Area of swept, $A = (22/7)*(\text{Radius of turbine})^2$
Velocity of turbine, $V = ((22/7)*D*N)/60$
Where, D = diameter of turbine=10cm
N = number of Revolutions Per Minutes
Power available at turbine, $P = (½)*\text{density}*(v)^3*cp*A$

MODEL CALCULATION

$A = (22/7)* (\text{Radius of turbine})^2$
$= 3.14*(0.05)^2$
$= 0.0078$
$V = ((22/7)* D*N)/60$
$= (3.14*0.10*40*)/60$
$= 0.20933$

Table 1.1
ESTIMATED POWER AT DIFFERENT SPEED

RPM FOR TURBINE	SPEED OF TURBINE IN m/s	POWER AVAILABLE AT THE TURBINE
40	0.20933	$1.7713*10^5$
46	0.2407	$2.692*10^5$
50	0.2616	$3.457*10^5$
55	0.2878	$4.565*10^5$

X. RESULT

It can Charge up to 9 volts normally, all popular and Indian mobile brands like SAMSUNG, KARBONN, CELKON, etc., can be charged. We can get 6 volt constantly even at 2500rpm. The maximum voltage generated by Generator at 6000rpm is 10-12 volts. It is eco friendly.

XI. CONCLUSION

The setup cost for this exhaust charger is very less and it can be easily mounted with the existing bike tail pipes. We take necessary steps to overcome the drawbacks or disadvantages occur in our Exhaust Charger setup. We are planning to execute our advanced type of Exhaust Chargers in future. The efficiency loss is may be up to 0.1-0.2% in rare occasions; our optimal blade design will avoid these losses. Also we are planned to fix dampers which will rectify the vibrations occur at generator setup.

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