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Wind Energy Utilization for Generation of Electricity on an Automobile

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Abstract: ***We are quite aware that numbers of vehicles on the road are increasing exponentially day by day leading to huge consumption of precious fossil fuels. In this research paper, the possibility of use of non conventional energy mainly conversion of wind energy into electrical energy of a vehicle is tested. When a car moving on a road accelerates, the air flowing over the car bonnet also increases. Here an attempt is made to utilize this wind energy as an input energy for electricity generation.*** [9] ***For this purpose CPU fans having DC motors are mounted on bumper of a car (Fig.1). These DC motors when used in reverse way, they generate an electrical energy. This electrical energy could either be used as a supporting charging system to the main battery in the car or to run some of the major electrical systems in the car such as a radiator fan, horn, brake light, parking light etc.*** [1][2][5]

Key words: **Wind Power, Clean Source of Energy, Electricity Generation on Automobile, Drag, Supporting Charging System**

I. METHODOLOGY

In order to increase the fuel economy of a vehicle, load on the vehicle engine need to be reduced. There are various methods to reduce the load such as reduction in weight of the vehicle; another method is to assist the alternator for battery charging purpose or to run some electrical system in the car by some other way.

Fig 1. Car with Fan Assembly

There are number of electrical loads on the engine. Some of them are mentioned below.

- Radiator fan high speed (240W), Slow speed (105W)
- AC blower
- Water pump
- Head light (230W)
- Parking lights, Stop lights (50W)
- Fog lights (110W)
- Music system & speaker (100W)
- Power window (350W)
- Wiper (60W)

Now, if some other source is found to support the charging of a battery to assist alternator i.e. to run any of the above mentioned electrical system by some other source, then by reducing load of alternator on an engine to some extent, the fuel economy of the vehicle can be improved slightly. In the long run, this slight increase in fuel economy can save substantial amount of fuel used.

List of Components:

- CPU fans- DC, 12V, 0.27A, fan units-10 Nos.
- Mounting mechanism: 'L' shaped steel brackets
- Battery
- Wiring for connections
- Air sealing

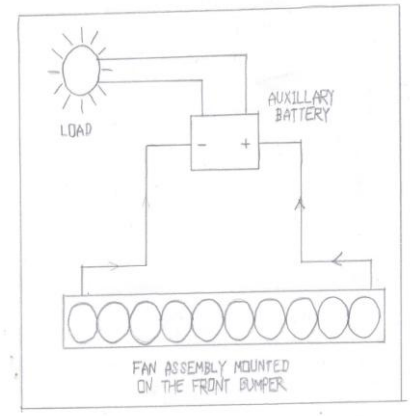

Fig 2. Schematic Diagram of Assembly

A. Fans

10 CPU fans (Fig.3 and Fig.4) are used in this system by considering the available space and also proposed power output.

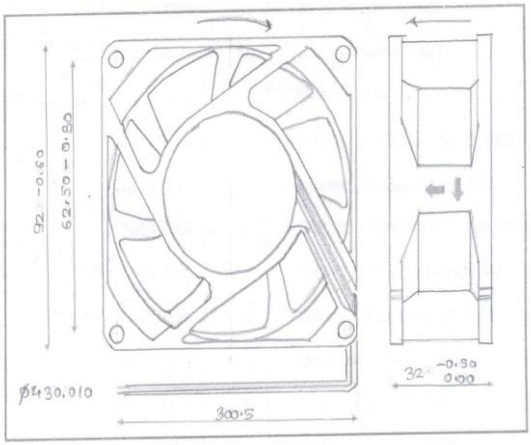

Fig 3. Schematic Diagram of Fan

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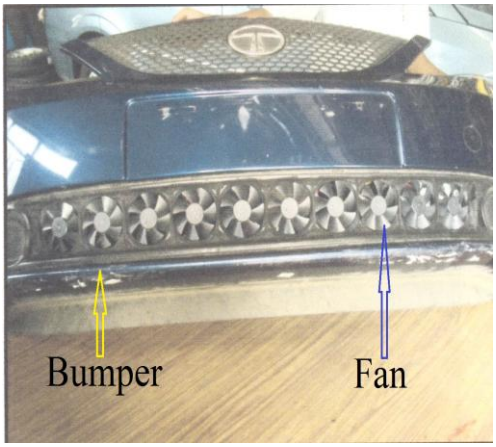

Fig 4. Mounting of fans

Table 1: Features of fans

Fan type	DC axial fan
Make	Nidee
Model used	TA350DC
Rating	7 blades, 12V DC, 0.27A.
Length	92 mm
Breadth	92 mm
Thickness	32 mm
Inner diameter	90 mm
Max. air pressure	6.9 mm of H_2O
Max. air flow	1.66 m^3/min.
Housing	Thermoplastic PBT, UL94V-0
Impeller	Thermoplastic PBT, UL94V-0
Bearing	Sleeve or Ball
Operating Temperature	Sleeve Brg.- 10^0C to $+70^0$C, Ball Brg. 30^0C to $+75^0$C
Insulation Resistance	10 mega ohms min. @ 500 VAC 60Hz for 1 minute (Between Frame and Terminal)
Weight	75 Grams

Table 2: Specifications of Bumper

Length	950 mm
Breadth	93 mm

B. Bracket

The CPU fans are fitted to the bumper with the help of 'L' shaped brackets and fasteners (Fig.5). Dimensions of brackets are 50×20×1.5 mm.

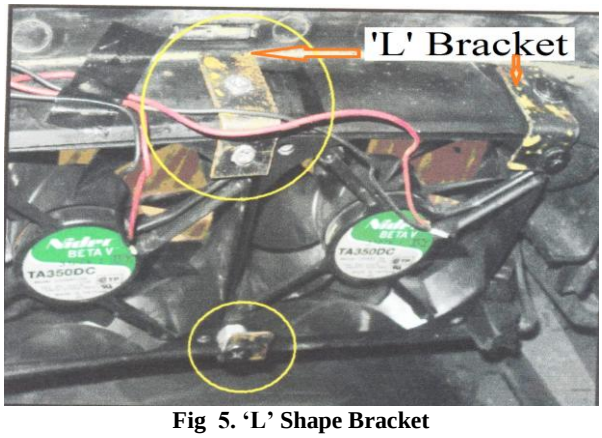

Fig 5. 'L' Shape Bracket

C. Air sealing

Air sealing (Fig.6) is used to cover the gaps present between the two fans and between a fan and bumper. This will ensure that air coming on the assembly will be passed through the fans exerting maximum pressure on the fan blades so that fan will run faster. [8][7]

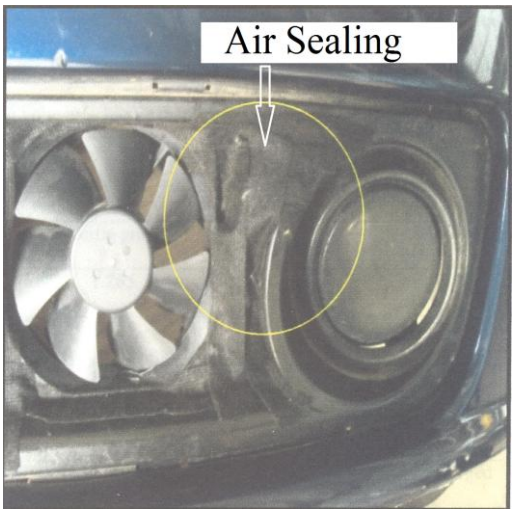

Fig 6. Air Sealing

D .Battery

An automotive battery is an electrochemical device that stores electrical energy. The system does not produce electrical energy at constant rate as the electrical energy generation depends on speed of the vehicle. Hence, the electrical energy produced by fans cannot be given directly to any one of the system in the vehicle. By using regulator the voltage supplied to battery is regulated to 12V for charging. And the supply from the battery can be given to any desired system of the vehicle.

II. RESULTS

After mounting of fans on bumper, the tests are carried out for different connections of fans at different speeds of car considering the direction of the car and direction of the wind and their effect on the output. The output in the form of voltage and current at different speeds is measured. Trial 1 and 2 were taken without any load on the system and multimeter and clamp-on meter were used for voltage and current measurement.

A. Trial- 1

Two fans were connected in series, to get five pairs altogether, which were connected in parallel. While taking the readings (Table 3), there was effect of the wind on the system. [4][10][11]

Table 3: Results of trial 1

Speed (kmph)	Voltage (V)	Current (A)	Power (W)
20	7.5	0.2	1.5
30	9.3	0.3	2.79
40	12.6	0.3	3.78
50	15.2	0.3	4.56
60	16.0	0.1	1.6
70	16.1	0.3	4.83
80	17.8	0.4	7.12

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90	18.4	0.6	11.04
100	20.1	1.1	22.11
110	21.8	1.3	28.34
120	23.7	1.4	33.18
130	23.9	0.7	16.73
140	24.0	0.9	21.6

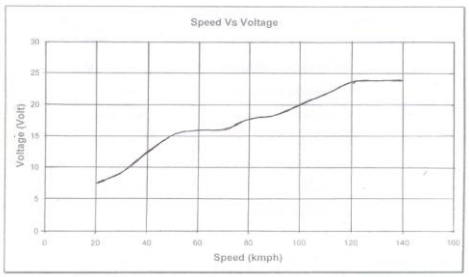

Fig 7. Graph of Speed Vs Voltage

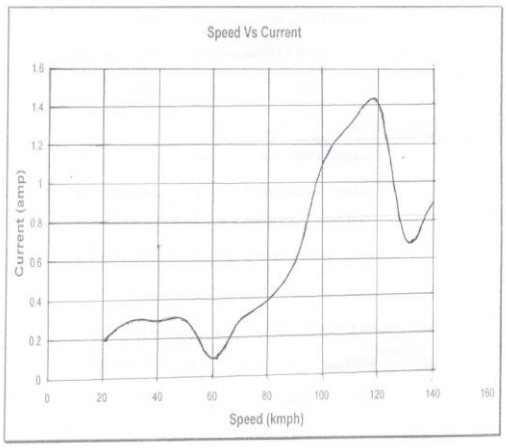

Fig 8. Graph of Speed Vs Current

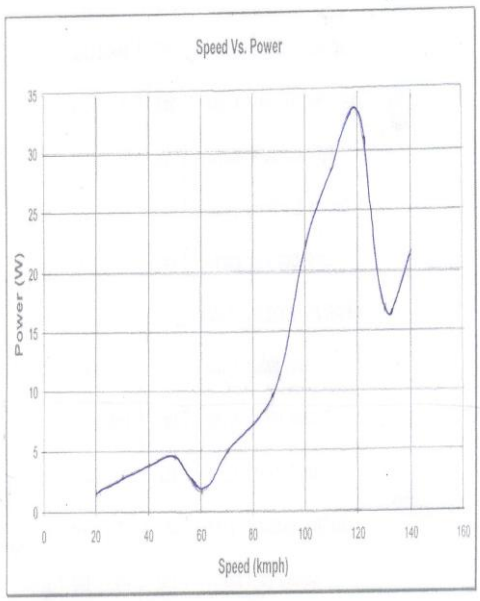

Fig 9. Graph of speed Vs power

In the first trial, the results were not satisfactory as it is desirable to have voltage of 12V and a current of more than 3A. And therefore, the connections in the next trial were changed.

B. Trial-2

Now, all fans were connected in parallel. The readings were taken on the straight road (Table 4). While taking the readings, there was minimum wind effect on the system. [4][11][10]

Table 4: Results of Trial 2

Speed (kmph)	Voltage (V)	Current (A)		Power (W)
		Up	Down	
20	2.0	0.7		1.4
30	3.1	1.0		3.1
40	4.5	1.4		6.3
50	5.9	1.8		10.62
60	7.9	2.2		17.38
70	9.6	2.8		26.88
80	10.6	3.3		34.98
90	10.9	3.7		40.33
100	11.4		4.3	49.02
110	12		4.7	56.4
120	12.07		5.2	62.764
130	12.3		5.5	67.65

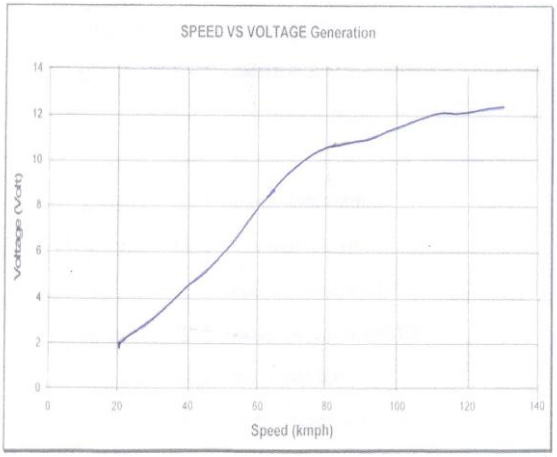

Fig 10. Graph of Speed Vs Voltage Generation

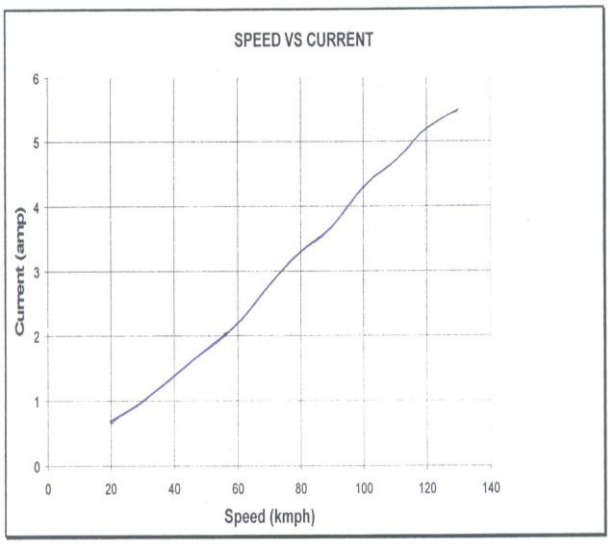

Fig 11. Graph of Speed Vs Current

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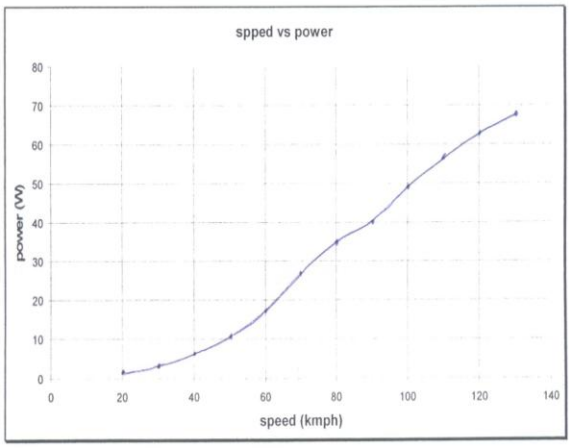

Fig 12. Graph of Speed Vs Power

III. APPLICATIONS

This system generated output of nearly 48W. Thus, an auxiliary battery could be charged by regulating the voltage at 12V and then using this charged battery, any one of the following system can be run.

AC compressor clutch
Fog lamps
Parking lamps
Washer motor
Brake lamp
Reverse lamp

IV. CONCLUSION

In the field of automobile sector, this kind of experiment is new. By implementing this system on an automobile, the fuel efficiency of an automobile increases without hampering environment. Moreover, the cost of the project is low and could be recovered within three years. In the first trial the expected results were not satisfactory. However, in second trial the output of 50W at the speed of about 100 kmph was achieved. With this much output, any one of the electrical systems in the vehicle could be operated with the help of second combinations of fans. Again it is observed that when vehicle is accelerated the output increases and vice-versa.

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