Conserve Electrical Energy From Wind Of The Around Of The Vehicles with using of Managing Of Effective Parameters by Topsis Method

Danial Zaghi, Araz Afsharifard, Aidin ZojajiKohan , Aidin Zaghi

Abstract— **In this research, utilizing airflow around any moving vehicles such as public transportation to obtain electrical energy, has been studied. Moving vehicles create airflow at the same relative speed, which can be used to produce electricity and again be used in transportation energy cycle. It has been studied, with Topsis method, to reveal the best area for installation of the system for better performance .The advantage of this system is the source of its energy, which is unending, and as long as the vehicle moves, the energy is available. This system can be installed around or on top of vehicles such as aircraft and trains, etc. Subsequently ,the systems which achieve optimum renewable energy in the transportation system must be generated by progressive technology because this one decreases the cost of energy in the transportation system dramatically despite the fact that there are a lot of speedy systems for transporting so the source of energy which there is anyplace in city where there is transportation system can be utilized for flourishing the system.**

Index Terms— Airflow, vehicle, Topsis method, Renewable energy, Electrical energy

I. INTRODUCTION

Kinetic energy has been used through out the history in mechanical devices and wind turbines specifically, which is now used to produce electricity. There are two main types of wind generator systems, horizontal and vertical axis wind turbines[1.2]. Turbine can generate electricity at wind farms with systems installed on and offshore or be used on a small scale in the city, and wind is the source which is unstable. The following describes the characteristics of wind systems. The advantages of this system are its simplicity and low manufacturing cost. Its disadvantages are uncontrollability, small yawing movement, and unstable yawing, which is very frequent , reducing the efficiency of power generator and even will affect the life of the wind turbines [3.4] The wind turbines in this system, are controllable, customizable and increase the performance . There are several critical factors which are included in this system like friction losses that are related to the wind turbines. It is important to obtain accurate wind speed data since it is cubed in the formula, it has great significance. This formula of wind power depends on air density ,velocity and area of turbine blades. P is power in watts (W), ρ is the air density in kilograms per cubic meter (kg/m3), a is the rotor area in square meters (m2), V is the wind speed in meter per second (m/s). The Topsis method is used to locate the best area to obtain energy, It is discussed in this section and The formula for calculating the power in the plant is shown in equation (1), [5].

$$P= 0.5 *a*\rho*V^3 \qquad (1)$$

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II. Topsis method

TOPSIS method is developed By Ho-young, for analyzing and ranking alternatives for the important factors which have the shortest distance from PIS and the farthest from NIS, in order to the optimize the system which is used in various fields such as engineering, economics, clean energy and transportation planning, etc and deal with candidate priority alternatives with respect to various attributes. The structure of the alternative performance matrix is expressed as shown in Table 1:

Table 1: Structure of the Alternative Performance

	Criterion 1	Criterion 2	...	Criterion n
Alternative 1	X_{11}	X_{12}	...	X_{1n}
Alternative 2	X_{21}	X_{22}	...	X_{2n}
⋮	⋮	⋮	⋮	⋮
Alternative m	X_{m1}	X_{m2}	...	X_{mn}
	W_1	W_2	...	W_n

Table 1.Structure of the alternative performance

Where xij is the rating of alternative i with respect to criterion j, wj is the weight of criterion j. Although the importance of the weights can be defined by decision makers directly, they can be obtained by pairwise comparisons. If the assessments of the weights are in pairwise comparisons, the importance of the weights can be determined by different methods. It is consider that have not natural wind and it is want to get energy from wind so analysis around of the vehicle system for getting and conserve energy from wind of the urbane vehicle[6.7].

III. construction of the model

Being formed from come airplane and Subway. Vehicles move to produce wind in verge of highways and airstrip and runways every time. Produce of wind depend to speed of Vehicles .we can use from this unnatural wind that produce Through type of Vehicles by wind power with small wind turbines[9].figure 1 is airstrip and every time airplanes come to produce wind on side of airstrip. Figure 2 is train line and every time trains come to produce wind on side of train line .figure 3 is road(high way)and every time cars come to produce wind. These winds and product of energy depended to speed of vehicle .
There is in the figure 1.2.3 wind of the around of the vehicle that it is can install small wind turbine in the near a track or a airstrip and a highway and is observed in the figure 1.2.3 .

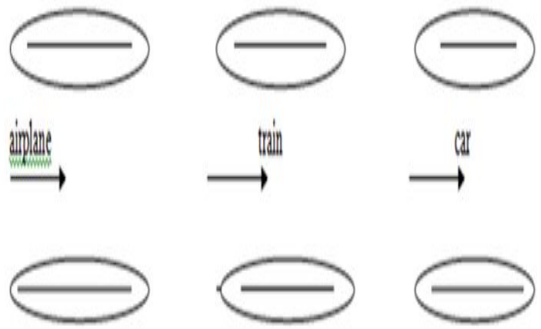

Figure1.wind around of the airplane Figure2.wind around of the train Figure3.wind around of the car

It is observes the system on the urbane vehicle for example train for conserving energy in the figure 4 that it is can install on the type urbane vehicles for high efficiency that is observed in the figure 4

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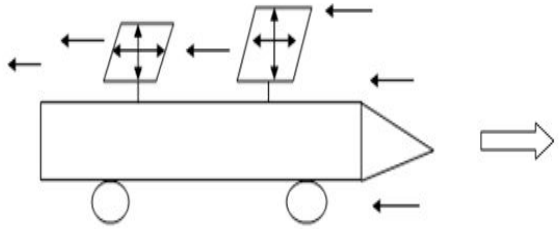

Figure 4 shows the system installed on a train.

These wind turbines are installed near the runway for conserving electrical energy from Wind of the around of the vehicles that is observe in the figure 5.

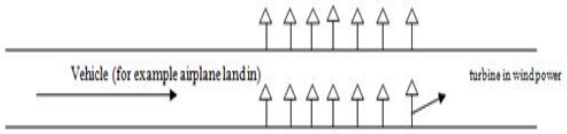

Figure5.install near the runway

In this part, safety of installation of turbines on around a runway is discussed. They can be planted under the ground, close to the surface, since moving aircraft produces jet blast(see figure 6 and 7). This system can even be put on the aircraft itself, which increases the efficiency that this subject is observed in the figure 6.

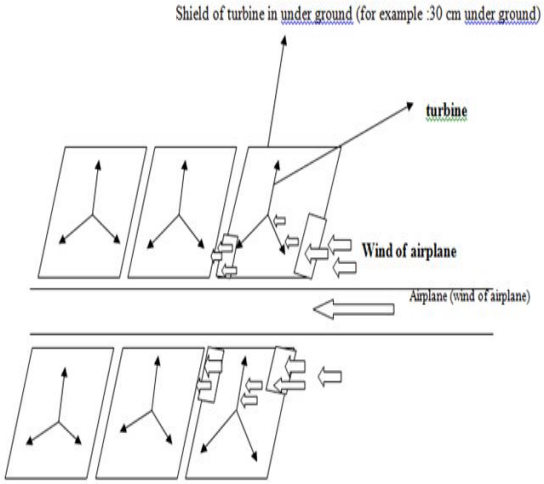

Figure 6.install wind turbine under ground near the airstrip

The wind turbine is installed on the wing aircraft of the airplane for conserving electrical energy from Wind of the around of the airplane that is observe in the figure 7.

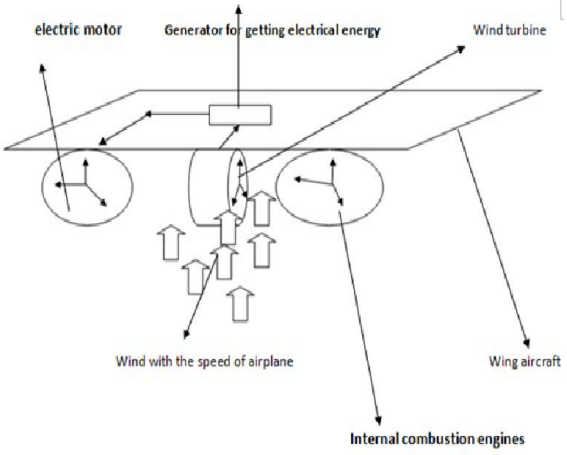

Figure 7.This system is Installed on the wing of airplane

To analyze the system, different parameters are to be considered, three of the most important are discussed here[10].

A. Index

j: Type of transportation system (Criterion)
i:Important parameters for getting energy (Alternative)

B. Parameters

This model is used to calculate the parameters. Due to the different speeds of the vehicles, there are different systems with different speeds. that's why speed is such an important parameter in this assessment. In this evaluation, we have considered 4 different vehicles with different speeds. All vehicles are tested under the same conditions. Important system parameters are calculated below and entered in the TOPSIS table below.

a = It is the rotor area in square meters (m²) = 1 m²
ρ = is the air density in kilograms per cubic meter (kg/m3)=1.22 Kg /m³
$V_{11=}$ Speed of a subway=50 km/h=13.8 m/s
$V_{12=}$Speed of a train =$150km/h = 41.66m/s$
$V_{13=}$Speed of an airplane = $200\ km/h = 55.5\ m/s$
$V_{14=}$ = Speed of an automobile 100 km/h= 27.7 m/s
T=Period of time that the vehicle is operating in the systems(e.g. one day:1440 minutes)
$n_{21=}$ Time of arrival of a subway (each 10 minutes)
$n_{21=}$ Time of arrival of a train (each 30 minutes)
$n_{31=}$ Time of arrival of an airplane (each 60 minutes)
$n_{41=}$ Time of arrival of an automobile (each 3 minutes)

The system only considers wind produced by the movement of the vehicle. Important parameters for obtaining electrical energy from the wind produced by vehicles are called alternatives. and various vehicles are called criterion.

C. Variables

$A_1 = x_{1j}$:Capacity of obtaining electrical energy from the system
x_{2j}: Number of the vehicles in the system
x_{3j} :Restrictions for the place of installation of wind turbines
The parameters are entered in equation (1) for calculating power of electrical energy from each transportation system and is shown in equation (2).

$$x_{1j} = 0.5 * \rho_{1j} * a_{1j} * v_{1j}^{3} \quad (2)$$

Turbine efficiency and productivity are considered in this section, which is about 60% and is shown in equation (3).

$$x_{1j} = \frac{60}{100} * (0.5 * \rho_{1j} * a_{1j} * v_{1j}^{3}) \quad (3)$$

$$x_{2j}: T/n \quad (4)$$

D. Result

It is calculated important parameters and it is entered in the table 2.

Table2.

	Subway	Train	Airplane	Highway
+	961.87	26462.98	62569.1	7778.9
+	144	48	24	480
+	5	9	1	5

Calculate (Sx2 ij)1/2 for each column and divide each column by that to get rij in the table 3.

Table3.

	Subway	Train	Airplane	Highway
+	0.9889	1.000001	0.9999	0.9981
+	0.1480	0.00181	0.00038	0.0615
+	0.0051	0.00034	0.000015	0.00064

Multiply each Column by wj to get Vij but it is consider . in this research and it is observe in the table 4.

Table4.

	Subway	Train	Airplane	Highway
+	0.9889	1.000001	0.9999	0.9981
+	0.1480	0.00181	0.00038	0.0615
+	0.0051	0.00034	0.000015	0.00064

Determine Ideal Solution A+ in this section and it is Determine Separation From Ideal Solution in the table 5.

A+ = {0.98, 1.000001, 0.9999,0.9981}

Table5.

	Subway	Train	Airplane	Highway
+	0	0	0	0
+	0.7071	0.9963	0.99990	0.8772
+	0.9678	0.9993	0.9997	0.9949

It is calculated a result of this sample and first area is airplane because have got very fast speed so produce huge wind in around of the yourself in the table 6.

Table6.Result of topsis

Airplane	0.99990
Train	0.9993
Highway	0.9949
Subway	0.9678

Conclusion

The airplane is the because it has a high speed and thus the resulting speed produced is high and the system is very depended on the speed. The second system with high efficiency is the train due to the lack of restrictions on the turbine installation and obtaining energy from it.result of calculate for an airplane is 0.99990 and Result of calculate for train is 0.9993 so advantage of this system is constant that this system can controls and plans exactly

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