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Research Paper

Engineering

Fabrication & Analysis of Power Produced By Portable Wind-Mill on The Basis of its Tail Length

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ABSTRACT

This work provides the analysis of power/r.p.m produced by a portable wind mill for different tail-lengths with an objective to derive a tail-length for which the power/r.p.m produced by a wind mill under similar air flow conditions is optimum.This is achieved by analysis and investigating the power/r.p.m of a portable wind mill at different elevation of a same site (College Campus).For this purpose the upper part of the wind mill is mounted with a caliberated tail with a provision of changing the length of the tail and r.p.m were recorded by the r.p.m meter.The recorded readings were analysed then graphs are plotted & the points having optimum power are shown.This work will help the desiger to get an idea about the geometry of the tail length of a Wind-mil to obtain optimum power.

KEYWORDS : Portable Wind Mill, Tail length , Elevation , Optimum Power , r.p.m .

1. Introduction :- Wind energy is one of the best renewable sources for power generation since many years because wind is clean and unbounded.Small scale wind turbine(less than 100 kW rated) have been used for many application like home, villages and telecommunication facilities to produce electricity.The global growths in small scale wind turbine help to ensure the safety reliability and performance.This paper report simulation and optimization of small scale wind energy system for rural area and small scale turbine operated at 4m/s or above the 4m/s wind speed.This research is done for optimal design of wind energy system. The small wind turbine is use to simulate and design of small scale wind system for village.The proposed small scale wind system consists with wind turbine, generator, batteries, and converter.

Wind energy is ecofriendly and renewable.I believe that wind energy can become an important asset to solve climate change and global warming issues in the future. Today, wind power is economically competitive compared to traditional energy because the cost of wind turbines is getting cheaper because of technology advancement and government incentives. It also creates jobs and generates extra personal and tax income.

However the plant load factor in wind power generation is very low, often in the single digits. The increase in interest in wind energy is due to investment subsidies, tax holidays, and government action towards renewable energy playing a big part in nation's energy system. There is a need to generate environment friendly power that not only raises energy efficiency and is sustainable too. The time has come for moving to generation based subsidies and understanding the drawbacks associated with wind power in India.

The capital cost of wind power is third higher than conventional thermal power; further electrical problems like voltage flicker and variable frequency affect the implementation of wind farm. However advances in technologies such as offshore construction of wind turbines, advanced control methodologies, and simulation of wind energy affecting overall grid performance are making a case for wind energy. Wind power economical sustainability depends not only on the excellence of wind turbine features, but mostly on the wind power resource itself. Unlike open environments, little attention has been paid to the assessment of wind power resources in urban areas and under typical building top-roof local conditions, characterized by turbulence, gust winds and multidirectional and highly variable speed wind flows. Consequently today open-environment designs and technologies are inadequately expected to harness urban wind power as they do with more continuous air flows, and most commonly the average performance of turbines placed on top of the houses and buildings bring about very poor efficiency figures that do not justify their investment.

2. Description of Experimental Setup :-

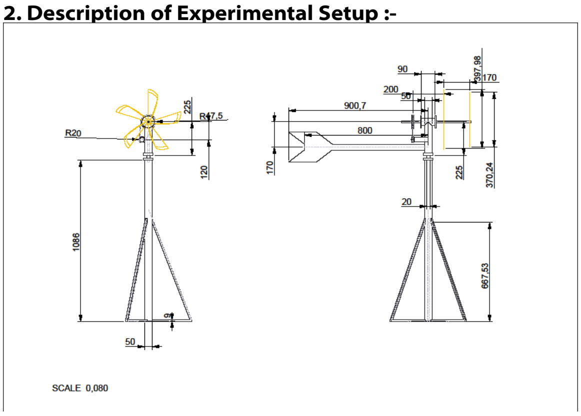


Figure 1: Drawing of the Portable Wind mill

S.No	Name Item	Quantity	Material
1.	Blade	02	Al
2.	Hub	02	Al
3.	Shaft	01	M.S.
4.	Bearings	02	Stainles Steel.
5.	Driver Pulley	01	------ -----
6.	Driven Pulley	01	-----
7.	Belt	01	Rubber
8.	Generator	12V	------
9.	Battery	12V	Acid Battery
10.	Diode	SEA440B	------
11.	Tripode Stand	03	M.S.
12.	Strip	01	Fibre
13.	Multimeter	01	------

Table 1 : Specification of the Experimental SetUp (Portable Wind Mill)

Figure:2 Experimental SetUp (Side Elevation)

Figure:3 Experimental SetUp (Elevation)

3. Analysis of the readings taken :
Observation Table No. 1 :
Location Ground : Elevation (Reference level) Site : College Ground

S.No.	Height (cm)	Length of tail (cm)	r.p.m of driven	Power (voltage)
1.	137	70	615	6.75
2.	137	80	736	7.15
3.	137	90	575	5.80

Observation Table No. 2 :
Location Ground : Elevation Site : Upper College Ground

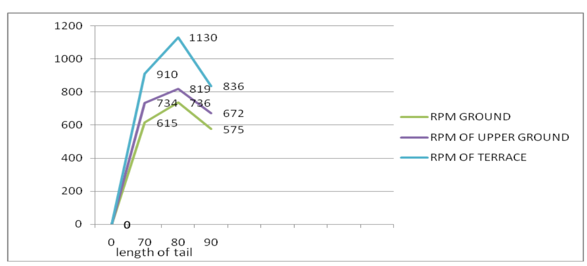
S.No	Height(cm)	Length of tail (cm)	r.p.m of driven	Power(voltage)
1.	437	70	735	7.20
2.	437	80	820	8.45
3.	437	90	670	6.90

Observation Table No. 3 :
Location Ground : Elevation Site : College Terrace

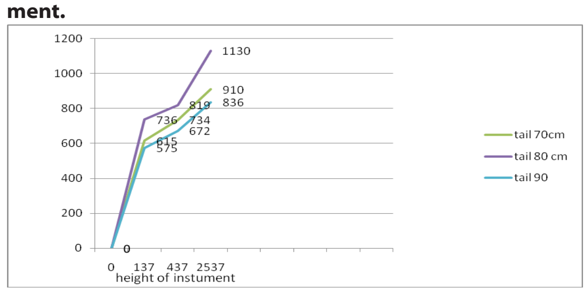
S.No.	Height (cm)	Length of tail (cm)	r.p.m of driven	Power (voltage)
1.	2537	70	910	9.15
2.	2537	80	1130	11.10
3.	2537	90	835	8.25

4. Presentation of the data on different graphs:

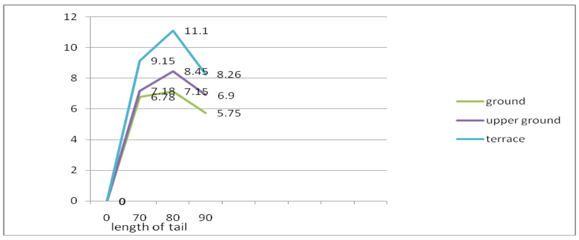
1. Graph between rpm of driven v/s length of tail.



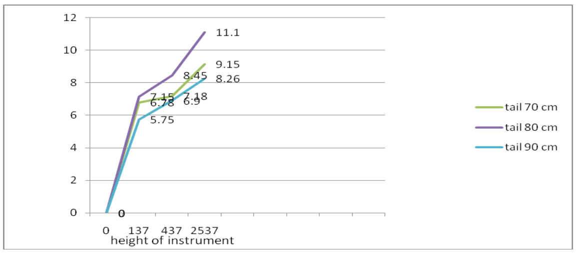
2. Graph between rpm of driven v/s height of instrument.



3. Graph between voltage v/s length of tail



4. Graph between voltage v/s height of instrument.



5. Results and discussion :

After taking the readings at three different elevations in the college campus with different tail lengths viz 70 cm ,80 cm and 90 cm under similar conditions of wind the power/r.p.m produced has a maximum value of 1130 r.p.m at 80 cm length of the tail.

6. Conclusion :

Wind flows in different direction in that case of stationary wind mill is not effcetive for multidirectional wind mills are more efficient .The length of the tail and the surface area of the tail vane are critical factors in having a wind turbine remain facing into the wind during normal and turbulent conditions.If not sized properly the turbine will shift away from the core wind direction causing a drop in rpm,a loss of power and a loss of time as the turbine repositions prior to spooling-up again.In these context wind mill tail has greater importance which turns the blades direction according to the wind flow.the size of the tail plays a key role thus the tails should be of optimum size.

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