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EFFECT OF WIND VELOCITY AND AIR DENSITY ON OUTPUT GENERATOR POWER USING LAB VOLT

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Abstract : *This paper is totally based on lab volt experiment and the main aim of working on lab volt using wind power generator is to produce electrical energy from this modules and to find the optimum wind velocity pertaining to optimum air density and load. After studying various results were obtained which will helped us to formulate a problem in data analysis. The output so obtained can be use to run the load or can be used for charging the batteries.. After obtaining the excel data sheet we can perform the optimization technique genetic algorithm solver for data analysis for multi objective optimization in Mat lab , and obtained the optimal value of all calculated fitness values.*

Keywords*: LAB VOLT, FOUR QUADRANT DYNAMOMETER/POWER SUPPLY, WIND TURBINE, GA SOLVER OPTIMIZATION,*

1. INTRODUCTION

The demand for electrical power is increasing drastically all over the world and the emerging scenario of increased human activities has lead to a great impact on the environment. All this motivated us in development of alternative energy sources i.e. renewable energy sources. Renewable energy is derived from regenerative resources that are naturally replenished, such as sunlight and wind. The prime source of renewable energy comes from the sun via solar radiation. Solar energy can generate electricity in many ways, including using photovoltaic (PV) cells and concentrated solar engines. Wind energy can generate electricity using turbines and generators. The Wind Energy Training System of lab volt forms a complete hybrid energy training system. This program demonstrates how wind turbines are being used in the consumer and industrial markets to supplement the world's power needs. Renewable energy is derived from regenerative resources that are naturally replenished, such as sunlight and wind. The prime source of renewable energy comes from the sun via solar radiation. Solar energy can generate electricity in many ways, including using photovoltaic (PV) cells and concentrated solar engines. Wind energy can generate electricity using turbines and generators. The Wind Energy Training System of lab volt forms a complete hybrid energy training system. This program demonstrates how wind turbines are being used in the consumer and industrial markets to supplement the world's power needs. Wind turbines power generators to produce electricity that can be used for powering homes and businesses. The efficiency is calculated from the capability of wind turbine to harness Wind Energy.

II. RESEARCH METHODOLOGY

Here we are using research methodology on totally based on LAB VOLT experiment to obtained the optimal power at different wind speed, air density, and load with the help of wind turbine module.

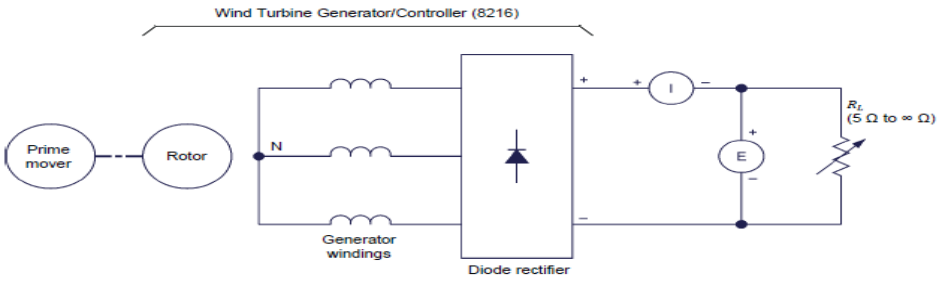

Figure 1: wind turbine module

Figure 2: Diagram of Lab volt and turbine module

AD	L	PE3	PE4	PE5	PE6	PE7	PE8	PE9	PE10	PE11	PE12
1.225	1200	0.14315	0.1326	0.11808	0.07303	0.33532	0.29532	0.45	0.3741	0.4098	0.4098
1.225	600	0.10796	0.12711	0.1136	0.07066	0.32544	0.38388	0.3294	0.4888	0.4008	0.4008
1.225	400	0.10308	0.1224	0.1097	0.06858	0.39545	0.37476	0.4296	0.48	0.3939	0.3939
1.225	300	0.0992	0.11673	0.15789	0.13256	0.3851	0.36524	0.3153	0.3525	0.3867	0.3867
1.225	200	0.09108	0.14468	0.14757	0.06246	0.3639	0.3472	0.4016	0.4508	0.3726	0.3726
1.225	100	0.0928	0.12104	0.12528	0.10726	0.06493	0.30292	0.35572	0.4012	0.4488	0.4488
1.5	1200	0.12272	0.13713	0.11886	0.07374	0.42355	0.39476	0.4476	0.375	0.4098	0.4098
1.5	600	0.11536	0.13128	0.114	0.07174	0.4134	0.3858	0.438	0.3678	0.4032	0.4032
1.5	400	0.11068	0.12711	0.11006	0.06997	0.40465	0.37752	0.43	0.4828	0.3975	0.3975

1.5	300	0.10648	0.12237	0.10576	0.06805	0.3946	0.27714	0.4212	0.4748	0.39	0.39
1.5	200	0.099	0.11457	0.09894	0.06453	0.37655	0.35352	0.4056	0.4584	0.3783	0.3783
1.5	100	0.10615	0.1298	0.126	0.1128	0.06798	0.3935	0.45535	0.4144	0.4612	0.4612
1.75	1200	0.12708	0.13935	0.1191	0.07416	0.34096	0.39492	0.4484	0.4996	0.4101	0.4101
1.75	600	0.12164	0.1335	0.11436	0.0723	0.33352	0.29028	0.4404	0.3687	0.4038	0.4038
1.75	400	0.11696	0.12984	0.16548	0.0707	0.40885	0.38048	0.4332	0.3639	0.3984	0.3984
1.75	300	0.11236	0.12588	0.15918	0.26996	0.39985	0.27975	0.4252	0.4772	0.3918	0.3918
1.75	200	0.10468	0.1185	0.0994	0.13186	0.38375	0.35908	0.4112	0.3474	0.3816	0.3816
1.75	100	0.1106	0.13616	0.12687	0.11668	0.34335	0.32276	0.37292	0.4232	0.3513	0.3513
2	1200	0.13052	0.14109	0.1221	0.07439	0.42805	0.39548	0.4488	0.375	0.4107	0.4107
2	600	0.1254	0.13629	0.11888	0.3552	0.41965	0.38816	0.4416	0.4924	0.4059	0.4059
2	400	0.1208	0.13251	0.05806	0.34875	0.32976	0.38188	0.4352	0.3648	0.5348	0.5348
2	300	0.11616	0.12867	0.11332	0.34065	0.32344	0.37588	0.4276	0.3594	0.3942	0.3942
2	200	0.10876	0.12192	0.10798	0.067	0.38865	0.36308	0.4144	0.4656	0.3837	0.3837
2	100	0.11895	0.14152	0.14277	0.1197	0.35175	0.33044	0.37976	0.4296	0.3561	0.3561
2.125	1200	0.132	0.14217	0.12234	0.22365	0.42885	0.39604	0.3372	0.3753	0.4101	0.4101
2.125	600	0.12692	0.13758	0.11928	0.21912	0.4215	0.38964	0.3315	0.492	0.5416	0.5416
2.125	400	0.1222	0.13392	0.11668	0.2154	0.33164	0.38368	0.4364	0.486	0.4011	0.4011
2.125	300	0.11792	0.12984	0.11392	0.21114	0.32612	0.37752	0.4296	0.4792	0.3948	0.3948
2.125	200	0.1106	0.16432	0.10884	0.27124	0.31472	0.36648	0.4176	0.4672	0.3858	0.3858
2.125	100	0.11905	0.14324	0.09642	0.24476	0.3637	0.33584	0.3856	0.4332	0.48	0.48
2.15	1200	0.09921	0.14223	0.06118	0.07451	0.34424	0.39608	0.45	0.3747	0.4107	0.4107
2.15	600	0.12696	0.13779	0.11938	0.357	0.33812	0.3898	0.4432	0.3696	0.4062	0.4062
2.15	400	0.12256	0.13392	0.11682	0.3511	0.3334	0.38436	0.4372	0.3651	0.4011	0.4011
2.15	300	0.11828	0.13011	0.11406	0.344	0.4106	0.37896	0.432	0.3606	0.3969	0.3969
2.15	200	0.11124	0.12348	0.1089	0.06784	0.3182	0.3682	0.42	0.3516	0.3861	0.3861
2.15	100	0.09552	0.14348	0.14478	0.12224	0.3644	0.34016	0.39016	0.4368	0.3621	0.3621
2.175	1200	0.13296	0.14265	0.06117	0.22455	0.34488	0.39632	0.4492	0.3744	0.4098	0.4098
2.175	600	0.12772	0.13812	0.11936	0.43374	0.4248	0.2928	0.444	0.3696	0.4068	0.4068
2.175	400	0.12332	0.1341	0.11694	0.49868	0.33512	0.3856	0.4388	0.3654	0.4014	0.4014
2.175	300	0.11872	0.13041	0.11436	0.49098	0.41215	0.38008	0.432	0.3609	0.3969	0.3969
2.175	200	0.11192	0.12399	0.10922	0.4753	0.4003	0.3698	0.4216	0.3528	0.3888	0.3888
2.175	100	0.1202	0.10812	0.14523	0.2526	0.3693	0.34232	0.393	0.44	0.3648	0.3648
3	1200	0.13824	0.14517	0.12362	0.22461	0.4316	0.39584	0.4496	0.3747	0.4101	0.4101
3	600	0.13424	0.1419	0.06068	0.22125	0.4254	0.39076	0.4432	0.3702	0.4065	0.4065
3	400	0.13068	0.13893	0.11924	0.2181	0.4197	0.38668	0.4388	0.3657	0.4032	0.4032
3	300	0.12748	0.13596	0.11722	0.21456	0.414	0.38136	0.4336	0.4828	0.3981	0.3981
3	200	0.12056	0.13029	0.11332	0.20847	0.40295	0.27861	0.4236	0.4724	0.3885	0.3885
3	100	0.10592	0.11685	0.10284	0.19167	0.37295	0.36232	0.39636	0.4436	0.3669	0.3669
AV		0.11679	0.132513	0.115397	0.195276	0.363564	0.362146	0.417339	0.413567	0.404027	0.404027
MAX		0.14315	0.16432	0.16548	0.49868	0.4316	0.39632	0.45535	0.4996	0.5416	0.404
MIN		0.09108	0.10812	0.05806	0.06246	0.06493	0.27714	0.3153	0.3474	0.3513	0.5416

Table1 Using GA solver optimization GA

Power at different wind velocity	Fitness
PE3	3265.78
PE4	3268.78
PE5	3278.38
PE6	3378.38
PE7	3379.38
PE8	3378.38
PE9	3389.65
PE10	3398.02
PE11	3398.22
PE12	3398.12

TABLE 2 GA tool

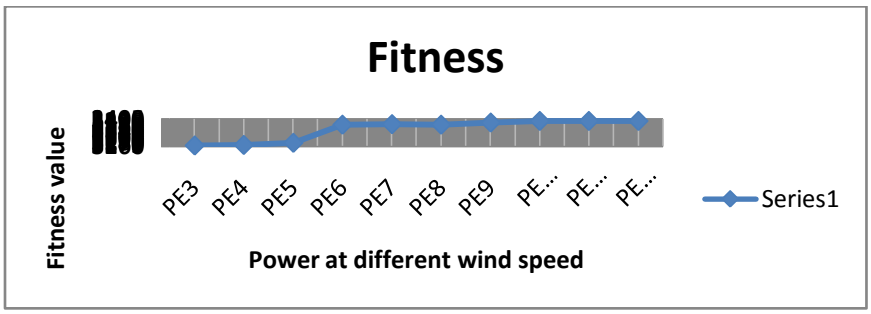

Figure 3: DATA ANALYSIS BY GA SOLVEL IN EXCEL

III.CONCLUSIONS

At same load and air density for all the wind velocities namely 3,4,5,6,7,8,9,10,11 and 12 m/sec readings of the electrical power was taken from the labvolt module and was optimised using GA in excel software. By Using the GA tool the fitness of Power at different wind velocities was checked, and obtained the optimal values at Fitness value of wind speed 10.

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