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A Novel Tool Design for Selection of Low Power Wind Turbines

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Abstract **– The use of alternative energy sources is beginning to increase with the increase in energy needs all over the world. With this increase, energy production from alternative energy sources is being tried to be obtained from day to day. Therefore, the systems used in alternative energy sources are developing. Nowadays, many companies are building large wind turbines, solar power plants as priority investment plans. However, private and legal entities lag behind large firms for wind turbines to be built with little power. Private and legal entities have difficulty in determining a roadmap for turbines to be installed with little power. In order to reduce the cost of eliminating difficulties, this study developed a software plug-in for the selection of low-wind turbines to be installed. With the prepared software, it is tried to help the people to choose which turbine in accordance with their energy demands.**

Keywords **– Renewable Energy, Wind Turbine, Power Curve, Application Program.**

I. INTRODUCTION

In order to generate energy from wind energy, many wing designs, turbine design, power plant applications and various studies have been done in this area. Some of these studies are listed below.

Sukru Ertike and his friends, have designed a battery charging system that monitors the power point for low-power wind turbines [1].

Davut Keles and his friends, have modeled and manufactured a wind turbine [2].

M. Ozgul Korukcu examined the dynamic behavior of a wind turbine in different conditions and examined the responses in different conditions [3].

Faruk Kose and Muammer Ozgoren examined the wind energy potential of the region using the data obtained from the metering station established in Selcuk University Alaaddin Keykubat campus area. They determined the depreciation period of the wind turbine to be installed [4].

Nida Nurbay and Ali Cınar examined the wind turbines and compared their advantages and disadvantages [5].

Vedat Mehmet Karslı has designed and manufactured an 11 kW horizontal axis wind turbine [6].

Ahmet performed the design of a low-power wind turbine for the production of electricity in the soil thesis [7].

Yelda Ozdil Kacan has made wind turbine design from graded composite material and made it ready for production [8].

Tamer Emre thesis, wind power stations in Turkey the above calculation of the efficiency value using the data envelopment analysis carried out a study [9].

Engin Huner and Yekta Ataozden have realized electromagnetic design of synchronous alternator with internal rotor, permanent magnet, for wind turbines with micro-power [10].

Murat Agcay thesis is that Turkey's determination of electricity supply and demand balance, the wind power plant design for the production of projection, has made wind power plant installation costs and the analysis of production parameters in Matlab & Simulink written with the program [11].

In the study of Beytullah Taskın, the physical and economic analysis of the wind energy plant that can be established in Nigde province has been realized [12].

Emre Ozsahin and Caglar Kıvanc Kaymaz used geographical information systems to determine the appropriate location for the wind energy plant to be built in Hatay province and reached the result that geographical information systems could be used for site selection in similar areas [13].

Mehmet Tekeli and his friends, carried out a strain analysis of a wind turbine using a finite element method. They achieved wing design in the direction of the obtained data [14].

Burak Tevfik Dogan and friends, carried out the cost analysis of the wind energy plant of 1-5-10 MW power plants to be installed in Hatay with the RetScreen analysis program which is still in use today [15].

Belgin Emre Turkay and Ali Yasin Telli have used Homer program to perform economic analysis of energy production with hybrid systems [16].

Looking at past work, there is no software specially developed for low-power wind turbine design. A simple software is prepared for low-power systems that will generate electricity from the wind turbine to be installed with low-power wind turbines in the light of the work being done. The screen image of the prepared writing is given in Figure 1.

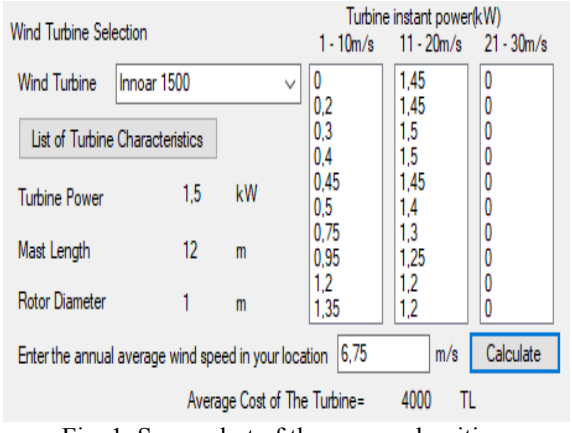

Fig. 1. Screenshot of the prepared writing.

While preparing the program, the turbine features of the various companies on the market are embedded in the software. How many m / s of turbines can produce power is based on turbine power curves. When the turbine of any company is selected, the maximum power of turbine, mast length, rotor diameter and power curves and average cost can also be displayed. In addition, the maximum amount of power that the turbine can produce at speeds of 1-10 m / s, 11-20 m / s, 21-30 m / s can be displayed. In order to be able to use the software add-on for the turbines to be installed with little power, the average annual wind speed of the zone needs to be known. The person who will build the turbine in the software can choose itself by calculating the energy requirement and making use of the turbine curves, or according to the annual wind speed and the generation to be produced, the appropriate turbine selection can be made directly in the software. The important point here is that the turbine can select the right turbine to meet its energy demands and determine the cost of the turbine to select at a later stage.

II. Conclusion

A wind turbine with a power of 1.5 kW was selected with the application program prepared. The shape of the selected turbine is shown in Figure 1, where the pole length is 12 meters and the rotor diameter is 1 meter. The average annual wind speed of the region where the turbine is to be installed is known. By using the turbine power curves at this speed, how much power can be generated in how many m / s can be displayed in the program and it is determined that it can produce 0,75 kW at 6.75 m / s wind speed. In addition, the average cost was 4000 TL.

As a result, it is expected that private and legal entities that will implement the turbine installation with small power wind turbine will be able to realize faster, less costly and more accurate turbine selection and will give a light to future works.

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