Low Cost Portable Wind Power Generation For Mobile Charging Applications

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***Abstract*— Wind energy based power generation has become one of the focal points in the research of renewable energy sources. Mobile phones are essential communication devices nowadays but still people face difficulties in mobile phone charging where the utility supply is not available. This paper presents a design and implementation of a small scale low speed wind power based portable mobile phone charger. The implementation includes a savonius wind turbine and a controller. According to the speed change of the wind, the output voltage of the generator changes from 1V to 3V so a controller is designed to control a DC-DC boost converter to get a constant output voltage. The formal approach of the PI control scheme is used in the design of the controller. The integrated device is able to produce the desired output voltage to charge the mobile phone. This device provides green energy for mobile phone charging where the utility is not available.**

Keywords—Portable, Savonius wind turbine, boost converter, PI controller

I. INTRODUCTION

As the result of the increasing cost and environmental pollution concerns of the power generation from fossil fuels, nowadays the power generation is moved towards the renewable energy sources. Modern wind turbines are designed in such a way to produce energy in a reasonable cost. Big constructions of wind turbines are widely used for a bulk generation of power to be supplied to the local grid. The Construction cost of these wind turbines is high and they are not suitable for portable applications.So small-scale Portable Wind Turbines will be the appropriate solution for harvesting wind power for small home applications .

Mobile phones have become a most essential electronic device in people's daily lives. Users always prefer mobile phones with advanced technology. However, there is a difficulty to charge the phone battery which is commonly due to a power supply problem when people are traveling to places where the utility is not available. The battery still cannot meet the increasing power demand due to the rapidly increasing functionalities and features of the mobile phones. Battery banks are used for charging but these batteries also have the limited capacity and need the utility supply to be recharged. Therefore, it is highly desirable to reduce the dependency of the mobile phone battery charging on the power supply by harvesting wind energy from the environment. So the mobile charging application is appropriate for the application of small scale wind power generation.

There are some proposed designs which can be attached with vehicles to charge the mobile phones as there will be a high speed wind while driving. Ali, Kharudin designed and implemented a portable mobile phone charger which can be attached to vehicles [1]. Another technique used to harvest wind power in constant speed, is a horizontal axis wind turbine which fixed in the axis of rotation parallel to the exhaust fan of the cooling tower to extract the wind power as a power recovery system [2]. Joni Welman, and Kristiantho Sulistiohadi designed low cost portable wind power generator by using PC fans which also can be used when traveling in vehicles [3].In the above mentioned designs they get enough wind speed to generate the required voltage level. In kilinochchi, many people are dependent on farming. So they used to spend most of their time in the paddy field in the evening and they stay at the paddy field at night as well. Thus they may not be able to get the utility supply to charge their mobile phones. Some other people like night guards who work outdoors also cannot access the utility supply. Hikers and back packers are also unable to charge their mobile phones while traveling. In these cases, it will be only possible to get low wind speed. So the challenge is to charge the mobile phones at low wind speed at these scenarios.

There are two major types of turbines in the basis of their orientation of the axis of rotation. They are Vertical Axis Wind Turbine (VAWT) and Horizontal Axis Wind Turbine (HAWT). Horizontal Axis Wind Turbines have more efficient aerodynamic performance for higher wind speed but has to be adjusted perpendicular to the wind direction. VAWT has low starting wind speed and capable of catching wind from multi directions. Although VAWT is less efficient than HAWT in aerodynamic performance, it is commonly used for low power applications due to its good starting torque, low cost and low starting wind speed [4]. As the wind speed varies the generated voltage will also vary. So a controlled voltage regulation circuit has to