MPPT based Charge Controller for off Grid Small Wind Machine using PWM Technique

Abstract

Wind is the most promising renewable source. However its erratic behavior hampers the output especially when the energy generated is to be stored safely and used as per demands. The paper reveals the charging battery with maximum power point tracking (MPPT) considering battery safety. The main task of wind power charge controller is to control the flow of charge to and from the battery and protect it from over charging and deep discharging. It regulates flow of charge by monitoring the battery voltage and wind variations continuously. The charge controller developed takes care of weak winds while battery charging and improves the efficiency. Upon fully charging the charge controller disconnects the battery from wind panel to avoid excess charging thus the battery life is increased. Further the performance of the wind charge controller is evaluated and the results show that use of PWM technique with MPPT increases the efficiency of charge controller up to 92% under different laboratory conditions as compared to normal charge controllers without MPPT having efficiencies up to 52 to 60%.

References
MD. ANWARUL AZIM, S. M. ARIFUL HUDA, HAFIZAL MOHAMMAD, NOWSHAD AMIN, 
"Microcontroller Based Standalone PV system for Wireless Sensor Node" in the 
IEEE Proceedings of the International Conference on Computer and Communication 

L. MAHARJAN, S. INOUE, H. AKAGI, AND J. ASAKURA, "State-of-charge (SOC)- 
balancing control of a battery energy storage system based on a cascade PWM 

A. M DE BROE, MEMBER, IEEE, S. DROUILHET, AND V. GEVORGIAN, MEMBER, IEEE 
"A PEAK POWER TRACKER FOR SMALL WIND TURBINES IN BATTERY CHARGING 

GEETA LAXMANRAO KALE, N. N. SHINDE, "Implementation of Prototype Device – Off 
Grid - Charge Controller – Suitable for Wind Solar Hybrid," ISSN: 2249-5762 (Online) 
IJRMET Vol. 1, Issue 1, Oct. 2011

GUOYI XU, STUDENT MEMBER, IEEE, LIE XU, SENIOR MEMBER, IEEE, D. JOHN MORROW, 
MEMBER, IEEE, AND DONG CHEN, "COORDINATED DC VOLTAGE CONTROL OF WIND TURBINE WITH 
EMBEDDED ENERGY STORAGE SYSTEM," IEEE TRANSACTIONS ON ENERGY 
CONVERSION, VOL. 27, NO. 4, pp. 0885-8969, DECEMBER 2012.


MUHAMMAD OWAIS, MUHAMMAD SALEHEEN AFTAB, "AN OFF-GRID MODEL SETUP FOR WIND 

J. LI, E. MURPHY, J. WINNICK, AND P. A. KOHL, "THE EFFECTS OF PULSE CHARGING ON 
cycling characteristics of commercial lithium-ion batteries," J. Power Sources, vol. 102, pp. 

"Input Current Control of Boost Converters Using Current-Mode Controller Integrated with 
Linear Quadratic Regulator," INTERNATIONAL JOURNAL OF RENEWABLE ENERGY 
RESEARCH M. A. Abdullah et al., Vol. 2, No. 2, 2012

WUJONG LEE, BYUNG-MOON HAN AND HANJU CHA, "Battery Ripple Current Reduction 
in a Three-Phase Interleaved DC-DC Converter for 5kW Battery Charger," 
978-1-4577-0541-0/11 IEEE.

Z. JIANG AND R. A. DOUGAL, "Synergetic control of power converters for pulse 
current charging of advanced batteries from a fuel cell power source," IEEE Trans. Power 

HANY M. HASANEN, SENIOR MEMBER, IEEE, AND S. M. MUYEEN, SENIOR MEMBER, IEEE 
"Design Optimization of Controller Parameters Used in Variable Speed Wind Energy 
Conversion System by Genetic Algorithms," IEEE TRANSACTIONS ON SUSTAINABLE 
ENERGY, VOL. 3, NO. 2, pp. 1949-3029, APRIL 2012

SERCAN TELKE, STUDENT MEMBER, IEEE, MESUT E. BARAN, SENIOR MEMBER, IEEE, ALEX Q. 
HUANG, FELLOW, IEEE, SUBHASHISH BHATTACHARYA, MEMBER, IEEE, AND LOREN ANDERSON 
"Control Strategies for Battery Energy Storage for Wind Farm Dispatching," IEEE 
TRANSACTIONS ON ENERGY CONVERSION, VOL. 24, NO. 3, pp. 0885-8969
SEPTEMBER 2009.
- T. Tafticht, K. Agbossou, Senior Member, IEEE, A. Cheriti, Member IEEE, and M. L. Doumbia, Member IEEE &quot;Output Power Maximization of a Permanent Magnet Synchronous Generator Based Stand-alone Wind Turbine&quot; IEEE ISIE 2006, July 9-12, 2006, Montreal, Quebec, Canada 1-4244-0497-5/06.
- O. BA, D. Depernet and P. Ndiaye1 and A. Berthon &quot;Medium power wind mill control for standalone energy generation&quot;.
- Kuo-Yuan Lo, Yaow-Ming Chen, Senior Member, IEEE, and Yung-Ruei Chang, Member, IEEE &quot;MPPT Battery Charger for Stand-Alone Wind Power System&quot; IEEE TRANSACTIONS ON POWER ELECTRONICS, VOL. 26, NO. 6, pp. 0885-8993, JUNE 2011.
- Wei Qiao, Member, IEEE, Xu Yang, Student Member, IEEE, and Xiang Gong, Student Member, IEEE &quot;Wind Speed and Rotor Position Sensorless Control for Direct-Drive PMG Wind Turbines&quot; IEEE TRANSACTIONS ON INDUSTRY APPLICATIONS, VOL. 48, NO. 1, pp. 0093-9994, JANUARY/FEBRUARY 2012

**Index Terms**

Computer Science
Applied Sciences

**Keywords**

Battery safety  charge controller  Maximum power tracking  Off-grid small Wind mill.