Abstract

Battery bank is used in many applications such as Electric vehicles, Hybrid Electric Vehicles and Plug in Electric Vehicles. These battery banks are of high-capacity and configured in series using multiple low or medium capacity batteries. These battery banks are expected to perform in the most challenging environmental conditions. Due to harsh environmental and operating conditions, the configured batteries tend to develop an imbalance in their charge levels. This imbalance may cause a normal variation or abnormal (large) variation in their state of charge. This imbalance of charge among batteries reduces the efficiency, reliability and life span of the battery bank. Hence, a technique called charge balancing and equalization is adapted to ensure the batteries are maintained at the optimum charge level in a battery bank so as to extend battery life span with reliability. Much topology on the cell balancing/equalization has been proposed in the past. The main topologies are passive and active balancing/equalizing. This paper presents a unique non dissipative 4 steps balancing and equalizing process for Lead acid batteries and a unique three step balancing and equalization process for other battery types. Both the process is so devised, to handle the batteries having normal or abnormal variations in
their state of charge. The proposed 4 step method has been validated by developing the experimental setup.

References

13. J.F. Reynaud, C. E. Carrejo, O. Gantet, P. Aloïsi, B. Estibals, C. Alonso Wen-Yeau Chang, “Active balancing circuit for advanced lithium-ion batteries used in photovoltaic
A New Charge Balancing and Equalization Mechanism for Batteries

application” International Conference on Renewable Energies and Power Quality (ICREPO’11)
Las Palmas de Gran Canaria (Spain), 13th to 15th April, 201, RE&PQJ, Vol.1, No.9, May 2011

State of Charge Estimation for Li-lon Batteries Based on an Unscented Kalman Filter with an
Enhanced Battery Model Energies 2013, 6, 4134-4151; doi:10.3390/en6084134, ISSN
1996-1073.

15. A. Lohner, E. Karden, R. W. DeDoncker,, “Charge equalizing and lifetime increasing with
a new charging method for VRLA batteries”, In Proc. IEEE Int. I. Telecommunications Energy

16. Mohamed Daowd, Noshin Omar, Bavo Verbrugge, Peter Van Den Bossche, Joeri Van
Mierlo, “Battery Models Parameter Estimation based on Matlab/Simulink”, The 25th World
Battery, Hybrid and Fuel Cell Electric Vehicle Symposium & Exhibition, ©EVS-25 Shenzhen,
China, Nov. 5-9, 2010

17. Mohamed Daowd, Mailier Antoine, Noshin Omar , Peter van den Bosche and Joeri van
Mierlo, “Single Switched Capacitor Battery Balancing System Enhancements”, energies ISSN

18. Taesic Kim, Wei Qiao, Liyan Qu, “A Multicell Battery System Design for Electric and
Digital Object Identifier: 10.1109/IEVC.2012.6183240.

Cell Voltages to Prolong the Life of VRLA Batteries in Standby Applications”, IEEE transactions
on industrial electronics, vol. 56, no. 6, june 2009

20. A. Tsapras, C. Balas, K. Kalaitzakis, and Dr. Eng. J. Chatzakis, “A New Equalization


Lead Acid Batteries”, Journal of EngineeringScience and Technology Vol,XX, No Y (Year)
PPP-QQQ.

23. Data sheet LM2596, ©Semiconductor Components Industries, LLC, 2008 November,
2008 – Rev. 0, Publication Order Number: LM2596/D.

Index Terms

Computer Science Circuits and Systems

Keywords

State of Charge (SOC); State of Health (SOH); Equalization Step, MOSFET; Battery; Over
Charging Current.