Part 01

Developing Technologies for Operation and Maintenance Services

Monitoring Lead-Acid Batteries

Storage battery systems that employ lead-acid batteries are often used as emergency backup. This emergency backup can power office buildings, infrastructure, such as power generation facilities, transformer substations, railway facilities, and telecommunication base stations, or equipment such as emergency lighting or surveillance cameras in case of power failure due to a disaster. Storage battery systems like these need periodic maintenance and inspection in order to guarantee decades of reliability.
With that in mind, GS Yuasa strives to create services that deliver long-term safety and reliability to our customers. This is also why we have developed a storage battery monitoring solution that takes advantage of the Internet of Things. This article provides an overview of our storage battery monitoring system and introduces useful tips for operating and maintaining storage battery systems.

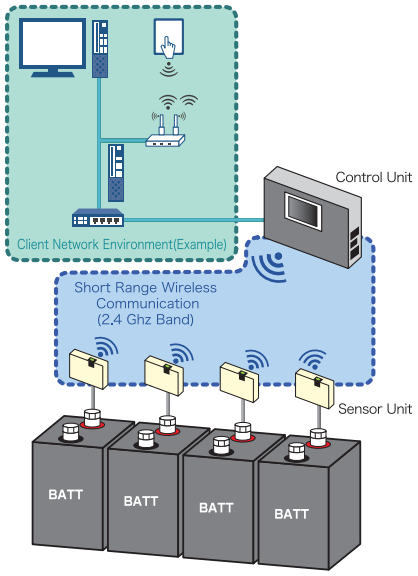
1. Obtaining and Monitoring Lead-acid Battery Data

GS Yuasa developed **DATAWINDOW-S** as a storage battery monitoring system that facilitates preventative maintenance of a storage battery system containing valve-regulated lead-acid batteries. **DATAWINDOW-S** automatically measures and monitors the voltage, internal resistance, and temperature for more than 500 batteries.

Sensor units connected to individual lead-acid batteries periodically take measurements, and a control unit collects and stores the measurement data from the sensor units via wireless communication[1] (●Fig. 1). The control unit compares the voltages, internal resistances and temperature data collected to a predefined threshold value to determine the state of the storage battery. The control unit may also be configured to notify multiple email addresses when an anomaly occurs, allowing for timely capture of abnormal states.

A user or technician can view information and adjust various settings via a touchscreen on the front of the control unit. The technician can also monitor or set up the storage battery system remotely via a PC or tablet that is networked with the control unit.

●Fig. 1　Configuration of the Monitoring System



2. Dealing with Anomalies

The control unit outputs an alarm to an external machine if an anomaly occurs in one storage battery among the many storage batteries being monitored. If the alarm continues to be presented until the one storage battery is replaced, even if an anomaly occurs in another storage battery, another alarm cannot be output during that time.

Therefore, **DATAWINDOW-S** allows the alarm output to be enabled or disabled for individual storage batteries through the touchscreen on the control unit. A battery to be setup can be specified in each group of storage batteries connected in series (banks A through D, respectively) by entering a battery number (●Fig. 2). The technician can enable or disable the alarm output for multiple monitored parameters individually for a battery, e.g., for voltage anomalies, internal resistance anomalies, temperature anomalies, or the like[2].

This function may be used to disable (i.e., temporarily deactivate) the alarm output for a battery for which some response, e.g., a replacement, etc., will take place. As a result, an alarm can also be output when a new anomaly occurs in another battery.

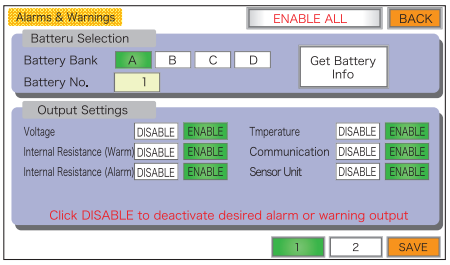
A lead-acid battery tends to degrade slowly over a long period. Therefore, there is little effect on the integrity of the storage battery system as a whole even if the alarm output is disabled until there is a response such as making a replacement. **DATAWINDOW-S** also includes a function that preliminarily disables alarm output at times it may be difficult to respond immediately to any anomalies, for instance, in the middle of the night. This increases the ease of maintenance.

The alarm output for individual storage batteries can also be configured remotely using a PC or tablet. The alarm output can be disabled by manipulating a check box on a web interface displayed on a terminal (●Fig. 3). Providing the ability to perform this kind of configuration without having to travel to the installation site for the storage battery system also improves the quality of operations and maintenance services.

DATAWINDOW-S detects anomalies in the storage battery as well as anomalies in communication or in the sensor units (●right, Fig. 2). When replacing a defective sensor unit with a new sensor unit, the GS Yuasa maintenance technician will need to assign the identification number associated with the defective sensor unit to the replacement sensor unit. This sort of reassignment of an identification number can be performed through the touchscreen on the control unit. The control unit sends a specific connection request to the newly replaced sensor unit via wireless communication (●Fig. 4) to initiate communication with the sensor unit. The control unit then accepts a predetermined identification number via the touchscreen and assigns the identification number to the sensor unit[3]. This function allows for prompt and reliable replacement of a defective sensor unit.

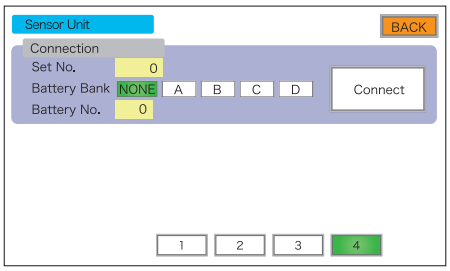
This article provided an overview of a storage battery monitoring system, and our technology that supports responding to anomalies that occur. As demonstrated, this practical application of an Internet of Things (IoT) to our monitoring technologies can reduce maintenance work and enable early discovery of the signs of abnormality or age, prompt maintenance response, and optimum upgrade planning. GS Yuasa continues to move beyond the bounds of making products to creating value through such practical applications of IoT to its technologies for monitoring lead-acid batteries.

●Fig. 2 Configuration Interface on the Control Unit



●Fig. 3 Configuration Interface on a Terminal

●Fig. 4 Connecting via Wireless with Sensor Unit Replacement



1. Japanese Patent No. 6708318, International Publication No. WO2020/174712 (Filed in 2019)
2. Japanese Patent No. 6690799, International Publication No. WO2020/174710 (Filed in 2019)
3. International Publication No. WO2021/241043 (Filed in 2020)

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