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| E-05 | Keywords | Y3 | equipment or facility | Z4 | electricity | S6 | energy storage |
| | | | | | | E29 | electrical machinery |

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Valve-regulated Lead-acid (VRLA) Batteries for the Stabilization of the Outputs of Photovoltaic and Wind Power Generation Systems

Features

- ◆ Main uses of VRLA batteries
 - (1) Uses in power generation and at transmission and distribution ends:
 - 1) Stabilization of electric power outputs, 2) Storage of generated electric power
 - (2) Uses by consumers:
 - 1) Lowering contract electricity with “peak-cut,” 2) Reduction in the cost of fuel for motor power generation
- ◆ VRLA batteries help stabilize outputs of power generation systems using renewable energy (including photovoltaic and wind power generation systems) mentioned in (1) 1) above, with their advantages including long lifetime, low-cost, low-maintenance and the existing recycling system.

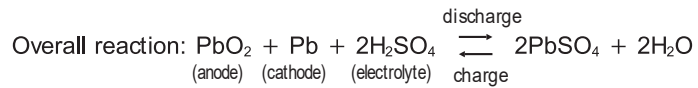
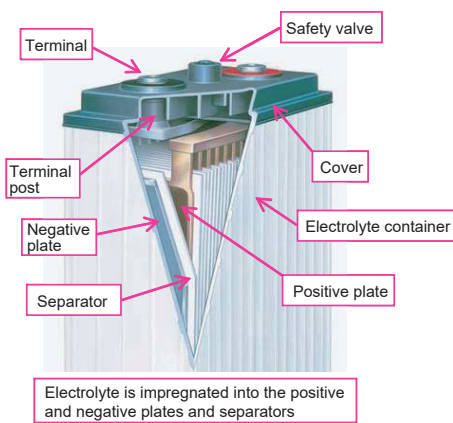
The expected long lifetime of 15 to 17 years of use or 4,500 cycles of discharge and charge (at DOD of 70 %) has been achieved.

(when used at the environmental temperature of 25°C and charged as recommended by the distributor)

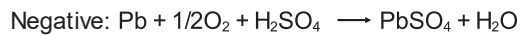
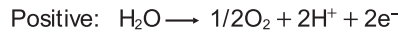
* DOD=Depth of Discharge

Basic Concept or Summary

Structure and the reaction principle of VRLA batteries



In the overcharged state



In the overcharged state, oxygen gas is generated on the positive plates. This oxygen gas moves inside the battery and is absorbed in the negative plates.

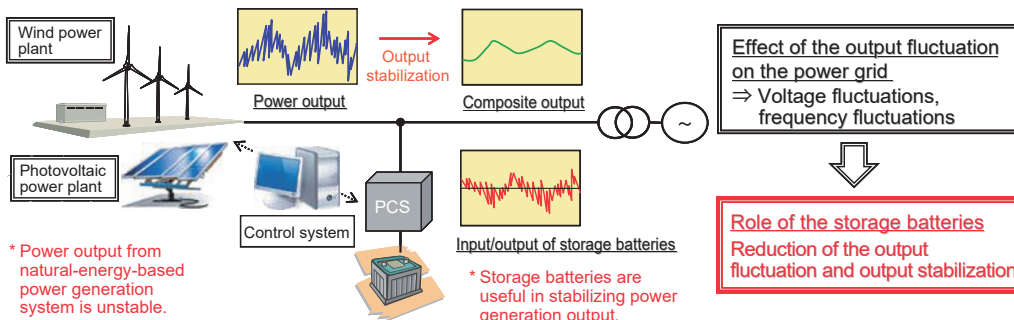


Most of the oxygen generated in the battery is re-bound inside the battery.

A VRLA battery (with the pressure inside regulated by a safety valve) discharges extremely small amounts of oxygen because of the rebinding of oxygen generated inside to the negative plates. In addition, the use of the Pb-Sn alloy collector minimizes generation of hydrogen when the battery is overcharged. In the way mentioned above, the decrease in the amount of electrolyte is minimized. Therefore, there is no need to add water in the battery. (The battery requires no maintenance such as adding water.)

An example of the use of the energy storage system for output stabilization

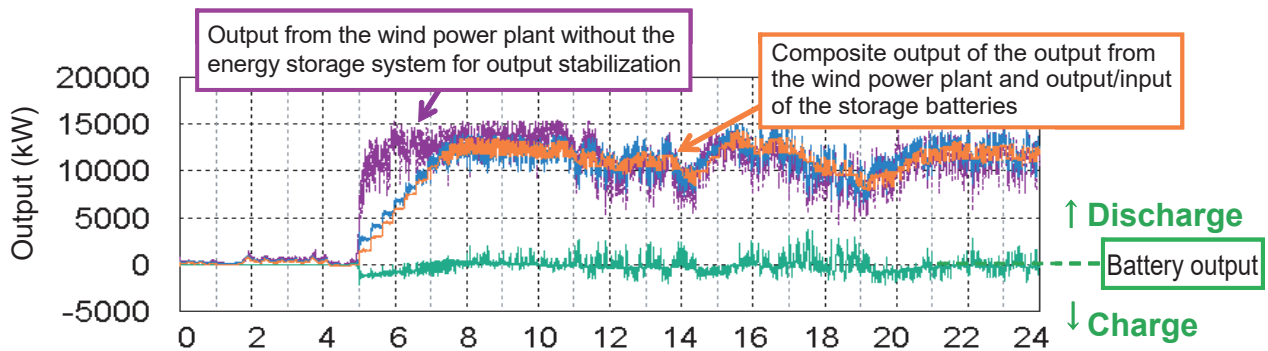
Energy storage system for output stabilization



Effects or Remarks

Data from a case of the system operation for output stabilization

With the installation of the energy storage system for output stabilization, the output fluctuation per unit time (20 minutes in the case shown below) was maintained at less than 10% of the rated output of the wind power plant. In this way, the energy storage system allows stable power supply from the plant to the grid.

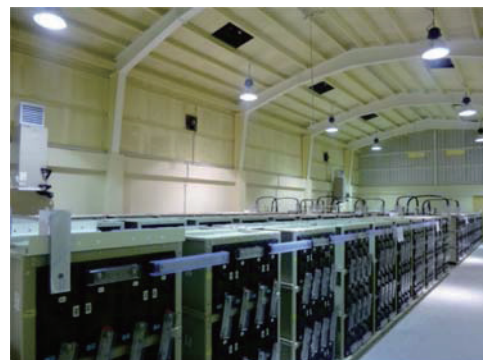


Installation in Practice or Schedule

Domestic Place of delivery: Shiura Wind Power Plant
(in Aomori Prefecture, operation began in February 2010)
Application for the accumulator: To cope with variety in wind power generation (15.4 MW)
Accumulator delivered: LL1500-W x 3,456 cells (10.4 MWh)



Overseas Place of delivery: Baltra Island, the Galapagos islands, Ecuador
(JICA project, operation started from 2015)
Application for the accumulator: To cope with variety in photovoltaic power generation (200 kW)
and adjust power supplied to the remote islands
Accumulator delivered: LL1500-W x 1,344 cells (4.0 MWh)



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