Valve Regulated Lead Acid Battery AGM Immobilized Electrolyte Technology

The generation of gases in aqueous electrochemical cells is a fact of life that must be accommodated in their design. Overcharging of lead acid cells gives rise to substantial amounts of gases from the electrolysis of water. Methods employed to reduce gassing have included the use of voltage-sensing over-charge limiting controls, catalytic recombination of hydrogen and oxygen, and now sealed operation is based on the chemical reaction of hydrogen and oxygen, which produces water.

In a traditional flooded lead acid battery, water electrolyses on overcharge liberating oxygen at the positive plate and hydrogen at the negative plate. In order to prevent the battery from drying out, this water loss must be replaced on a regular maintenance schedule. In a sealed immobilized electrolyte cell, the active materials is arranged such that the positive plate becomes fully charged before the negative, and oxygen is liberated which diffuses to the negative plate where it reacts with lead to form lead oxide. The lead oxide then reacts with the sulfuric acid electrolyte to form lead sulfate and water, completely eliminating water loss.

A schematic representation of the oxygen cycle is shown in figure.

1. Oxygen is produced at the positive plate on overcharge: $H_2O \rightleftharpoons 2H^+ + \frac{1}{2}O_2 + 2e$

2. Oxygen diffuses through the separator to the negative plate.

3. Oxygen combines with lead on the negative plate to produce lead oxide: $Pb + \frac{1}{2}O_2 \rightleftharpoons PbO$

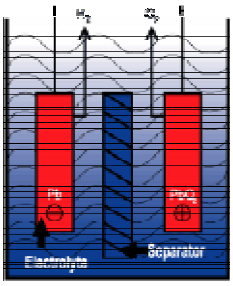
4. Lead oxide on the negative plate combines with sulfuric acid to form lead sulfate and water. The water consumed at the positive plate is thus regenerated, and a portion of the negative plate is chemically discharged to lead sulfate:

$PbO + H_2SO_4 \rightleftharpoons PbSO_4 + H_2O$

5. The exact portion of the negative plate that was chemically discharged is now electrochemically charged back to lead, completing the cycle:

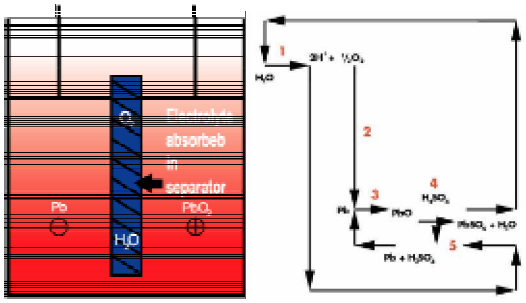
$PbSO_4 + 2H^+ + 2e \rightleftharpoons Pb + H_2SO_4$

Traditional Flooded Cell



Gases are vented, thus topping-up is essential.

Sealed Immobilized Electrolyte Technology



Oxygen evolved at the positive plate recombines to form water at the negative plate, thus no topping-up.

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