Cell voltage

The average test voltage of each cell is 2 volts. It increases to about 2.5 to 2.7 volts while the battery is being charged and decreases to between 2.1 and 2.0 volts soon after the charging current has been cut off. The battery is discharged when the cell voltage has dropped to approx. to 1.8 volts under no-load test conditions.

Battery Rating

The capacity of the battery is 84 ampere-hours. This rating gives the amount of current the battery can deliver for 20 hours at an electrolyte temperature of 27° C (80° F). Formerly 10 hours delivery at 20° C (68° F). The capacity of a fully charged battery is determined by the discharging current which can be drawn so that the voltage drops to 1.75 volts in 20 hours. Thus a battery of 84 ampere-hours can deliver a current of 4.2 amperes for 20 hours while the cell voltage does not drop below 1.75 volts. The temperature is a very important factor since the capacity increases with rising electrolyte temperature due to lower internal resistance and the lower viscosity. The capacity drops at decreasing electrolyte temperature.

Charging the Battery

The battery can only be charged with direct current (from the generator). It is important that the proper polarity is obtained. In other words the positive pole of the power supply must be connected to the positive pole of the battery, and the negative pole of the power supply to the negative pole of the battery.

Battery charging process

Under the action of the d.c. charging current the grey-white lead sulphate ($PbSO_4$) at the negative plate is converted to lead sponge (Pb), and that of the positive plate to lead dioxide (PbO_2). Additional sulphuric acid is formed in the process. As a result the acid concentration in the cell increases.

Battery gas

During gassing the acid concentration of the battery increases further, owing to dissociation of the H_2O molecules yielding combustible gases.

As the charging proceeds, the voltage at the terminals of each cell increases to a maximum of 2.8 volts at full charge. This value is not exceeded even if the cell gasses for a longer time. Normally the battery is allowed to gas a certain amount to insure that at all points, especially in the active material, the lead sulphate has been converted to lead or lead dioxyde. Hydrogen and oxygen escape in a highly explosive mixture called oxy-hydrogen gas. Extreme care must be taken to avoid bringing open flames, lighted matches etc. near a battery which is or has been gassing. Likewise care must be taken to avoid causing sparks near a battery, since this can also ignite the gases. No smoking or open flames should be allowed near a charger.

Battery discharging process

The brown lead dioxide of the positive plate and the light grey colored lead of the negative plate combine with sulphuric acid (H_2SO_4) to yield lead sulphate ($PbSO_4$), water (H_2O) and electric current. The density of the battery acid is reduced by the water produced by discharging.

Battery Maintenance

A battery in good working order is required to properly start the engine. The battery should therefore be given proper care and inspections at regular intervals.

Hydrometer Test

The state of the battery can be checked my means of a battery hydrometer. The specific gravity of the battery acid increases with the charging of the battery. Tested with the hydrometer, the gravity can be read from the scale on the float.