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Nickel-cadmium battery is a source for DC voltage. Due to its properties and advantages, it is taking over lead acid-based batteries and gaining popularity in recent times. It is small, compact, easily traveled from one place to another. General uses of this battery are toys, calculators, small DC motors, etc. Principle wise it is the same as lead accumulator based batteries. A metal is rolled with cadmium and separator layers and kept in redox so that the chemical reaction produces the DC voltage. Batteries have been popular for a long, and in an effort to increase the efficiency of the battery more and more chemical elements are used. This makes the construction compact.

It"s a device that produces, DC voltage based on the chemical reaction between the substances involved. In a nickel-cadmium battery, the redox material is used as a base, and around it, the layer of nickel and a separator are used. The nickel-cadmium cell voltage is around 1.2 V. When connected in series generally 3 to 4 cells are packed together to get an output of 3.6 to 4.8 V

The operating principle of a nickel-cadmium battery is the same as other batteries. To improve efficiency, nickel and cadmium are used. A battery is the source of DC voltage, hence it must consist of two potential points i.e positive and negative or also called anode and cathode. In a nickel-cadmium battery, first, a layer of nickel oxide NiO2 is kept around the redox.

This layer of nickel oxide acts as a cathode layer. Above the nickel oxide layer, a layer of KaOH is kept, which acts as a separator. It must be noted that this separator layer must be soaked in water or moist. Its purpose is to provide required OH negative ions, for the chemical reaction. Above the separator layer, cadmium is placed. The cadmium layer acts as the anode for the nickel-cadmium battery. The nickel-cadmium battery diagram is shown below.

The purpose of the insulator ring is to provide insulation between the two layers. The insulator gasket is the place where the insulation ring is kept nearby. The separator layer is connected to this ring. The outer case is to provide protection to the inner layers from external factors such as damages and mishandling of the battery. It must be noted that, due to chemical reactions taking place within the batter, it always hazardous to work with the battery.

The case of the battery is never opened, as all the layers are exposed and it may cause harm to the person using. Similarly, when not in use, it is recommended to remove the battery out of the device.

The chemical equations representing the chemical reaction can be given as

The first equation represents the reaction between the cathode layer nickel and the separator. It gives an output

of Nickel oxide OH ions. The need for the separator layer as mentioned before is the provide the OH ions required for the chemical reaction. For the provision of H20, the separator layer is soaked with water for the initial reaction. Later H2O is obtained as one of the byproducts.

The temperature range for nickel battery is 0 to 45-degree centigrade during charging and -20 to 65 degrees centigrade during discharging. Beyond this temperature range, the battery fails to operate and even chances of explosion exist.

Nickel-cadmium battery is very toxic to the human body. Cadmium is a heavy metal posing several risks to the human body. Cadmium even has a physiological effect on the system. The average presence of cadmium in the human body is approximately 1 microgram per liter. It has a direct effect on the digestive system. Similarly, nickel is also poisonous to the human respiratory system.

In general, each voltage for a Nickel-cadmium battery would be approximately 1.2 V. Number of cells are connected in series or parallel to get the required voltage. Apart from the voltage, its specific energy is around 50-60 Wh per Kg. This is moderately high that nickel-iron, but relatively less than nickel-zinc and nickel-metal hydride batteries.

The specific power is 200 W per kg. This is moderately high than nickel-iron but relatively less than nickel-zinc and nickel-metal hydride batteries. For nickel-metal batteries, it is around 170-1000. For nickel-iron batteries, it is around 100. The energy efficiency is around 70-75%. This is moderately high than nickel-iron but relatively less than nickel-zinc and nickel-metal hydride batteries. For nickel-metal batteries, it is around 70-80 %. For nickel-iron batteries, it is around 60-70%.