HOW IT IS MADE

LEAD ACID BATTERIES: PART 1

(A BRIEF HISTORY)

Introduction

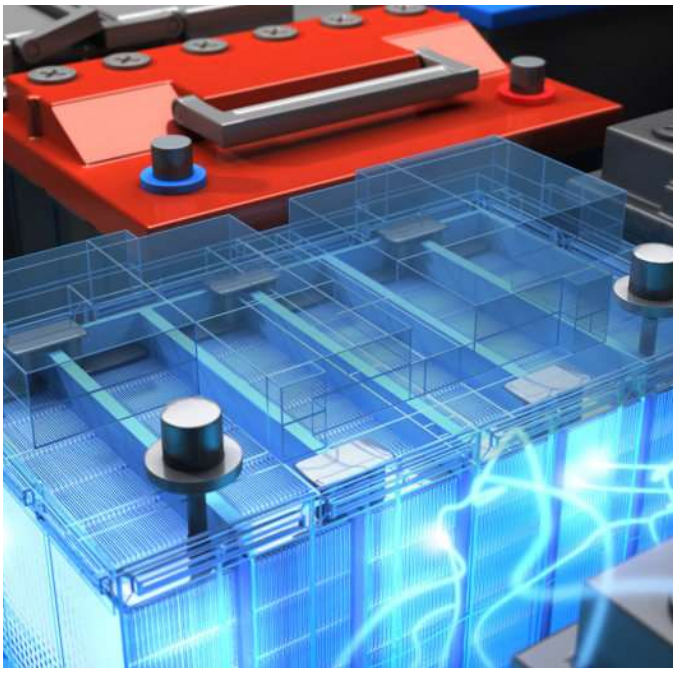
Gaston Planté, a French physicist, developed the lead-acid battery, world's first rechargeable battery, as a result of his research and ideas. The physicist was indeed researching the polarization that exists between two identical electrodes in 1859. Planté employed plates that were submerged in liquid solutions and made of various materials. His plan was to investigate the relationship between the type of electrode material utilized and the highest capacity and voltage that could be produced.

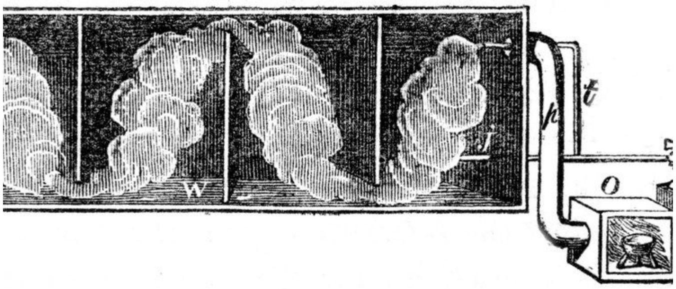
The OPlanté found that the levels of polarization vary according on the substance being used. The French Academy of Sciences released "Research on Voltaic Polarization," which summarized the findings of his research, in 1859.

The French scientist's most important discovery was that the secondary current flowing through a circuit made of lead plates separated by insulating rubber strips and submerged in a sulfuric acid solution was the highest of all the currents found in the different materials used in the experiment.

The lead-acid battery was developed more than ten years prior to the debut of the first mechanical energy generator. The battery needed reasonable assistance to be charged, though, as it was a backup energy source. Zenobe Gramme is credited with creating the first dynamo, a machine that could convert mechanical energy into electric energy and vice versa, which made it simpler to charge the Planté battery.

There was no real-world use for Gaston Planté's discovery of the fundamentals of battery production and operation in 1859. However, nearly two decades later, with the debut of Thomas Edison's incandescent light bulb, Gaston Planté's discovery found the first real-world implementation in 1879. Subsequently, Gustave Trouvé created the first electric tricycle and battery-powered submarine in 1886, which marked a significant step forward in the practical application of the Planté battery.





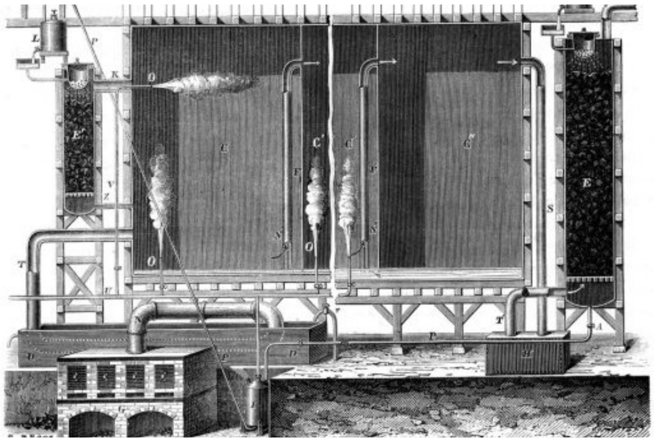
However, the question of how to apply the Planté battery to the production process was still open. Faure's improvements greatly increased the capacity of batteries and led directly to their manufacture on an industrial scale, sometime around 1881. He proposed the new technique, also known as the "mixed plate", in which the lead plates were covered with a paste of oxide, sulfuric acid, and water. The elements were charged until active masses of lead and lead dioxide were obtained.

The First Artificial Lighting System

By order of the Austrian Emperor Franz Josef, Gaston Planté installed the first artificial lighting system in history in 1883. The artificial light resulted from the combination of using dynamo motors and Planté batteries. With its use in the Schönbrunn Palace, the invention of the lead-acid battery definitively established itself as one of the leading inventions of the 19th century.

Earlier Attempts of Industrial Production of Lead Oxide

To make lead oxide, it was customary to melt lead in a reverberatory pot. When the molten lead came into touch with the air, oxide began to form on the surface. The amorphous oxides generated were difficult to manage in terms of their chemical compositions and granulometries. The transition from the lead plate to the grid, which was thought up by Ernest Volkmar, was another major development. Antimony alloy grids were eventually introduced to replace the original pure lead grids. The grid increased the percentage of active material while decreasing the percentage of metallic lead.



The Barton Method and the Shimadzu Method, Two Subsequent Advances in Oxide Production:

George Barton developed a novel method of producing oxide and patented it in 1898. The researcher used lead that had already melted (at temperatures between 400 and 450 degrees Celsius). Tiny droplets of liquid lead were dispersed into the heated, oxidizing environment by a mechanical blade within the pot that was revolving. These minute drops reacted with the oxygen in the pot as they travelled through the highly oxidizing environment, eventually reaching the desired degree of oxidation. The powder was transported to the container by an oxidizing airflow.

Following Genzo Shimadzu's work, other advancements in the field of oxidation were accomplished in 1926. The technique basically involved adjusting the pigments' grinding mechanisms to the oxidation process. In a ball mill, lead spheres were put, and the friction produced enough heat to oxidize the surface of the spheres, turning the oxide content into powder.

Shimadzu used lead below its melting point (about 270°), but Barton used molten material, which is the key distinction between the Barton and Shimadzu techniques. These two processes continue to serve as the technical foundation for the manufacture of the raw materials for lead-acid batteries.

Reference

Batteries Step by Step: The Lead-Acid Battery
SOVEMA: Equipment for Lead Acid Batteries.