OPERATION OF A "FLOAT" SERVICE BATTERY SYSTEM GENERAL DESCRIPTION

This section of our Technical Papers is primarily written for the benefit of new inexperienced people in the industry, or for review of others who are themselves writing specifications regarding the use of Batteries, Battery Chargers or Plant Loads using any of these systems in a 24/7/365 day to day operation of these Systems.

<u>For Starters We Should Say There Are Two Different Basic Types of Batteries</u>

1: The "Primary" Cell

This is a cell designed and manufactured to have an original charge at the time of manufacture, and when it has been "discharged", it will be properly disposed of and replaced with a new cell. A standard example of these batteries is the common flashlight battery.

2: The "Secondary" Cell

This is a cell designed and manufactured to accept repeated "Recharges" as it is being used. A standard example of these batteries includes the common "SLI" battery used for Starting, Lighting, and Ignition of our cars and trucks, Motive Power Batteries for electric fork truck operation, and Stationary Industrial Batteries in Plant operations where a battery is connected across the Charger Output on a 24/7/365 basis to provide instantaneous Back-up Power to the Load should the Utility line, or the Battery Charger "Fail".

Also, for these different types of Secondary Cells there are different basic types of each of them. The primary differences are the Lead Acid Electro-Chemical Couple and the Nickel Cadmium Electro-Chemical Couple. There are several different types of each of these, resulting in a broad range of Quality, Price, Life expectancy, Physical Shock Specifications, Required Maintenance, and various other parameters. Today these different types of batteries are available that have a Guaranteed Life/Prorated Warranty from 90 days to 5 years Full Replacement/25 years Prorated. Of course, with this wide of a product quality range, there is a wide range of the initial cost.

A brief example of some of these differences:

SLI Batteries:

The SLI Battery is primarily designed to provide cranking power to the engine's electric starter for your automobile or truck. It is being charged when the engine is running and is not being charged when the engine is not running. These have relatively thin plates to provide high Amps/AH of the active material.

Motive Power Batteries:

These Batteries are designed to be Re-Charged overnight and to power the Fork Truck, Golf Car, or whatever for several hours the next day.

Float Service Batteries:

These Batteries are designed to be connected across the Charger and in parallel with the Plant Load 24/7/365. Each has a very different job to do and is designed with that in mind.

Now let's get back to thinking about "Float Service" applications. In a Float Service application, the Battery Charger must power the Load under all normal operations.

Float Service Battery Charger

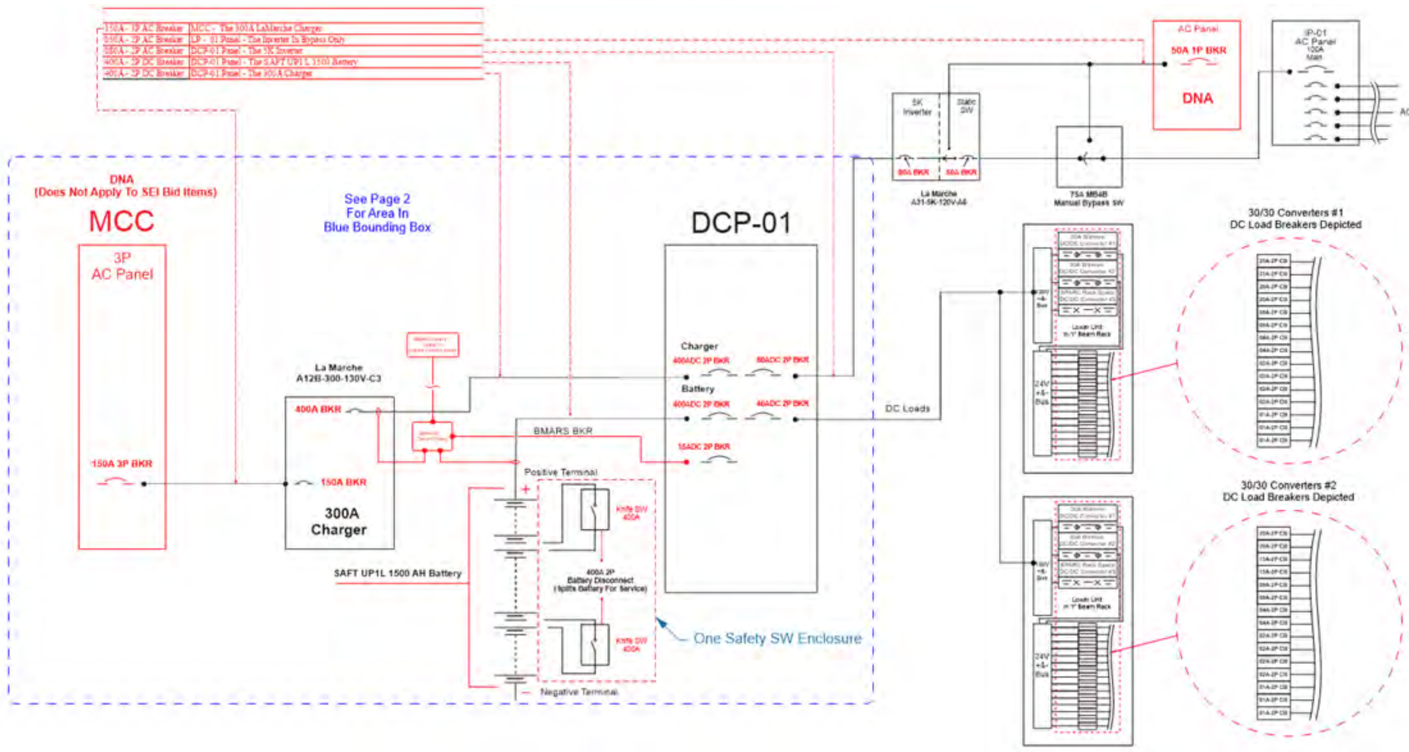
The Float Service Charger must meet all of the worst-case specifications of the different loads regarding "Voltage Regulation", "AC Ripple", Harmonic Distortion, etc. It also must have enough current capacity and voltage window adjustment to power the plant loads plus recharge the battery in the specified time required.

Float Service Battery

The Battery must be sized to power the entire DC Load for however many minutes/hours/or even days (with some Solar Systems). The discharge current available from all batteries deteriorates over time as the battery is used and ages. If sizing allowances need to be made to accommodate for aging or for possible "Future Growth" of the Plant Load this must be spelled out when the Request for Quote, "RFQ", is being prepared.

Example: If you believe the Plant Load may be increased at a later date you may want to specify 5, 10, or even 15% for Future Growth.

IEEE says all batteries have "Failed" when a Fully Charged Battery will provide less than 80% of its Original Rated Capacity. Therefore, if you want the battery to carry your load at the end of its Warranted Life the battery will need to be sized with the original load and then that number will need to be divided by 0.8. This will allow the Battery to provide the original Current after it has deteriorated by 20%. Sometimes you may compensate for this by how you specify the magnitude of the Loads or by how long you specify them to run. The main thing everyone needs to be aware of is if more "Future Growth", or "Full" capacity at the end of Warranted Life, is not specified, it will not be there.



NOTE 1:

This is a somewhat typical One Line Drawing of a SEI UPS System. Certain of the items shown on the drawing. i.e., the MCC Panel and the AC Lighting Panel, are marked DNA indicating they do not apply because SEI was not asked to supply them on this specific Job. However, they are shown on this drawing because they do contain Breakers which must be supplied in the proper Voltage and Current sizes for the System to function properly.

Some Battery Charger manufacturers Data Sheets indicate a “Full Load Input Current” that is based on their Full Load Current when the Battery is Fully Recharged and the Utility is at Full Specified Voltage. However, when the Utility drops to it allowable Minimum Voltage of “- 10%” and the Battery is near Discharged the Battery Load becomes virtually pure Resistive and therefore is no longer a “Capacitive” Load, and at the lower input voltage the Charger draws more current. The Current ratings shown are the minimum required for the equipment provided.

NOTE 2:

The 15 ADC Breaker in the DCP-1 Panel is the smallest Breaker Eaton offers for this panel. The Input current for the BMARS Main Control Panel is only 1-2 ADC, and is Internally fused for its own protection.

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