SEALED LEAD–ACID BATTERIES

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The objective is to develop a maintenance-free, 6-V, 100-A h, lead–acid battery for deep discharge applications. The design will be an extension of existing technology including starved electrolyte, permitting the battery to operate in any position, and sealed cells with recombination of gases making it totally maintenance free.

The effort is divided into five tasks. Task I involves testing, which includes the National Electrical Manufacturers Association cycle, partial-state-of-charge cycle, and stand loss tests. Task II involves active material utilization, and both increasing available electrolyte and increasing electrode porosity are being investigated. Task III is for the optimization of electrolyte distribution, which includes characterization of the electrolyte distribution in state-of-the-art cells. Task IV deals with oxygen recombination optimization to reduce water loss from the sealed cells below the present low rate. Task V involves the development of charging techniques that will increase battery life by reducing positive grid corrosion and water loss from the cells.

Three batteries are delivered to SNL each quarter for testing and, 12 batteries have been placed on test to date. The longest lives are 183 cycles, achieved in the standard deep cycle test, and 640 cycles in the partial-state-of-charge test; both of these batteries are demonstrating capacity greater than that obtained initially and cycling is continuing.

Plans for 1983 are to emphasize increasing battery cycle life and decreasing cycle life costs. Specific areas include the following:

- Continue the cell and battery tests now underway to characterize the design and identify modes of failure,
- Investigate methods of increasing the utilization of active positive and negative plate materials,
- Study electrolyte distribution and stratification to improve utilization,
- Develop a better understanding of the mechanism of oxygen recombination with a goal of 100 percent efficiency after battery formation, and
- Determine optimum battery charging techniques to decrease corrosion and water loss while maintaining compatibility with solar systems.

Recent publications

1 J. Szymborski, Maintenance-free, deep-discharge, lead–acid battery for photovoltaic applications, Gould Laboratories, *SAND82-7026*, April 1982.