

3-29-62

"MAINTENANCE-FREE LEAD STORAGE BATTERIES"

Recently, Exide Industrial Division of The Electric Storage Battery Company announced the development of completely maintenance-free lead-acid batteries, a revolutionary concept in packaged-power technology.

The new batteries combine the advantages of power and rechargability, characteristic of wet cell batteries, with the handling ease of dry cell batteries.

We expect the maintenance-free batteries will have many advantages for such diverse uses as in cordless tools, appliances and lights; portable television sets; thermoelectric heating and cooling devices; stationary industrial applications; and a multitude of consumer products.

As you undoubtedly know, the lead-acid battery since it was devised by Plante in 1860, has found a multitude of uses. It cranks our automobiles and serves as a current reserve and regulator for accessory systems. It supplies power for industrial material handling trucks, for submarines, for control functions in electric power generation and distribution, for emergency lighting, for telephone offices, for starting marine and railway Diesel engines, for railway car lighting and air conditioning, for railway signaling, for fire alarm systems and for literally hundreds of other uses.

The list gets longer all the time. It shows how dependent most of us are on this chemical means of storing electricity.

Nickel-cadmium, silver-zinc and other rechargeable systems, far from supplanting the lead-acid system, actually have helped to open new -

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and sometimes exotic - fields for various electrochemical energy systems, including the lead-acid system.

The lead-acid system remains the battery of widest application. Until now, its extension into many more fields, particularly in consumer products, has been limited by the maintenance it has required - such as checking of electrolyte levels, additions of water, voltage or specific gravity checking, and cleaning of corrosion from the terminals.

It also has been limited because it has evolved gases and because it usually has not been designed to be spill-proof.

These limitations have not handicapped the lead-acid system in many industrial, automotive and military applications where the system is strongly entrenched because of its economy, long life and ever-increasing electrical capacity.

But, these limitations have caused innovators to experiment with rechargeable nickel-cadmium, silver-zinc and other sealable cells as well as with dry cells.

What has been needed are economical, high-current-density, maintenance-free systems - and now we have them in the lead-acid rechargeable couple.

These are the results of major efforts and technological break-throughs by Exide's engineers.

The resulting new products are for use both in portable power systems that require deep discharges and recharges and in heavier stationary and standby systems where the battery charge is maintained constantly to

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handle peak loads and emergency outages.

The new maintenance-free batteries -- in both the portable and the stationary types -- require no additions of water throughout their service life.

Unlike conventional lead-acid batteries, the electrolyte can't spill out, and no fumes are emitted.

Now entering production, the first of the new battery types is expected to be on the market this year.

Designed to be used as complete power-package systems, both lines of the new batteries are coupled with automatic charging devices, believed to be unique, that enable maintenance-free batteries to achieve their high performance potential.

The new maintenance-free Exide lead-acid batteries for standby service are tightly sealed. They are intended for operation in the usual upright position, but they are spill-proof if upset accidentally.

Based on engineering work accomplished during the past year, it is predicted that the new stationary types of lead-acid batteries will give maintenance-free service for at least seven years.

There are many areas where reduction of maintenance can count heavily in terms of costs and reliable performance. Reliable, economical, maintenance-free battery power has not been available before.

Now, I have some slides to show you how the batteries look and perform.

SLIDE 1

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This stationary type of maintenance-free battery for standby power service is completely enclosed in a clean, smooth, high-impact container. It has no exposed parts other than the terminals.

Prototypes of this battery have been on test more than a year. There has been no measurable loss of water and no gas evolved. There has been no evidence of any deterioration.

SLIDE 2

This chart shows the characteristics of the battery on discharge, at discharge times ranging from eight hours to 15 minutes. This battery is capable of relatively high rate discharges, matching the performance per pound or per cube of conventional stationary batteries.

However, we don't yet know whether this specific battery design will be adaptable to all present day stationary applications, because our developmental work has been limited to a 30 ampere hour, 6 volt prototype. This will be determined in studies of higher voltage and higher capacity models.

SLIDE OUT

Now, let's turn to Exide's new cycle type of maintenance-free portable batteries. They give promise of being extremely economical substitutes for battery power units now being used experimentally in tools and appliances with moderate power requirements.

The electrolyte of cycle batteries is wholly contained within the unit. The batteries can be discharged inverted or in any other position without risk of electrolyte loss or loss of efficiency.

They never require the addition of water.

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Completely enclosed in neat, rugged metal containers, the batteries are capable of withstanding severe shock and vibration.

Their charge retention is high when standing idle.

The only maintenance ever required on this battery is recharging. It is designed to be used with charging equipment that is compatible with the specific use of the battery.

SLIDE 3

This slide shows two batteries that have been built for small power applications. Both have electrical capacity of 5 ampere hours. The one on the left is a 12 volt battery, and on the right is a 6 volt battery. Note the outlet plugs that are designed for a specific application. Also, note the polarized charging plugs for automatic recharging.

These maintenance-free portable batteries can be built to meet varying weight specifications and can be produced in a variety of sizes.

Generally, our development work has been confined to portable batteries having capacities of 5 to 20 ampere hours at 6 to 24 volts. But, some larger batteries rated up to 100 ampere hours are on test.

SLIDE 4

Here is a performance curve for a typical 10 ampere hour cycle battery. Rates up to 45 amperes are shown - a 6 minute discharge.

Now, let's look at the efficiency of this battery compared to conventional lead-acid batteries that require maintenance.

SLIDE 5

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The ampere hour per pound efficiency of the sealed battery for cycle service is below that of the highest quality aircraft or motive power batteries. But, the output per pound approximates that of good motive power batteries and high quality truck and bus batteries. The output efficiencies vary from 8 to 10 watt hours per pound at 6 to 20 hour discharge rates, down to 5 watt hours per pound at the $\frac{1}{4}$ hour rate.

Storage batteries are tailored to the application. The present motive power design has a top efficiency for the dollar invested. Likewise, high performance aircraft batteries cannot, with present technology, be matched by the maintenance-free product.

As batteries today are tailored to the application, the sealed maintenance-free battery expands the usage of batteries into new products and applications of existing products.

SLIDE 6

On a volume basis, you can see that efficiencies compare more favorably to good motive power and aircraft batteries.

SLIDE 7

This slide shows the effect of intermittent discharging on this type of battery. The 5 ampere hour, 12 volt battery, that was shown on Slide 3, when discharged at 5 amperes continuous drain, shows a total running time of 47 minutes. When the discharge schedule is modified so that the battery is drained one minute out of every 4 elapsed minutes, the total time that the battery is on discharge at 5 amperes is 58 minutes.

Of course, these curves represent the efficiencies of the maintenance-

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free battery at a comparatively early stage of its development. The really significant achievement so far, we believe, is that the feasibility of closed systems has been demonstrated. Our engineering activity now is devoted to studies of watt hour performance that will lead to significant improvements in the future.

SLIDE 8

What about the cycle life of this battery? It is difficult to make an accurate prediction at this time. But, this slide does show results that we have obtained to date. Sealed cells that are cycling to a depth of 80% discharge at a frequency of once per day already have exceeded 300 cycles.

No failures have occurred, but there has not been enough time to complete the many tests that are under way. Frankly, we don't anticipate cycle life of these cells to be as long as motive power batteries. But, already, we know that they will exceed the cycle life of aircraft batteries.

SLIDE OUT

That is the last of the slides, but there is something else you might like to see. We have models of two of the cycle maintenance-free batteries in your exhibit here at the hotel.

The 6 volt battery is mounted on a lantern. It will light the .5 ampere bulb for approximately 15 hours. Then, the battery can be recharged in 16 hours with the small charger, also shown in the exhibit.

The 12 volt battery in the exhibit is one that is adaptable to certain

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power applications. The charger with it is specifically designed for service where charging should be terminated automatically when the battery is fully charged.

As the battery has virtually no stand loss, it is not necessary to recharge it frequently as is customary with conventional lead-acid batteries. The automatic charging device keeps the battery in a fully charged condition.

We have other types of charging devices tailored for other applications. As a matter of fact, we will design the whole power system -- that is, the battery-charger combination -- to meet the specific needs of each application.

Now, let me summarize the characteristics of the maintenance-free batteries: First, the stationary battery

- It is sealed and spill-proof, but it is designed to operate in an upright position
- It has no exterior "live" parts other than the terminal leads
- It requires no watering or other maintenance during a predicted service life of 7 years
- It evolves no fumes on charge or discharge when operating in the ESB system

Second, the battery for cycle applications

- It is sealed and completely enclosed in a permanent metal container with polarized outlets, thus assuring proper charging and discharging
- It requires no addition of water or maintenance during its service life

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- No fumes or corrosive spray are emitted on charge or discharge
- It operates in any position
- It is of extremely rugged construction, capable of withstanding a great amount of shock
- It has no measurable stand loss, thus eliminating any need for special servicing precautions
- It can be left in a partially charged condition without danger of reduced service life. Its service life, which can be as much as several years, will depend upon the application
- Charging of the battery is so simple that this brief instruction on the charger is adequate -- quote: "Plug line cord into 110 V. AC outlet, insert polarized plug into battery receptacle, recharge overnight when battery is nearly discharged, as indicated by the appliance. If not in use for one year, charge for two to four hours. Do not charge otherwise."
- It is operated as part of the complete ESB power system.

These are the chief characteristics of the two basic new battery systems. The Electric Storage Battery Company has patents on phases of sealed batteries and a patent application on the procedures used in the building of these batteries.

You might ask if it is our intention to make and sell these batteries for use in automobiles and in the bulk of industrial applications. This might become practical in the future. But, for now, we plan to market the new batteries in industries where they can help cut maintenance costs and increase reliability of operations.

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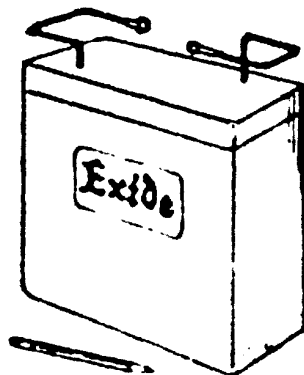
We also expect to market the new batteries for power devices that have had only limited usefulness or new devices that haven't even been developed as yet, principally because there were no maintenance-free lead batteries available.

Thus, we anticipate that this new concept in battery technology will help spawn a great many useful new products of benefit both to industry and the consumer.

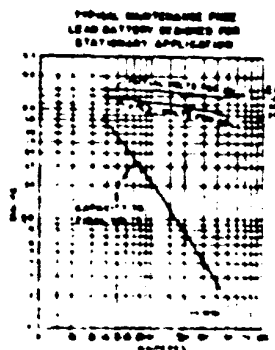
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For Delivery at Annual Meeting of the Lead Industries Association
at Noon, Wednesday, April 11, 1962, at Chase Park Plaza Hotel, St. Louis.

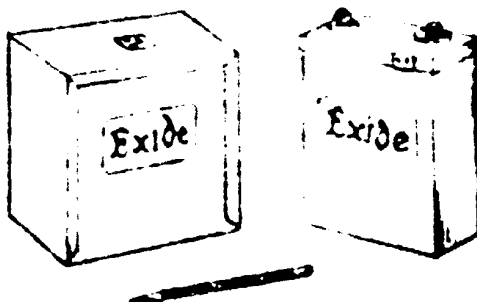
MAINTENANCE FREE BATTERIES



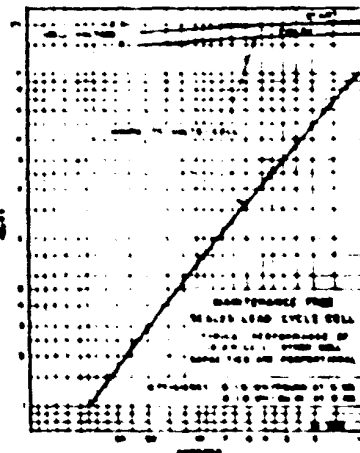
SLIDE-1



SLIDE-2

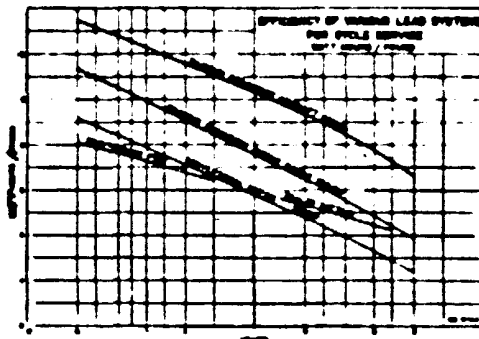


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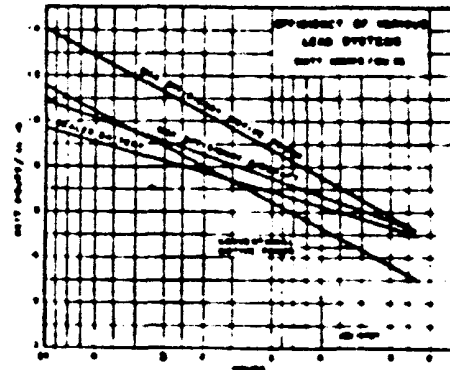


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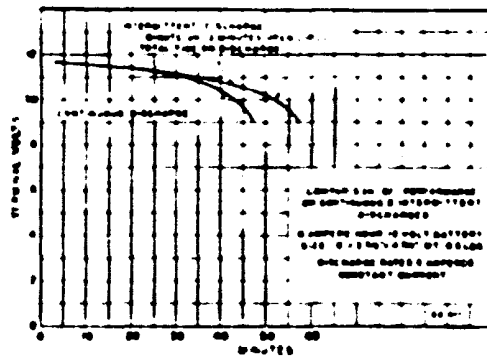
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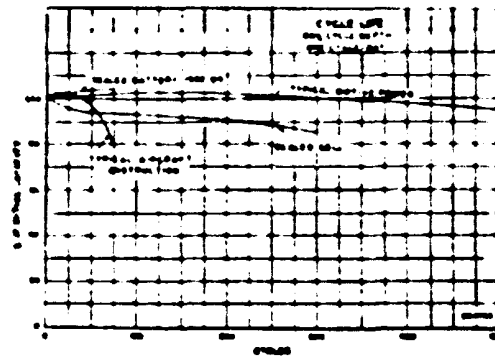
SLIDE-5



SLIDE-6



SLIDE-7



SLIDE-8