



BATTERY MONITORING

SAFETY

TRACK MAINTENANCE

EXTEND BATTERY LIFE

REDUCE COSTS

IMPACT SENSOR

In rugged industrial applications, batteries are often subjected to rough handling, resulting in damage or impact to the battery and possibly creating a potentially dangerous environment to the warehouse or facility operators. Batteries equipped with impact sensors, such as the Advanced Battery Steward (ABS) Sensor, provides supervisors or battery monitoring personnel, the exact time and date of an incident. These occurrences can be viewed through Advanced Battery Steward's alert section on the app/web portal or through push notifications sent directly to a designated phone or email account. Catching impacts in real time rather than months later can save time and money resulting in increased return on investment on equipment.

1. Battery damage repair costs to equipment
2. Reduce damage repair costs to racks
3. Reduce dangers to employees caused by unrecorded damage
4. Battery abuse (impact can damage cells and angle can expose cell plates causing cell failure)
5. Battery "shedding" which results in reduced battery life

Fine tune your maintenance schedule and reduce labor costs

Reduce time spent manually checking batteries

TRACK MAINTENANCE

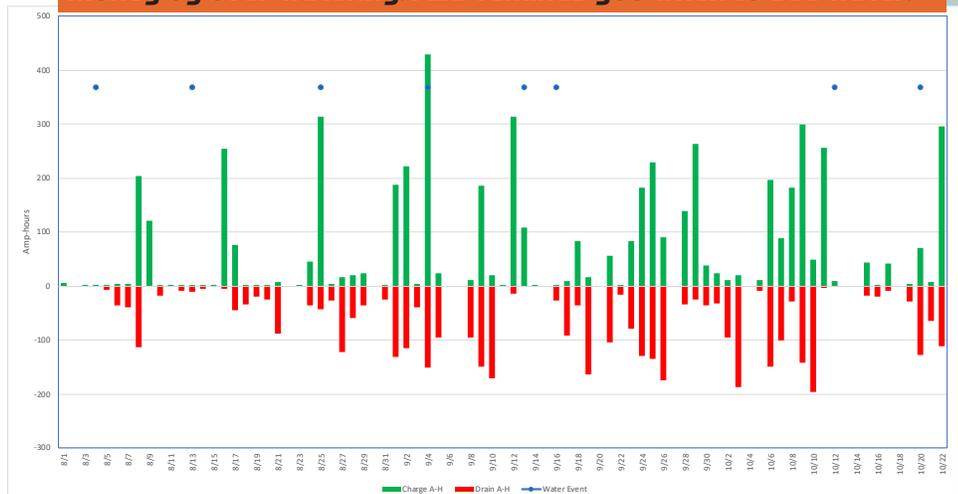
Excess time spent on manual battery maintenance and time spent chasing down problems can add to labor costs.

Save time and money in labor by fine-tuning a maintenance schedule to fit the organization's needs.

CREATING A PROPER MAINTENANCE SCHEDULE

Below is a graph from an organization that runs three shifts a day and conventionally charges their batteries. Low fluid events are represented by the blue dots on the graph. Daily watering and even weekly watering is not needed for this organization. Schedules can be generated based on watering requirements and are monitored through the use of the alerts section.

Don't destroy batteries by under-watering and don't waste money by over-watering. ABS reminds you when to add water!



Battery Monitors have been estimated in the industry to extend battery life up to 14%. The information tracked will alert users of any issues such as high heat, improper watering, improper charging, and voltage imbalance, allowing them to be addressed prior to it becoming a major issue. By recognizing and addressing these common issues while using Advanced Battery Steward, battery downtime can be significantly decreased.

HEAT

Heat is one of the main contributors to shortened battery life. Advanced Battery Steward will provide the current temperature and send alerts if the battery spikes over the high heat threshold. Because the temperature is time stamped, you can link a high measurement with the cause.

IMPROPER WATERING

Dry cells due to insufficient watering, and over-watering cells are the second main contributors to shortened battery life. Advanced Battery Steward will date and time stamp when the batteries are watered and send alerts to inform supervisors or operators that the battery needs to be watered.

CHARGING INCORRECTLY

Proper charging is essential to maintaining a healthy battery. Advanced Battery Steward will track time spent on charging as well as amp hours put back into the battery to ensure the proper charging/equalization profile is being followed.



AVOID BATTERY DOWNTIME

Prevent downtime through consistent reports and information on batteries. Have the confidence that these four major contributors to battery failure are being addressed through the Advanced Battery Steward platform.

1. Eliminate long duration low water events (exposure of plates, damaging cells)
2. Early detection of damaged cells (weaker cells over work normal cells and bring overheating, shortened life)
3. Identification of charge/discharge ratio for opportunity charging (not getting enough charge cycles makes the battery work harder)
4. Eliminate improper equalization charging (overcharging when fluids not full can damage battery)

REDUCE COSTS

Assume 100 batteries at various ages being utilized at 100% and manually maintained by (3) maintenance personnel at \$20/hr over the course of (1) year.

Without Advanced Battery Steward:

- 15% of the batteries are abused (10%) or not maintained well (5%).
 - Loss of battery life
 - Unplanned or unscheduled maintenance
- 5% of batteries in repair
- 2% of maintenance staff not working due to safety issue

With Advanced Battery Steward you can:

- Reduce the number of batteries abused by *impact* and *angle* by **8%**; ABS alert notifications inform you so you can follow-up with discipline or equipment adjustments
- Reduce poorly maintained batteries by **3%**
- Reduce batteries in repair by **2%** by addressing abuse occurrences
- Prevent staff injury completely by preventing field repair by **2%**

Estimated savings with Advanced Battery Steward:

Before ABS:

- 20 spare batteries due to batteries out of service @ \$5000: 20 x \$5000 = \$100,000
- 125 lost staff hours: \$20/hr x 125 hrs = \$2,500

After ABS:

- 3 spare batteries @ \$5000: 3 x \$5000 = \$15,000
- Savings: \$85,000**
- 0 lost staff hours:
- Savings: \$2,500**