

TECHNICAL NOTE

March 29, 1994

SUBJECT: EXTENDING TRACER BATTERY USEFUL LIFE

PROBLEM: Typically most customers need to change Tracer batteries about once each year with frequent usage. However, some customers seem to get much less usage. This is particularly true with customers who use their Tracers infrequently.

CAUSE: There are several factors that can contribute to the appearance of short battery life. They include the environment in which the Tracer is used, the sample frequency, the process the Tracer is exposed to, and the frequency of Tracer use.

Specifically:

- Interval settings of longer than one minute tend to provide a modest battery life improvement. Intervals less than 10 seconds can adversely impact battery life. Collect data based on what is appropriate and necessary for the process analysis, not just to collect as much data as possible.
- Rapid temperature cycles that approach full-scale transitions can reduce battery life. Measuring temperatures that rapidly and repeatedly change from ambient to 150°C, for instance, reduces battery life much quicker than measuring only one cycle over the same amount of time.
- Sporadic use of Tracers can reduce useful battery life. If, for instance, a customer uses his or her Tracers several times in a week, then puts them in the Storage Module for several months without using them, the battery could become unusable. This is a chemical reaction called “passivation”.

CURE: Some customers can not alter the frequency of readings or affect a change in process. However, most can have an impact on the frequency of Tracer usage, and thereby reduce the impact of passivation on battery life.

Passivation is the chemical process in which a “film” develops between the electrolytes in a Lithium battery when it is not in use. This film reduces the self-discharge for batteries in storage, providing the long shelf life Lithium batteries are famous for.

The passivation that forms has a “thickness memory” from previous periods of inactivity. In subsequent inactive periods, the passivation rapidly forms to previous thickness levels, then gradually increases still further. This is analogous to the capacity memory of NiCad rechargeable batteries: if you do not completely discharge a NiCad battery before recharging, it will only allow charging to a reduced capacity in the future.

As strange as it may seem, the more frequent customers use their Tracers, the longer the battery life they seem to experience. This helps explain why some customers who use their Tracers all the time have experienced longer battery life and operating usage than someone who use their units infrequently.

PROCEDURE:

Our recommendation to customers wishing to optimize their battery life is to use their Tracers on as frequent and consistent a basis as possible.

However, if operating requirements preclude this, there is an alternative preventive procedure. By using the Tracers every three to four weeks, the passivation can be kept in control. The following program is suggested:

- Program each Tracer normally, except set the Sample Interval for 2 seconds.
- Allow the Tracer(s) to collect sample data for approximately 5 minutes.
- Read the data from each Tracer normally.
- Replace the Tracer in it's Storage Module.
- Continue this procedure on a three to four week basis or until the Tracer(s) are required for normal process activities.

Finally, do this same procedure just before the Tracer is needed for normal process work to verify that it's battery is operatio