

DESCRIPTION AND TREATMENT OF “SULPHATED” BATTERIES

A “sulphated” battery is one which has been left standing in a discharged condition or undercharged to the point where abnormal lead sulphate has formed on the plates. When this occurs the chemical reactions within the battery are impeded and loss of capacity results.

CAUSES

Most cases of sulphation are caused by:

(1) UNDER CHARGING OR NEGLECT OF EQUALIZING CHARGE

When a cycled battery is charged repeatedly at low rates but not fully charged, the acid is not effectively driven out of the plates, particularly the lower parts, and sulphation results. Repeated partial charges which do not effect thorough mixing of the electrolyte also result in sulphation. It is difficult in normal battery operation to determine just when sulphation begins, and only by giving periodic equalizing charges and comparing individual cell specific gravity and voltage reading can it be detected in its early stages and corrected or prevented. Troublesome “sulphation” does not occur in less than 30 days.

(2) STANDING IN A PARTIALLY OR COMPLETELY DISCHARGED CONDITION

Permitting a battery to stand in a partially discharged condition for long periods allows the sulphate deposited on the plates to harden and the pores to close. Batteries should be charged as soon as practicable after discharge and not allowed to stand in a completely discharged condition for more than one month. During freezing weather the battery should be recharged immediately following discharge to prevent freezing.

(3) LOW ELECTROLYTE

If the level of the electrolyte is permitted to fall below the tops of the plates the exposed surfaces will harden and become sulphated.

(4) ADDING ACID

If acid is added to a cell in which sulphation exists the condition will be aggravated.

(5) HIGH SPECIFIC GRAVITY

In general, the higher the fully charged specific gravity of a cell the more likely is sulphation to occur and the more difficult to reduce. If in any battery there exists cells having specific gravity more than 0.015 above the average, the possibility of sulphation in these cells will be enhanced.

(6) HIGH TEMPERATURE

High temperatures accelerate sulphation, particularly of and idle, partially discharged battery.

All cells of a sulphated battery will give low specific gravity and voltage readings. They will not become fully charged after normal charging. An internal inspection will disclose negative plates having a slate-like feeling, sulphated negative-plate material being hard and gritty and having a sandy feeling when rubbed between thumb and forefinger. The internal inspection should be made after a normal charge, since a discharged plate is always somewhat sulphated. A good fully charged negative plate is spongy and springy to the touch and gives a metallic sheen when stroked with the fingernail or knife. A sulphated positive plate is a lighter brown color than the normal plate.

TREATMENT

Thorough and careful attention to the following steps often will restore a sulphated battery to good operation condition.

- (1) Clean battery
- (2) Bring electrolyte level to proper height by adding water.
- (3) Put battery on charge at the prescribed finishing rate until full ampere-hour capacity has been put into the battery based on the 8 hour rate. If at any time during these procedures the temperature of the battery exceeds 110 degrees F. reduce the charge rate to maintain temperature at or below this point. If any cell gives low readings (0.20 V less than the average cell voltage of the battery), pull and repair the cell before continuing with the procedure.
- (4) After full ampere-hour capacity has been put into the battery, continue the charge at the finishing rate until the specific gravity shows no change for a 4 hour period with readings taken hourly. Record voltage and specific gravity readings. Correct specific gravity readings for temperature. These readings indicate the state of charge.
- (5) Place battery on discharge at the 8 hour rate and during the test record individual cell voltages and overall battery voltage at the following time intervals: 15 minutes after test is started, then hourly until voltages on one cell reaches 1.80 and from then on at 15 minute intervals. From this point on the cell voltages should be under constant observation and the time recorded when each cell voltage goes below 1.75 volts. Terminate the test discharge when the majority of the cell voltages reach 1.75 volts, but stop the test before any single cell goes into reversal.
- (6) If the battery gives rated capacity no further treatment is required other than normal recharge and equalization of gravity.

- (7) If the battery does not deliver near-rated capacity, continue the discharge without adjusting the discharge rate until one or more cells reach 1.0 volts.
- (8) Recharge the battery at the finishing rate as described above, again charging until there is no further rise in specific gravity over a 4 hour period, readings being taken hourly.
- (9) Discharge again at the 8 hour rate and if the battery gives full capacity, recharge and put into service.
- (10) If this procedure does not result in full capacity, repeat once more as noted above.
- (11) If battery does not respond to this treatment, it is sulphated to the point where it is impractical to attempt further treatment and battery should be replaced.