Batteries in Trucks

John C. Nardi [1] and Akiya Kozawa [2]

[1] *ITE Yeager-Kozawa Battery Research Institute, editing@roadrunner.com*
[2] *ITE Yeager-Kozawa Battery Research Institute, akiya-kozawa@mwb.biglobe.ne.jp*

Abstract
Based on our extensive battery regeneration testing, we have concluded that 50 % smaller lead-acids should provide similar performance in trucks, buses and taxis. In order to confirm this, 20 trucks were evaluated using these smaller batteries and it was determined that these batteries had a sufficient performance if they contained our ITE organic polymer activator in the acid electrolyte.

Keywords
150-300 amp discharge, smaller battery test, 40B19 battery, 80D26 battery, 50 % smaller battery

1. INTRODUCTION

Based on our basic discharge tests, we determined that 50 % smaller lead-acid batteries can be used in trucks and cars. We tested such 50 % smaller replacement lead-acid batteries in trucks for five years. The successful results are described in this paper.

2. BASIC BATTERY TESTS

New lead-acid batteries (40 Ahr or 50 Ahr) were fully charged and discharged to various capacities ranging from 5 to 80 %. These batteries were discharged at 75, 150 and 300 A for 5 seconds and their closed circuit voltage (CCV) at 5 seconds recorded. Regenerated used batteries (50 Ahr when new) were also tested at currents of 75 A and 150 A for 5 seconds. Figures 1 and 2 show the result of this testing.

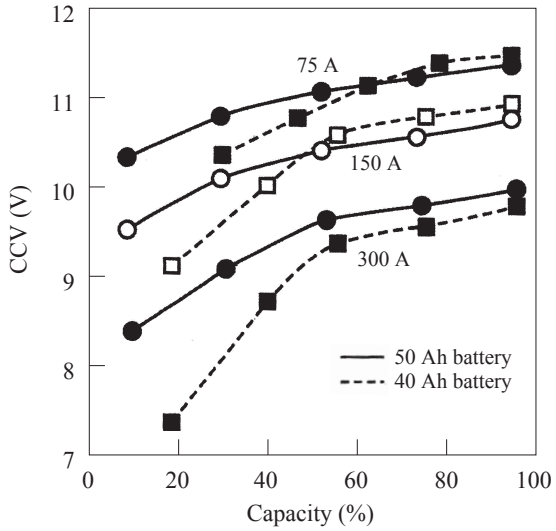

Fig. 1 New batteries (40 and 50 Ahr) tested at 75, 150 and 300 A for 5 seconds

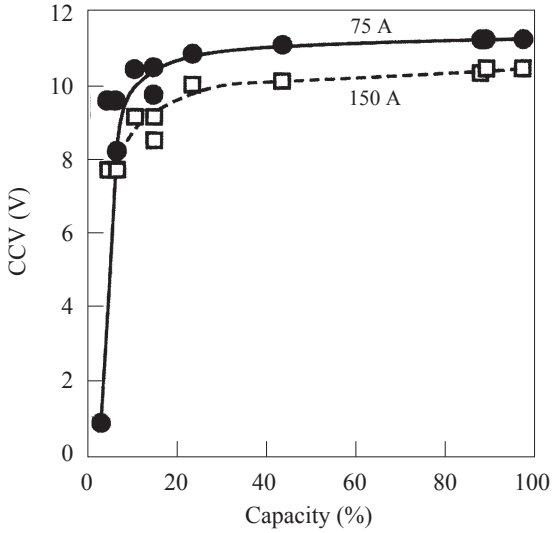

Fig. 2 CCV tests of regenerated batteries (40 and 50 Ahr) at 75 or 150 A for 5 seconds

The regenerated batteries had about an 80 % capacity of the new batteries. Since most trucks need only 120-150 A for engine starting, the 50 % discharged battery can be used for SLI (starting, lighting, ignition) purposes.

3. PRACTICAL TESTS

Table 1 shows the batteries used in the various trucks (1-ton to 20-tons). Since the greatest production of lead-acid batteries is the 40B19 (40 Ahr, 12 volt) and 80D26 (80 Ahr, 12 volt) in Japan, we used these two batteries for our testing.

4. PRACTICAL TESTS FOR 20 TRUCKS USING 40B19 AND 80D26 BATTERIES

Figure 3 shows the batteries used in the 2-ton, 8-ton and 13-ton trucks. Each truck required 4 12-volt batteries, i.e., 2 for normal use and 2 as spares.

Table 1 Batteries used in various truck battery tests

	Regular Batteries	Our Small Batteries
10-20 ton trucks (2 batteries tested)	155G51 145G51	80D26 80D26
2-8 ton trucks (2 batteries in series for 24 volts)	120E41 130F51	80D26 80D26
1-2 ton trucks (2 batteries in series for 24 volts)	95D31 85D26 80D26 75D26	40B19 40B19 40B19 40B19

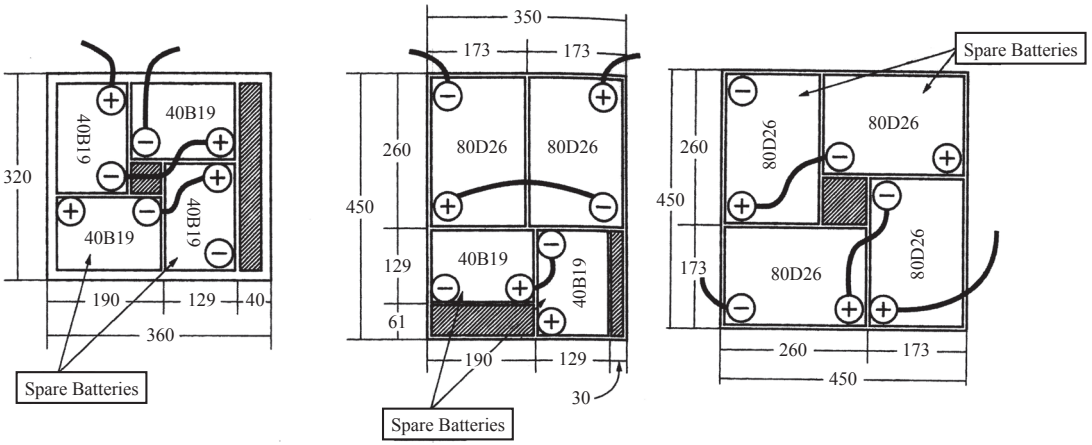

Fig. 3 Batteries placed in experimental trucks (2 for normal operation and 2 as spares)

Table 2 Test trucks and test starting dates (t = ton)

Start Dates	Truck Size	Km Used	Std. Battery Used	Our New Battery	New Spare Battery	Number of Trucks
Jul. 15, 2008	13t	46,320	155G51	40B19L	40B19L	2
Aug. 19, 2008	13t	52,160	155G51	40B19L	40B19L	2
Sept. 9, 2008	2t	73,990	95D31L	40B19L	40B19L	2
Sept. 10, 2008	8t	40,907	95E41R	80D26L	40B19L	2
Sept. 16, 2008	13t	48,400	145G5L	80D26L	40B19L	2
Sept. 19, 2008	2t	170,844	75D23R	40B19L	40B19L	2
Oct. 1, 2008	2t	81,598	95D31L	40B19L	40B19L	2
Oct. 2, 2008	2t	77,650	95D31L	40B19L	40B19L	2
Oct. 7, 2008	4t	25,295	95E41R	80D26L	40B19L	2
Oct. 10, 2008	2t	60,438	75D26L	40B19L	40B19L	2
Oct. 15, 2008	5t	41,430	95D31L	40B19L	40B19L	2
Oct. 15, 2008	3t	76,043	95D31L	40B19L	40B19L	2
Oct. 16, 2008	frozen		130E	80D26L	80D26L	1
Oct. 22, 2008	13t	49,314	145G51	80D25L	80D25L	2
Oct. 23, 2008	3t	50,528	95D31L	40B19L	40B19L	2
Mar. 2, 2009	13t	83,245	165G51	80D26L	40B19L	2

Table 3 Change in specific gravity of the batteries

Test Battery	Oct. 29, 2008	Nov. 5, 2008	Nov. 13, 2008	Feb. 20, 2009	May 26, 2009	Jan. 15, 2010
40B19L	1.25	1.25	1.24	1.23	1.25	1.25
40B19L	1.25		1.28	1.27	1.27	1.27
80D26L	1.27		1.27	1.27	1.26	1.27
80D26L	1.27	1.26		1.27	1.26	1.27
40B19L	1.26		1.30	1.28		
40B19L	1.25		1.27	1.28	1.28	1.28
40B19L		1.26	1.28	1.27	1.28	1.28
80D26L	1.27		1.27			1.28
40B19L	1.26		1.27			1.28
40B19L		1.26		1.27	1.27	1.27
40B19L		1.26		1.27	1.27	1.27
80D26L	1.27		1.28	1.27	1.27	1.27
40B19L	1.26		1.26	1.27	1.27	1.27

Table 2 shows the test starting date and batteries. Table 3 shows the change in the specific gravity of the acid electrolyte from Oct. 29, 2008 to Jan. 15, 2010. Since all these batteries contained our ITE Activator in the acid electrolyte (0.5 g or 1.0 g/cell), the specific gravity remained unchanged, indicating that the battery was not deteriorating. For the first 4.5 years, no battery change took place. Nearing the fifth year, 5 trucks had a battery change, but those changed batteries were regenerated by our ITE charging system. When engine starting becomes difficult, the battery has a low specific gravity of 1.12 or less. Therefore, when the specific gravity is between 1.23-1.28, the battery remains in good condition (almost new).

Control experiments had been previously run. According to the company's records involving 300-500 trucks, most battery changes occurred between the fourth and fifth years. Thus the average battery life containing no polymer activator was approximately 4 years.

Similar results out to five years were based on the truck company's observations as many of the trucks were transferred to other locations and specific gravity readings were not easily obtained.

5. CONCLUSION

Since our 50 % smaller batteries containing our activator successfully performing in the 20 trucks, we can reduce the battery size at least 25-35 % for most vehicles all over the world. This will significantly contribute to our environment related to both energy and materials savings of more than $US20 billion per year.

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