Battery tear-down

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Battery assessments performed by Telepower Australia often involve a combination of evaluating the electrical performance characteristics and an examination of the physical design, construction and condition of a battery. Telepower Australia routinely performs tear-down evaluations of both new batteries and field-aged batteries, and has a broad range of experience in the tear-down of different types of batteries.

Tear-down evaluation of batteries

The examination of the internal physical condition of field-aged batteries that may have failed is a routine part of determining causes of battery deterioration and unexpected failure. For field-aged batteries with known capacity issues, the primary purpose of the tear-down is to assess the condition of the internal components of the battery for indications that may be associated with the reduced performance. This includes evidence of original poor manufacturing processes, as well as in-service and age-related conditions such as corrosion, plate sulphation, loss of compression and separator dry-out.

Telepower Australia also carries out tear-down evaluations on new batteries as a means of revealing generic design and construction and manufacturing issues that may affect service life. Batteries with evidence of poor design practices, poor construction quality and consistency may not be good value. For valve-regulated lead-acid (VRLA) batteries used in standby applications demanding long service life, there are relatively few low cost means by which the suitability of the battery can be assessed (independent standards conformance testing is expensive). Long standby service life depends on the relative similarity and consistency between the cells that make up the battery. Lack of similarity in the constructional aspects of the battery and the relative degree of the manufactured quality reduces the degree of confidence that the battery will provide good service life. Telepower's approach is therefore comparative in nature, and Telepower typically advises the tear-down of three (3) samples of normal production batteries of the same type and size. For End-users, it is best if the samples submitted for tear-down assessment are randomly selected from battery consignments destined for installation in the User's end-application. This reduces any concern that the batteries provided for assessment are "special" and therefore not representative of the User's inventory.

In general, tear-down assessment involves qualitative examination of the physical battery design, the quality of construction and consistency of manufactured components. During tear-down examinations, the battery is systematically (and destructively) disassembled, and various aspects of the battery are assessed by visual observation, photographed where appropriate, and quantitative measurement of some component parts. Standardised techniques used by Telepower involve de-constructing the battery in an order approximating the reverse of manufacture.

The process of tear-down used by Telepower typically includes the following general steps:-

1. Dimensional measurement for evidence of battery case distortion.
2. Removal and examination of the battery lid and vent assembly. Cross-section examination of mating joints or junctions. For VRLA batteries, the cross section of the gas vent is also examined.

3. General examination of *in-situ* condition and position of the plates, separators, group bars and terminals.
4. Removal of the cell stacks from the battery case. Removal, dissection and cross section examination of the terminal and post-seal, and post-seal to group-bar connectivity.
5. Removal, dissection and examination of the group-bar, inter-cell through-wall welds and plate tab to group-bar welds for manufacturing quality.
6. Removal and separation of the plates from the separators. Visual inspection for signs of grid corrosion or paste sulphation. For new batteries, the individual plate weights and grid thickness are measured.

The actual steps of the tear-down method are generally varied to accommodate the aspects of a given battery construction. For valve-regulated batteries, the static operation of the safety vent valve is tested prior to the tear-down.

Telepower can perform tear-down examination of both flooded and valve-regulated batteries. The time taken to tear-down a battery depends on the size (capacity) of the battery and the type of battery technology. However, the actual time to tear-down a single cell unit, measure component elements, section and prepare selected components for photography, and take the photographs for reporting purposes is approximately 3-4 days. Preparation of a summary report of the tear-down results takes another 3 days or so. Compilation of all the results of a tear-down into a comprehensive, fully-detailed report can take up to a further 2 weeks.

The costs of vary with both the size of the battery and the type of battery technology. Telepower provides a discount for tear-down evaluations for three or more samples of the same battery. Generally, the tear-down of flooded lead-acid batteries is slightly more expensive than for VRLA batteries. The cost of the basic tear-down includes a summary report of the findings and the cost of material disposal after completion of the tear-down work. A comprehensive, fully-detailed report is optionally available at additional cost. Indicative costs are listed below, subject to formal quotation. Contact Telepower.

Tear down evaluation	**Indicative Price**			
	Up to 50 kg unit mass		More than 50 Kg unit mass	
	One unit	Group of 3	One unit	Group of 3
Flooded batteries *(with summary report)*	$1500	$4125	$1750	$4810
VRLA batteries *(with summary report)*	$1300	$3575	$1500	$4125
Fully-detailed report *(optional)*	$1250	$1800	$1250	$1800

Notes:

1. Pricing listed includes vent pressure tests for VRLA batteries.
2. Pricing only applies where unit capacity < 1000 Ah.
3. Current pricing. Subject to change.
4. All prices are in Australian dollars (AUD)
5. All prices are exclusive of GST and any other taxes.

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