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Accelerated Battery-Life Testing: A Concept

A proposed accelerated test program, employing empirical, statistical, and physical models, could determine the service life and failure probabilities of electrochemical cells and batteries, and would be applicable to the testing of a variety of mechanical, electrical, and chemical devices. The objective would be to obtain, in a short period of time, data useful for predicting the long-term performance of a battery or cell.

In the design of an ideal accelerated battery-life test, a statistically significant number of units (approximately 300) would be required for a test involving five levels each of three parameters: temperature, voltage, and pressure gradients. The data would be analyzed in terms of a proposed quality standard, which would be numerically the inverse of observed cell degradation within a given duty cycle. Empirical analysis methods would be employed to search for failure indicators; statistical methods, to assess statistical validity and to predict functional failures during testing; and physical methods based on stress-strain relationships, to determine the mechanisms causing cell degradation with time.

Data processing equipment enabling maximum flexibility in acquiring, handling, and reporting test data would be desirable. On-line monitoring would be needed for empirical surveillance during testing; and off-line stored data would be suitable for statistical and physical analyses.

A combination of destructive and nondestructive

tests would be performed. The destructive tests would not be limited only to those cells which have failed under specific stresses, but would also include periodic, deliberate destruction of good cells in order to determine their conditions after exposure to specified stress levels. This procedure would allow the early detection of probable failure causes.

Note:

The following documentation may be obtained from:

National Technical Information Service
Springfield, Virginia 22151
Single document price \$3.00
(or microfiche \$0.95)

Reference:

NASA-CR-97935 (N69-13454), Survey of Testing Methods Applicable to Space Battery Evaluation

NASA-CR-107114 (N70-12478), Ideal Approaches Towards Accelerated Tests and Analysis of Data

Patent status:

No patent action is contemplated by NASA.

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