

A BATTERY STORAGE TEST FACILITY FOR LOAD FREQUENCY CONTROL AND INSTANTANEOUS RESERVE

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Comprehensive studies carried out by BEWAG since the mid-seventies have shown that steam storage or electro-chemical storage units might be an appropriate means of fulfilling load frequency control and instantaneous ("spinning") reserve power requirements. Subsequent studies proved that an advanced lead-acid battery would be most suitable.

Information on the operational behaviour of lead-acid batteries and their service life expectancy under load-frequency control stress was not available however. Hence, it was decided to carry out a long-term test featuring the operational stress to be found in a full-scale installation.

The main objectives were:

to determine the battery service life;

to optimize the operational regime for the storage system;

to collect information on system efficiency and availability.

The test facility has been operating since July, 1981. The device under test is a newly developed lead-acid battery made available by HAGEN Batterie AG. Its characteristic properties are

tubular positive plates with low antimony alloy for high cycle life;

negative plates made from expanded copper grids instead of cast lead grids — improving internal resistance and discharge voltage level, and battery efficiency.

During the test operation it was shown to be advantageous to equip the cells with an electrolyte circulation system.

The battery ratings were chosen to guarantee operation under the identical specific stress which would be expected to occur in a future full-scale plant.

The mode of operation has been improved step by step, according to the objectives. The operational parameters are as follows (see Fig. 1).

In the load-frequency control mode, the 1000 A h battery runs at ± 660 A, charge coefficient 1.0, maximum load gradient 300 A s^{-1} . Three times each week a "normal" charge (constant current-constant voltage) is carried out during the low load period at night. Once each week a 12 hour equalization charge takes place.

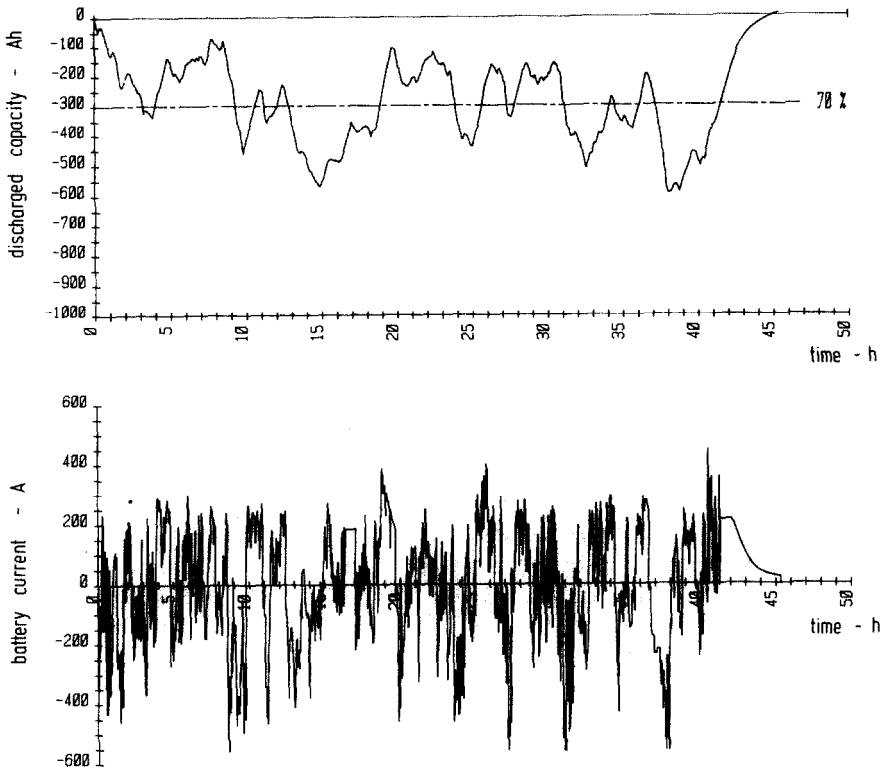


Fig. 1. Test facility operation.

During load frequency control service the state of charge is kept within 50 - 90% of the rated capacity — thus retaining a minimum of 50% of the rated capacity for instantaneous reserve purposes.

Operational experience after four years of operation is dealt with in the presentation.