Redundant battery system application and maintenance considerations

Special sizing and maintenance considerations are needed when employing redundant batteries. Under normal conditions (both batteries in good shape and fully charged) there is a considerable excess of capacity available to start the engine. When one battery fails, however, performance of the starting system degrades to considerably worse than half the originally available performance on two good batteries. Two unavoidable effects work together to amplify the harmful outcome of one failed battery:

1. Joule’s law\(^1\) causes increased power losses in every component of the electric starting system including batteries, BBS\(^2\), battery cables and starter motors.
2. As discussed in SENS Genset Starting Education Module #2: Engine Start Battery Performance Characteristics, electrochemical reaction kinetics and diffusion characteristics cause a battery to deliver less total energy as discharge power rate increases.

It should be obvious that each battery, charger and cabling of a redundant starting system must be specified, tested and maintained as though it is the only battery available to start the engine. In an emergency it just might be.

Recommended maintenance appropriate to redundant battery systems

The normally excess starting power of a redundant battery system can mask performance problems in one battery. Therefore periodic maintenance should include temporary disabling of one battery while engine crank performance is observed and measured while powered by the other. Both starting systems must deliver the originally specified performance. Any deficiencies must be remedied to insure that the expected redundancy in batteries is available.

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\(^1\) Joule’s law: power dissipation in a (linear) resistance is proportional to the square of the current (P=I^2*R). Doubling current causes a fourfold increase in power loss.

\(^2\) Best Battery Selector, the purpose of which is to deliver power from two different batteries for the purpose of battery redundancy. The BBS is a passive diode steering device that automatically supplies the load from the stronger of two batteries. In case one battery is weak or has failed the BBS prevents parallel connection of two batteries so that a bad battery does not drain the good one.