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Batteries Used as Back-Up Power for New Terrestrial Microwave Network That Will Improve Communications in Southeast Alaska

Alaska Power & Telephone Company, an Alaskan electric and telecommunications utility, determined a need for a terrestrial microwave communications network within its strategic plan to serve the ongoing demands of its customer base to deliver voice and data communications needs within Southeast Alaska. Although the industry trend is to develop extensive fiber optic networks for long haul applications, this was neither practical nor economical in this geographically diverse region of Alaska. Some villages served with broadband services have less than 100 year round inhabitants. Due to the isolation of these communities, reliable communications services are vital for Internet access, telemedicine and distance learning applications. The project was developed and constructed by the AP&T Wireless division.

Any communications network is only as good as its weakest link, and in many cases this is reliable grid power with associated backup systems including auto starting AC generators and associated battery systems. This is a difficult and operationally intense task for any telecommunications carrier, but applying this concept to mountain top sites in Southeast Alaska is especially difficult. The average elevation for various AP&TW communications sites are 3,000 feet and they are exposed to severe wind and icing conditions from the Pacific Ocean air currents and their rapid rise caused by the mountain ranges. This can cause conditions where it is difficult if not impossible to safely travel to a site via helicopter (as there are no roads) to restore power or make other repairs.

To achieve minimum 99.999 percent availability of the communications system, fully discrete, redundant power systems are a must. In addition, the battery systems within this environment must be capable of sustaining the communications site for an extended period of time. In this case, a seven day minimum reserve time is required. In order to achieve this, AP&T employ load management techniques, including load shedding in sequence from non critical, sub critical and critical loads. This is achieved with an Argus power system CXCP controller and associated low voltage disconnects. In addition, they utilized remotely open or close battery disconnects on the battery strings. There is no augmentation to the battery systems, photovoltaic panels or wind power is not practical in the extreme operating environment.

In spite of the load management system, a seven day reserve time requires significant Ah capacity, even for a relatively small load. Battery plant design was outsourced to Reeve Engineers of Anchorage, Alaska.

VRLA (valve regulated lead acid) batteries were specified primarily due to past operational and logistics experience and practical considerations. It was possible to get a higher density of Ah/cu ft within limited space, spill resistant (important for helicopter sling loads) and simplified modular construction meant achieving UBC seismic zone 4 installation versus a wet cell design. A caveat to VRLA's are their susceptibility to thermal overload conditions. As a safety measure, temperature probes

were installed on each battery string that controls rectifier output in the event of a thermal condition. Also, plate inspection is impossible due to the opaque plastic jars. Specific gravity measurements are not possible due to the sealed design.

As a general rule, battery strings within remote sites across Alaska do not get the amount of regularly scheduled maintenance they require, primarily due to economic factors (it can cost as much as $3,000 to charter a flight to some areas) and many cases the lack of a controlled environment. State wide, AP&T operate more than 30 sites and have developed experience with various battery types and manufacturers. Out of this experience, the Deka Unigy II AVR series works best compared to other manufacturers they tried. Specifically, they selected the 3AVR95-33 series. The installation is straightforward. Some "burping" of the cells were necessary to eliminate case bulging. This was due to the rapid elevation change during transport (sea level to 3,000 feet). Initial tests were made, a freshening charge was applied, then put into service.

In the November of 2007 AP&T got their first opportunity for a practical test of the system. They lost all AC power generation to a faulty fuel system pump design. Of course, the weather was lousy. The site lasted 12 days on batter backup until the weather cleared and crews dispatched. Like so much of what they have to do, it was trial by fire.

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