DESIGNING A 20-YEAR AMR DEVICE

APPLICATION FEATURE

By Tom Galuska – Sensus Metering Systems

The utility industry has aggressively sought new ways to cut costs, increase efficiencies and improve cash flow. This search has led to the growing use of Automatic Meter Reading (AMR) systems to reduce the expenses associated with manual meter reading.

Widescale acceptance of AMR technology hinges on AMR device manufacturers demonstrating to the utility market that the initial investment costs associated with installing advanced AMR systems can be cost justified by long-term savings.

Sensus Metering Systems, a leading manufacturer of water meters and AMR solutions, wanted to deliver the highest possible return on investment to customers purchasing the Sensus RadioRead™ system. This system provides a complete package of AMR applications for the water market, and incorporates the Sensus Meter Transceiver unit (MXU).

Attached to water meters located underground, in basements, vaults or on the outside walls of buildings, the Sensus MXU 505C provides efficient remote meter reading by eliminating visual inspection. The MXU 505C communicates with Sensus' hand-held or vehicle-based meter reading interrogators.

When a valid wake-up signal is received from an interrogation unit, the MXU 505C begins the communication process with the meter and then transmits information back to the interrogating device using Direct Sequencing Spread Spectrum (DSSS). The use of DSSS technology offers important advantages, as it is virtually immune to noise and interference, therefore ensuring reliability.

After the MXU transmits the meter’s encoder identification and meter reading to the interrogation unit, the interrogation unit signals that valid reading parameters have been met and instructs the MXU to power-down. This power-down mode allows the MXU to conserve energy until the next interrogation session. The unique combination of two-way communication and power saving application provides the most robust and reliable RF unit in the market.

The MXU is a feature-oriented product that guarantees high reliability and reading consistency. Able to connect with up to 16 meters with one unit, the MXU offers features such as remote programming, cycle codes, passwords and diagnostic capabilities. They offer flexibility in meter reading applications and minimise long-term maintenance costs.

TECHNICAL CONSIDERATIONS

Several technical challenges had to be overcome in designing a 20-year AMR device. After evaluating its battery chemistry alternatives, Sensus chose lithium thionyl chloride batteries because of their high capacity, high energy density, long life and reliability. Powering the MXU 505C device with hybrid lithium thionyl chloride battery packs enabled Sensus to offer the only nationally published 20-year warranty for both electronics and battery.

By incorporating the Tadiran PulsePlus™ bobbin-type lithium thionyl chloride "C" size cell in combination with a unique Hybrid Layer Capacitor, Sensus was able to provide a solution that delivers the high current pulses required to maximise data streams and increase the frequency of transmissions without affecting battery life.

End-users have demanded that power sources in AMR devices have greater life cycles and are field-replaceable if needed. The PulsePlus hybrid lithium battery, in conjunction with the Sensus snap-in battery pack, provides utilities with a cost-effective solution.

The PulsePlus offers the lowest self-discharge of any lithium chemistry. The self-discharge rate is governed by the cell’s electrolyte composition, its production processes, and mechanical considerations. For example, bobbin-type cells typically deliver lower self-discharge than spiral wound cells of equal size. Self-discharge rates can also be affected by impurity levels in the electrolyte. Lithium batteries are not alike in terms of the level of electrolyte impurities and parasitic reactions.

Sensus Metering Systems also selected the PulsePlus battery for its extended temperature range (-40°C to +85°C). Temperatures below -20°C can be problematic for certain battery chemistries, since cold electrolyte becomes less active, leading to higher internal impedance and possible battery failure. When subjected to temperatures above +40°C, certain battery chemistries and mechanical sealing techniques start to fail, affecting both short-term performance and long-term reliability.

CALCULATING THE POTENTIAL SAVINGS

What are the potential life cycle savings associated with installing the MXU 505C? When calculating actual costs of a battery expected to last seven to ten years, costs begin to accrue in year seven and continue throughout the product life cycle of approximately 20 years.

For example, a water utility with 5,000 service connections could realise up to $200,000 in maintenance cost savings over a ten year period by eliminating all battery changes during that period, assuming the cost of each changeout to be about $40. If a second round of battery changeouts was eliminated over a 20-year period, the potential savings would reach $400,000 for every 5,000 service connections. These savings are in addition to the long-term cost reductions associated with eliminating visual meter reading.

For more information on the RadioRead MXU 505C meter transceiver unit, contact Sensus Metering Systems at 800-638-3748

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