

Choosing batteries for RTLS: Lithium or Alkaline?

Wireless devices are everywhere in today's hospitals, but what about battery use?

Right now, many devices, especially RTLS systems, run on powerful lithium thionyl batteries, which are great, but pricey to buy and dispose of and have certain performance and risk issues vs. alkaline ones. But many RTLS systems need the power that lithium can provide.

Regarding cost, lithium batteries are pricey – roughly 15 to 20 times more than alkaline, with only double the capacity. Viewed as cost-to-capacity, that factor is close to eightfold. This can become expensive very quickly with some devices. Costs for Real Time Location Systems (RTLS) transmitters using six lithium batteries can reach \$90.00 (\$15.00 per transmitter unit), making this option a very expensive choice for realizing long battery life.

On the other hand, alkalines would run only about \$3.00 per transmitter unit. This means that the cost differential for a typical hospital installation could be in the hundreds of thousands of dollars over the product life span.

Performance quirks are another concern about lithium batteries. While powerful, they can suffer sudden voltage loss without warning. This makes their uptime simply less predictable than standard alkaline batteries.

"Batteries that have performance issues, such as sudden voltage exhaustion, can make maintenance planning more challenging, as replacement cycles are less predictable, and can drive costs up," said Alan Moretti Vice President, Advanced Imaging and Radiation Oncology at of Renovo Solutions, a biomedical services firm.

This can be an especially tough problem in wireless devices, such as RTLS, where transmitters run on batteries and are installed across a facility on the ceilings.

There is also a growing concern about the safety of lithium thionyl batteries, which are more volatile than alkaline and pose a risk of explosion.

Many RTLS systems need lithium's power. But not all. RTLS maker Sonitor Technologies, for example, has configured its ultrasound technology for the efficient use of standard alkaline batteries.

They did this by making ultrasound more battery-efficient, so it could run without the extra boost only lithium batteries can provide to systems requiring them.

The firm achieved this by focusing the ultrasound beams, saving considerable energy. This contrasts, for example, to radio waves, which emit in all directions and go straight through walls, wasting energy.

To a great extent the same radio-

Ultrasound can be sent in particular directions very easily. So, for example, in corridors where a directional beam is sent, it has a shape that fills the corridor very well and spreads very little sideways. "This is desirable because we can create a zone within the corridor and a zone within the room. So it's the directionality that can be controlled very easily," Olsen explained, "We don't have to transmit with such high power since we can focus the energy."

Performance is more efficient. Increasing the update rate from 30 seconds to one second. Therefore, the latency and the responsiveness of the system become much better, but at the same time, it effectively doubles battery life.

"The fact that the ultrasound signal is contained within a room is a big advantage," according to Øystein Olsen, Sonitor's Chief Technology Officer, adding that because the signals stay within the confines of the room where one wants them, they do not have to compensate for loss, using up precious battery energy.

wave-like performance is true of infrared. This technology has an additional challenge too, in that it will be absorbed by any color in the infrared area. These physical challenges are considerably more taxing on batteries because they have to compensate for signal loss and inefficiency by pushing out more to communicate.

Ultrasound-based RTLS do not have the same drawbacks: "The fact that the ultrasound signal is contained within a room is a big advantage," according to Øystein Olsen, Sonitor's Chief Technology Officer, adding that because the signals stay within the confines of the room where one wants them, they do not have to compensate for loss, using up precious battery energy.

Ultrasound-based RTLS has a number of advantages. Each room can have its own ultrasound signal, making it inexpensive to listen for the ultrasound signature relative to using a radio to communicate to the rest of the system;

An additional boost in efficiency comes from the very low amount of background noise generally found in rooms occupied by people. This relatively low background noise is also relatively low in the ultrasound range. This means that very little signal has to be sent to get above the noise level.

This background noise advantage contrasts with radio frequency in the 2.4 GHz band, which is very crowded with signal, forcing the use of higher-powered transmissions.

Infrared also has background noise issues. Anything that is hot emits infrared, especially lights, screens, and ovens, but also windows. Incoming sunlight is also problematic in that it actually contains a good deal of infrared.

As more devices go wireless and are run by batteries, ultrasound RTLS may find a growing presence in increasingly cost-conscious hospitals.