

# THIN CELL APPLICATION



**ULTRALIFE<sup>®</sup>**

# Honey, I shrunk the battery!

~ How thin cell batteries are revolutionizing industry ~

---

In 2011, Chinese engineers claimed to have made the world's first shrinking device. While it may sound like it came from a film, the device only creates the illusion of a smaller object, rather than actually shrinking it. Illusions aside, it is clear that devices in the electronics sector are continuing to get smaller.

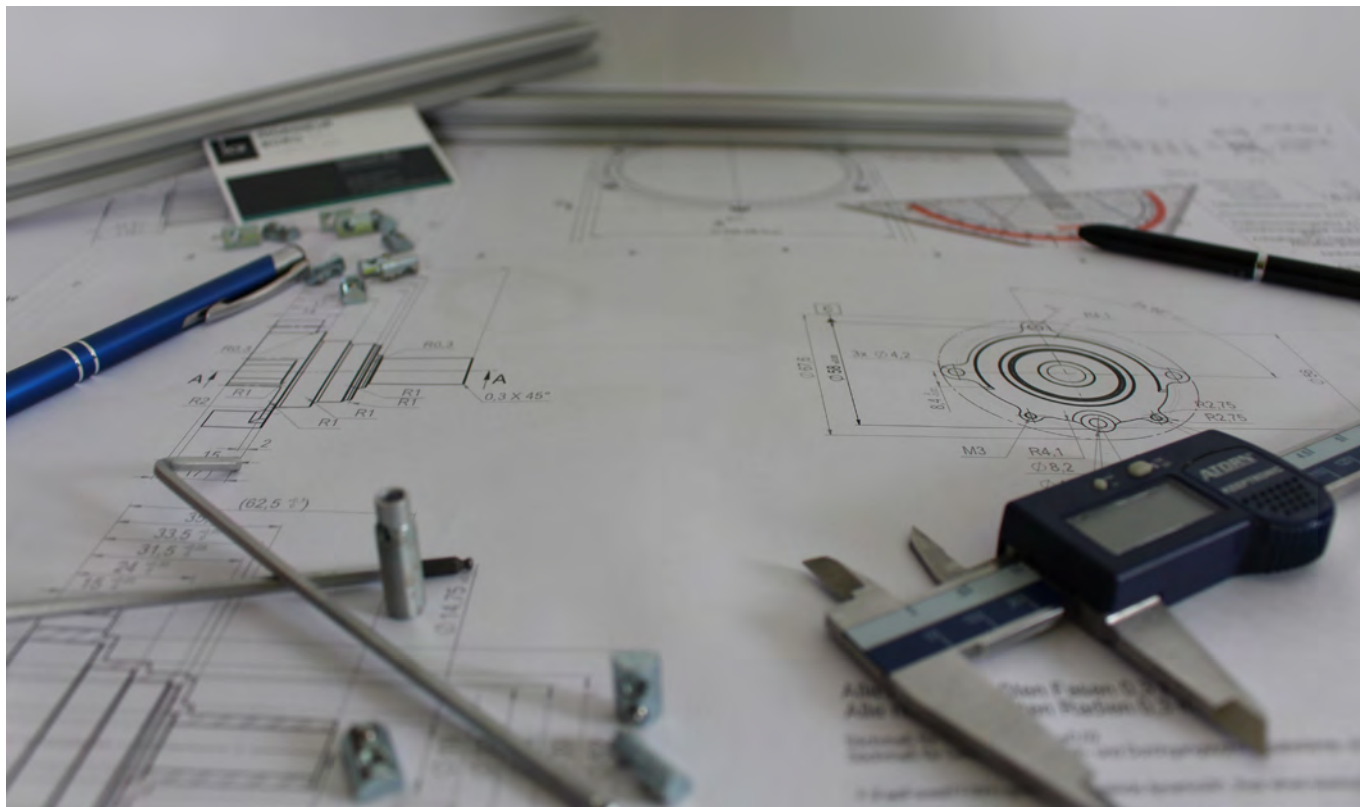




Thin cell batteries are some of the smallest batteries available on the market. However, despite their small size, they are capable of providing a stable voltage to power electronic devices and outperform coin cells at higher discharge rates. So what makes thin cells different from other types of batteries on the market?

The chemistry behind thin cell batteries originated over twenty years ago when Ultralife developed the 9 volt battery. Over the years of developing one of the most successful batteries on the market, Ultralife's engineers changed the cell layout to maximise the space used. The original cylindrical cells wasted vital space by using a square formation, so the thin cell battery was developed as a pouch with square cells. It was also necessary to keep moisture out of the cell, so Ultralife's engineers sealed the cell with a bespoke mixture of materials to ensure battery longevity.

Because of this longevity and the small size of the battery, the thin cell battery is having an impact on a number of different industries, allowing engineers to make devices smaller, yet just as effective. For example, asset tracking is becoming increasingly sophisticated and is better able to protect items because of the development of thin cell batteries.



On construction sites, large quantities of materials are delivered and received every day, with vehicles and people moving in and out the site regularly. This makes it a prime target for the theft of valuable metals such as copper. Using thin cell batteries in small trackers attached to the valuable materials is a much more efficient way than using RFID tags, which have to be manually scanned. Because the batteries are small, the tracker can be fitted discreetly to deter thieves from breaking off the tag.

For the forgetful among us, companies are now offering Bluetooth tracking tags to consumers to keep an eye on where they've left their keys or wallet. By using thin cell batteries, the tags are small enough to attach to everyday devices without adding additional bulk, but also have a high energy density to ensure that the consumer doesn't need to replace the battery as frequently.

The security sector is also benefiting from increasingly small batteries. The market is growing, with forecasts that the total market for home security products will reach \$51.5 billion by 2022, and smart security is increasingly playing a big part in this market.

Using thin cell batteries, smaller sensors can be manufactured. These can be easily hidden around the house, so that burglars don't simply see the sensors, avoid them or destroy them.

The medtech sector is another growing market where thinner and smaller batteries make patient monitoring easier. Juxtaposed alongside the growing medical wearables market, thin cell batteries reduce the size of components in the wearable device. This makes them more comfortable to wear for long periods of time and mean they do not interfere with movement.

These sectors are only a selection of those where the use of thin cell batteries has made devices smaller, while not compromising on a reliable power source. With more sectors taking heed of the Internet of Things (IoT), the industry trend for connected devices, the demand for smaller components will increase.

While we might not be seeing a shrinking device in reality any time soon, the IoT means that device manufacturers are increasingly looking for smaller, yet reliable components, meaning they must rely on the expertise of experienced and innovative companies.



## Thin cells against theft

~ How thin cell batteries improve asset tracking ~

---

Jimpa, an Australian dog, travelled 2,000 miles to make his way home after losing his owner while working at a farm. We may wish that our lost possessions had an inbuilt tracker to return themselves to home, but with the development in asset tracking technologies, tracking of valuable items is improving.

## CONSTRUCTION MATERIALS

Anyone who has worked on a construction site will tell you that deliveries are constantly coming and going, making it an ideal spot for thieves to operate. Materials such as metals can reach high values on the black market, so the risk of theft is ever present.

In the US, the National Equipment Register (NER) estimates that the value of construction equipment stolen every year is between \$300 million and \$1 billion. Not only does this equipment have to be replaced, but there are additional costs with renting replacement equipment, delays and increased insurance premiums.

There is therefore a strong demand for asset tracking on construction sites, which must have a reliable and long-lasting power source to maintain accurate tracking. Tracking devices should also be as small as possible, as if the device is easily spotted on the valuable item, the thief may simply remove it.

Using a thin cell battery allows the valuable materials in the construction yard to have a discreet tracker that can monitor where the materials are, meaning they can be tracked in the case of theft and the culprit can be identified.



## CASH-IN-TRANSIT

Naturally, cash and valuables in transit (CVIT) are a key target for thieves. There are numerous deterrents, including SmartWater security dye systems or exploding glue, but tracking devices in cases are commonly used to help the police track down stolen items.

In this situation, the smaller the tracker, the less noticeable it is to thieves. This means that the criminals are less likely to simply rip out the tracker immediately, reducing the likelihood of the authorities finding the items.

Not only is the size of the thin cell advantageous in this situation, the battery is designed with optimized current collectors to ensure it can deliver high bursts of energy. This is particularly useful for radio frequency (RF) transmitters, as used in tracking devices.



## CONSUMER TRACKING DEVICES

Tracking devices are not only used for valuable business items but are increasingly used by consumers to keep track of items. Not only can they be used for items of monetary value such as mobile phones, they can also be used for items with a sentimental value such as a child's teddy.

One leading brand uses Ultralife's Thin Cell batteries in its trackers due to the reliability and size of the batteries. The trackers use Bluetooth technology to feed a signal back to the app to alert the user of the item's location.

All the components inside the battery must be small to ensure that they can be attached to small items such as keys, without adding additional bulk. They must also be long lasting, as the company guarantees that the tracker has a lifespan of a year, without having to replace the battery.

With the rise of connected devices in the industry, business and consumer sectors, tracking devices are increasingly playing a role. The development of thinner, yet still energy dense, battery technologies such as Ultralife's Thin Cell batteries helps tracking devices to be more discreet and used in even more applications in the years to come. Your possessions might not find their own way back like Jimpa did, but you'll be able to find your way back to them.

# Thin cells and medtech

~ Wearable sensors in healthcare ~

---

By 2050, there will be around 83.7 million senior citizens in the United States, increasing rapidly from 49.2 million in 2016. The ageing population across the western world is no surprise to anyone in the healthcare profession, but medical technology (medtech) has to adapt to meet these changing needs.







A recent article by academics from the University of Hamilton, Canada, says that the ageing population will cause a “significant impact on the socio-economic structure of society in terms of social welfare and healthcare needs...Therefore, it is an utmost necessity to develop and implement new strategies and technologies in order to provide better health care services”.


When developing new technologies to better care for the ageing population, many medtech companies are also following the industrial trend of the Internet of Things, with a multitude of connected devices feeding information back to a central point. Wearable devices and sensors are seen as a way to keep a constant monitor on vitals, in a hospital and outside of a healthcare environment.

In a hospital, doctors can use wearables that measure vitals, without the patient being restricted to a bed, but can also use items

such as the SensiVest. This vest is used to prevent recurrent heart failure by measuring the level of fluid in a patient’s lungs and sends the information to a doctor’s computer, allowing the doctor to change the medication if the level of fluid raises.

One example of how wearables are used outside of a hospital environment is created by Kenzen, manufacturers of a wearable smart patch that analyses the electrolytes, metabolites, small molecules and proteins in sweat. These can then indicate through a smartphone app if the body’s glucose levels are too high or if someone is dehydrated.

If wearables are used in either a life-critical device or a device simply to measure everyday health indicators, it is still essential that the device is powered by a reliable battery, despite requiring a small component. This is where thin cell batteries come in.



The Thin Cell range, as manufactured by Ultralife, has cells as thin as 0.4mm, which are packaged in a pouch cell format. The high energy Lithium Manganese Dioxide chemistry means that the battery has a high energy density for its size, denoting manufacturers do not need to increase the size of the wearable device to fit a long lasting battery.

As thin cell batteries can be manufactured as thin as 0.4mm, they reduce the size of the components going into the wearable device. If a wearable device is worn around the clock by someone on the go or by a patient in a hospital bed, it should not be obtrusive. While the thin cell battery is not a conformal battery, it's form encourages a much more ergonomic design to a wearable device.

When manufacturing wearable devices for the changing healthcare market, it's vital that manufacturers consider how to power the device, to ensure that it is long lasting and suitable for the needs of the end user.

If the quality of the battery is not considered by the manufacturer, it could fail at a critical point and fail to collect essential data. Ultralife manufactures Thin Cells to the same quality standard as their "failure is not an option" military batteries. Ultralife has been a top-quality supplier of military batteries for over 25 years.

For medtech to meet the challenges of the ageing population, design engineers must consider the minute detail of every one of their components. Otherwise, wearable products and other new medtech offerings may exist, but they may not be fit for purpose.

A modern living room with a fireplace, a floor lamp, and large windows. The room is well-lit, with natural light coming from the windows. The fireplace is in the center, and there are comfortable-looking sofas and a coffee table. The overall atmosphere is warm and inviting.

# Thin cells and smart security

~ Powering the security revolution ~

---

The worldwide smart home security market is expected to reach \$18 billion in 2020, with smart security systems becoming increasingly prevalent in people's homes to protect against intruders, monitor entrances and detect floods.



Traditionally, alarm systems used wired sensors throughout the home to detect any intruders moving around in the property, relying on a neighbour to call the police if the alarm was set off. However, most smart security services can be controlled by a smartphone app, showing live cameras and allowing homeowners to view alerts.

As more parts of the home are being monitored by smart security sensors, the power requirements for the devices have changed. Sometimes, they cannot all be powered by the central mains supply, as wires are not practical or are too obvious. This means that manufacturers of these devices must carefully consider the power source they use.

For example, smart locks allow the homeowner to gain entry to their home by entering a code, unlocking and locking their door from a smartphone app, or using a key tag. It also provides an additional layer of security for the vulnerable or those with mobility issues, who

can easily see who is at their front door with little-to-no movement required.

From a power perspective, the smart locks are often retrofitted onto existing doors and, given the location of the locks, they cannot be wired to the mains supply. However, the manufacturer must ensure they choose a reliable battery. If the lock was to fail due to a battery that suddenly runs out of power, or needed changing regularly, this could lock someone out of their home.

Choosing a battery from a well-respected manufacturer is therefore essential, as consumer off-the-shelf batteries are often insufficient for a security system. Innovative technologies that improve capacity, such as Ultralife's Thin Cell technology, are essential in these applications.

However, capacity must be balanced by size. Security sensors are used in smart security applications to detect movement. If any movement is detected when the homeowner



is out an alert can be sent to the connected smartphone, so they can use the camera to identify a potential threat or a false alarm.

For this system to be effective the sensors must be discreet, meaning the avoidance of mains wires, or an intruder could identify and try to avoid them. Worse yet, an intruder could cut the wires to disable the system, but it is impossible to cut a wireless connection! The smaller the sensor, the better, so a small yet reliable battery is essential for this type of application.

Thin Cell batteries are constructed in a pouch with square cells, rather than round cells in a square arrangement. This means more cells can be packed into the space, increasing the capacity, without increasing the size of the battery.

Security is such an important topic that device manufacturers must consider the power source early in the design process. And, with home automation intensifying, battery manufacturers

should reflect on how to best power the multitude of sensors and devices which form the web of smart security systems.

If home automation equipment manufacturers fail to use innovative battery technology to ensure long lasting and reliable batteries, end users will soon become frustrated and therefore unlikely to invest in further technology. To ensure the continuation of the growth of the home automation market, choosing the right battery technology is key.



**ULTRALIFE**<sup>®</sup>

[www.ultralifecorporation.com](http://www.ultralifecorporation.com)