



Water Meter Manufacturer Extends Battery Life over 10 Years

Introduction

Everywhere you look, technological advancements are improving the world around us. Take for example, the Industrial Internet of Things (IIoT). Technological advancement in semiconductor and electronics devices, automation solutions, and government support for IIoT solutions, are all driving the growth of the IIoT market. The smart water meter is an example of an IIoT solution that helps utility companies measure the real-time usage of water, monitor for leaks, and help consumers conserve precious water resources.

One premier water meter manufacturer in China took advantage of the technological advancement and set out to modernize its meters with LoRa-based communications. Half-way through its design cycle, the manufacturer ran into unexpected challenges managing the power consumption of its design. Using the Keysight X8712A IoT device battery life optimization solution, the company reduced its development and test time by two months. This solution improved the design by extending the battery life to over 10 years.



Company:

- Premier water meter manufacturer in China

Key Issue:

- Lack of insight into the power consumption to help with the design of new smart meters

Solutions:

- Keysight X8712A IoT device battery life optimization
- Keysight KS833A1A event-based power consumption monitoring software

Results:

- Reduced development and test time by two months
- Resolved design flaws to extend battery life to over 10 years



The Company: Premier Water Meter Manufacturer in China

A premier water meter manufacturer in China, known for its high-quality meters and extensive portfolio across residential, industrial, and agricultural applications, recently began developing a new line of LoRa-based smart water meters. These smart water meters have an embedded wireless module, can provide real-time measurements, and receive and execute commands from the water utility. The new LoRa smart water meters have low-power capabilities and a longer battery life — a baseline expectation for a low-power wide-area network (LPWAN) device. However, the manufacturer had a concern about the unit's power consumption early in the product design cycle. Their design and test engineers needed a solution to confirm the battery-operated water meter's longevity.

The Key Issue: Lack of Visibility into the Power Consumption

During the product design and development stage, the manufacturer realized they lacked visibility into power consumption from critical events and subsystems. Without these insights, the design engineers could not make changes or trade-offs to optimize battery life. The engineers lacked critical data to make design and cost trade-offs for the display, flow meter, and gauge components.

The lengthy sleep time between each data transmission, a characteristic of LPWAN devices, presented further challenges to the design engineers. Capturing current waveforms and completely characterizing the battery life was time-consuming across several transmission cycles. These challenges prolonged the product validation cycle and increased the risk of an inaccurate measurement when characterizing the meter's battery life. This created uncertainty and risk that the product could fail to meet battery life expectations after field deployment.

The design engineers knew that traditional general-purpose instruments could not deliver the precision measurements, data collection, visualization, and correlation capabilities needed to solve their problem. Also, the engineers knew they would need multiple traditional instruments to get the job done.

The Solutions: Battery Drain Analysis Redefined

The manufacturer approached Keysight looking for a solution to help shorten its design cycle. Keysight recommended the Keysight X8712A IoT device battery life optimization solution to meet their requirements.

The X8712A enabled the design engineer to detect inefficiencies in the design quickly, using a combination of synchronous RF event and current consumption analysis. They now could perform in-depth current consumption analysis and the estimated battery life

of the smart meter. The patented seamless ranging capability of the Keysight N6781A source measure unit (SMU) was critical to accomplishing the job quickly and accurately. The N6781A measures a wide range of current, from tenths of milliamps of active mode current, down to sub-microamperes of standby mode current.

Through the Keysight KS833A1A event-based power consumption monitoring software, the design engineer was able to analyze the data and gain insights that resulted in design changes implemented early in the development cycle. Figure 1 shows how the software correlates power consumption to RF or analog voltage / current events in the subsystem of a smart meter. This correlation enabled the design engineer to pinpoint critical events that consume the most current.

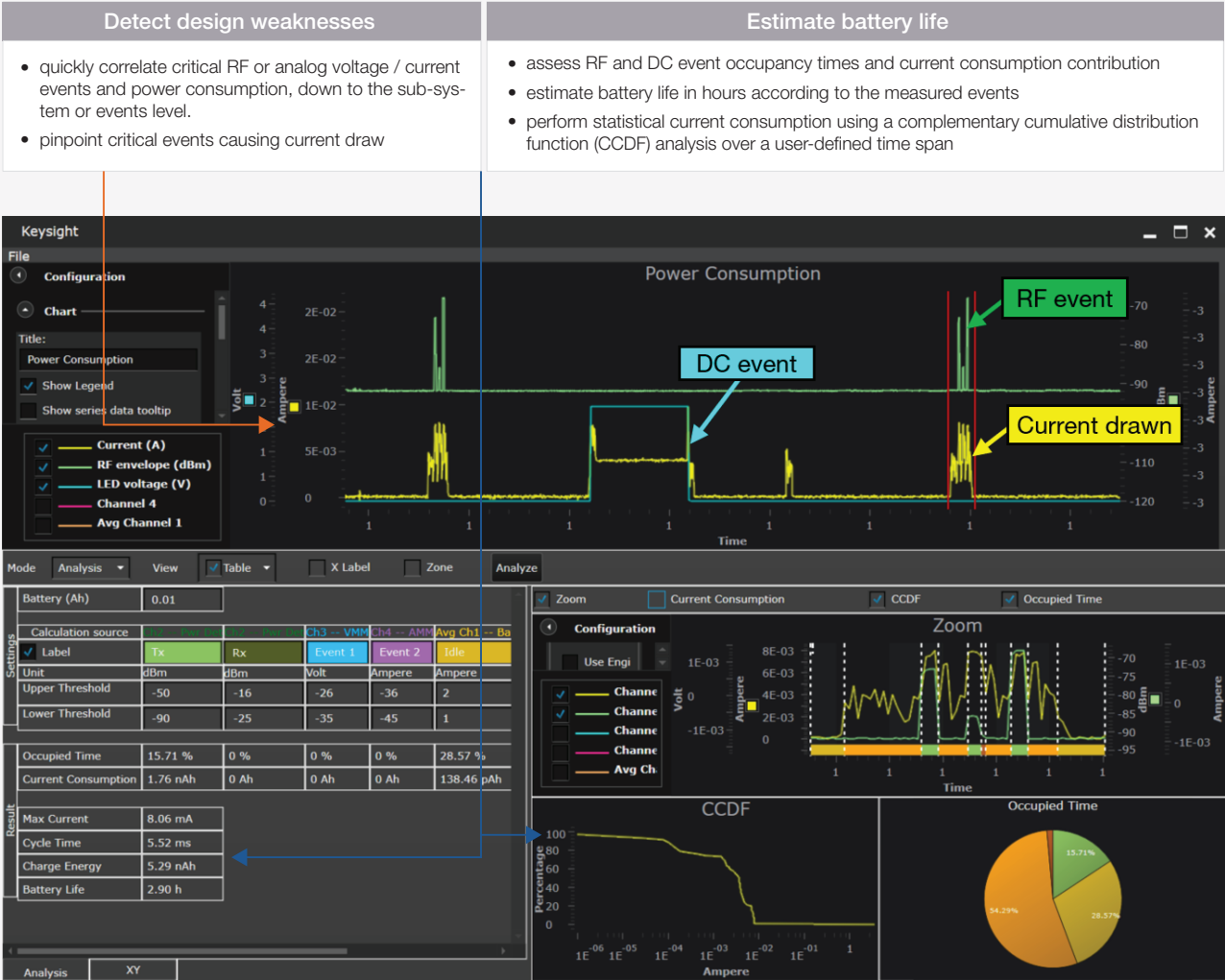


Figure 1. Event-based power analysis displaying a correlation between RF / DC events and current drawn

The X8712A supports waveform acquisition level triggering, enabling the design engineers to log critical event timing together with the current consumed. Figure 2 displays the data to estimate battery life.

Design engineers can use this information to predict device behavior in the field. The engineers quickly found that the meter would not sustain more than 10 years of operating life while using the LoRa module.

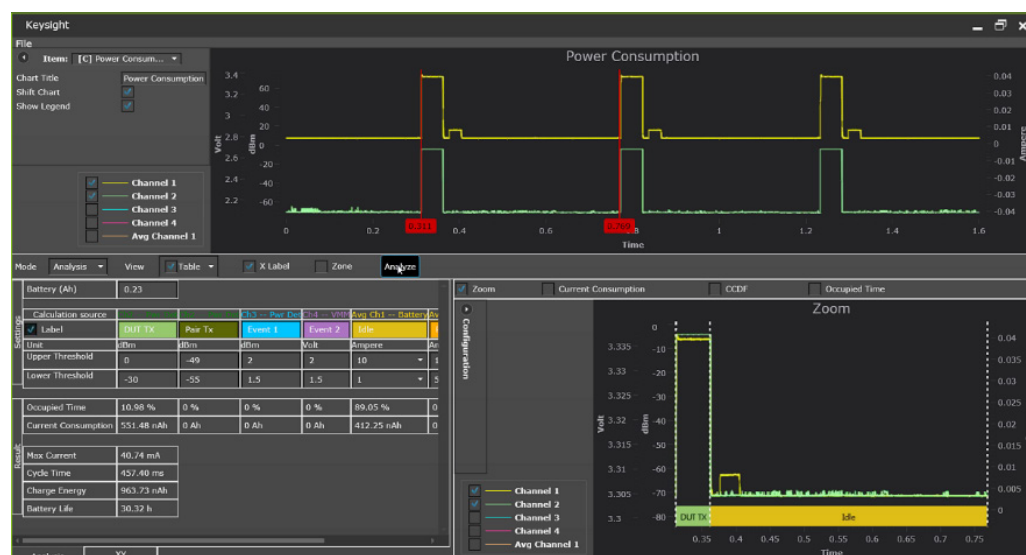


Figure 2. X8712A software displaying the battery life analysis of a LoRa module

The detailed analysis showed that the maximum current consumption was higher than expected, and it occurred at a specific spreading factor. Using this data, the design engineer determined that changing a particular subsystem module would reduce the overall power consumption so that the meter design could meet the requirement of more than 10 years of battery life.

”

We're lucky to be able to discover the issue with power consumption early in the design cycle. It would have costs us a lot of time and resources if the issue was found later. Our reputations would have been jeopardized and shipping to customers would have been delayed.

Senior Design Engineer

The Results: Reduced Product Design and Development Time

The X8712A IoT solution, shown in Figure 3, enabled the design engineer to discover design issues early in the design cycle quickly. The X8712A reduced the development and test time by two months. With the new tools, design engineers at the meter company could achieve design and test cycles that were not possible using traditional general-purpose instruments.

The manufacturer saved time and cost by testing its design early and prevented a costly product recall by measuring and analyzing device power consumption. This solution enabled the manufacturer to confidently ship a meter that would provide over 10 years of continuous operation in the field.



Figure 3. Keysight X8712A IoT battery life optimization test solution

To learn more, please visit:

www.keysight.com/find/X8712A

www.keysight.com/find/devtestiot.

Learn more at: www.keysight.com

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: www.keysight.com/find/contactus

