



CASE STUDY

SMART SYNC

Maxwell Technologies, Inc.

Maxwell Technologies, Inc.
Worldwide Headquarters
9244 Balboa Avenue
San Diego, CA 92123
USA
Phone: +1 858 503 3300
Fax: +1 858 503 3301

Maxwell Technologies SA
CH-1728 Rossens
Switzerland
Phone: +41 (0)26 411 85 00
Fax: +41 (0)26 411 85 05

Maxwell Technologies GmbH
Brucker Strasse 21
D-82205 Gilching
Germany
Phone: +49 (0)8105 24 16 10
Fax: +49 (0)8105 24 16 19

**Maxwell Technologies, Inc. -
Shanghai Representative Office**
Rm.2104, Suncome Liauw's Plaza
738 Shang Cheng Road
Pudong New Area
Shanghai 200120, P.R. China
Phone: +86 21 5836 5733
Fax: +86 21 5836 5620

info@maxwell.com – www.maxwell.com

MAXWELL TECHNOLOGIES CASE STUDY: Smart Sync

Market Conditions Influencing Automatic Meter Reading (AMR) Technology

For electricity suppliers to provide a high level of continuous service to their customers, they need a way to monitor the entire supply path. The vast amount of data collection needed in the utility industry necessitates an automated system because on-site human meter-readers could never collect data as fast as it is required. Automatic meter reading (AMR) is fast becoming a necessity for utilities as they strive to collect timely, accurate data from an ever-increasing number of service locations.

The Automatic Meter Reading Association defines AMR as “the remote collection of consumption data from customers' utility meters using telephony, radio frequency, power-line and satellite communications technologies. AMR provides . . . electric utility-service companies the opportunity to increase operational efficiency, improve customer service, reduce data-collection costs and quickly gather critical information that provides insight to company decision-makers” (see www.amra-intl.org/about/amr.htm). AMR is no longer a luxury; it is a requirement for utilities looking to compete in a deregulated global market in which the demand for precise metering information never ceases.

SmartSynch's AMR System – SmartMeter™ System

SmartSynch® Inc. is a leading technology provider for remote meter monitoring for the electric utility industry, providing a completely integrated end-to-end AMR system for utilities' highest-revenue Commercial & Industrial customers as well as lower-usage residential customers. SmartSynch's SmartMeters are linked through public two-way data communications networks to the Transaction Management System, a Web-based head-end software system developed by SmartSynch.

AMR Challenges

The key element of an AMR system is the automatic meter. For rapid deployment, automatic meters must be plug-and-play, transparently replacing existing meters. In addition to communicating detailed power-consumption data, SmartSynch's SmartMeters report power-outage and restoration status, complete self-diagnostics, power service, wiring stability and health, tamper detection, and meter-clock deviations and corrections. For these advanced features to be successfully integrated into a competitive product, the size, lifespan, and cost of the communication hardware's power supply are key considerations in creating the wireless meter.

Maxwell Technologies, Inc.
Worldwide Headquarters
9244 Balboa Avenue
San Diego, CA 92123
USA
Phone: +1 858 503 3300
Fax: +1 858 503 3301

Maxwell Technologies SA
CH-1728 Rossens
Switzerland
Phone: +41 (0)26 411 85 00
Fax: +41 (0)26 411 85 05

Maxwell Technologies GmbH
Brucker Strasse 21
D-82205 Gilching
Germany
Phone: +49 (0)8105 24 16 10
Fax: +49 (0)8105 24 16 19

Maxwell Technologies, Inc. -
Shanghai Representative Office
Rm.2104, Suncome Liauw's Plaza
738 Shang Cheng Road
Pudong New Area
Shanghai 200120, P.R. China
Phone: +86 21 5836 5733
Fax: +86 21 5836 5620

MAXWELL TECHNOLOGIES CASE STUDY: Smart Synch

Since the SmartMeter must report power-outage events, it requires some form of energy storage. Lead-acid batteries had been the original power source, but their life expectancy was only three to five years, they were relatively large and heavy, and battery replacement was a costly process.

The Solution: An Inexpensive, Reliable, and Compact Energy Source

SmartSynch needed an energy source that could draw power from the meter power supply at a relatively constant rate and then handle the power peaks demanded by the SmartMeter's wireless connectivity. Power peaks are known to dramatically reduce the life of conventional batteries. A power source was needed that could withstand the full operating temperature range of (-40°C to +85°C). Operating at such extreme temperatures diminishes operating performance and shortens the life of batteries, while also degrading their packaging.

During its investigation into alternative power-supply options, SmartSynch discovered ultracapacitors (also called "supercapacitors" or "electrochemical double-layer capacitors") as an innovative technology for energy storage and power delivery and realized that they could provide many benefits over their existing components. One of the manufacturers SmartSynch considered as a possible supplier of ultracapacitors was Maxwell Technologies, a leader in ultracapacitor technology and manufacturing. SmartSynch chose Maxwell's BOOSTCAP[®] PC10 ultracapacitor.

Why Ultracapacitors?

Maxwell's BOOSTCAP PC10 ultracapacitor was chosen because of its unique characteristics. This energy-storage component is small, lightweight, and board-solderable. Though it stores less energy than a battery, it stores far more than SmartSynch's specification requires, and meets the power required to transmit the AMR's data. Relatively inexpensive, the ultracapacitor requires no special charging regimes, operates well over the AMR's complete temperature range, and has a proven installed life of up to ten years.

Maxwell Technologies, Inc.
Worldwide Headquarters
9244 Balboa Avenue
San Diego, CA 92123
USA
Phone: +1 858 503 3300
Fax: +1 858 503 3301

Maxwell Technologies SA
CH-1728 Rossens
Switzerland
Phone: +41 (0)26 411 85 00
Fax: +41 (0)26 411 85 05

Maxwell Technologies GmbH
Brucker Strasse 21
D-82205 Gilching
Germany
Phone: +49 (0)8105 24 16 10
Fax: +49 (0)8105 24 16 19

Maxwell Technologies, Inc. -
Shanghai Representative Office
Rm.2104, Suncome Liauw's Plaza
738 Shang Cheng Road
Pudong New Area
Shanghai 200120, P.R. China
Phone: +86 21 5836 5733
Fax: +86 21 5836 5620

MAXWELL TECHNOLOGIES CASE STUDY: Smart Sync



A3 SmartMeter integrating Elster's A3 ALPHA[®] meter with SmartSynch's SmartMeter module



Maxwell Technologies
PC10 Ultracapacitor

Results after Integrating Ultracapacitors

The Elster A3 ALPHA[®] meter is one of the wireless SmartMeters offered by SmartSynch. With Maxwell Technologies' BOOSTCAP ultracapacitors in the SmartMeter, instead of more traditional energy sources such as lithium-ion or lead-acid batteries, the life expectancy of the SmartMeter's power supply is extended to over ten years, providing a 100- to 300-percent improvement over lead-acid batteries. SmartSynch has developed an energy storage sub-system in the SmartMeter containing six PC10s and utilizing a state-of-the-art invention under a patent-pending application. This design also leverages the PC10's lightweight, rugged packaging and numerous mounting options. SmartSynch realized an overall cost savings of over \$200 per meter by eliminating the battery-replacement task during its 10-year cycle, a savings that the company has been able to pass on to its customers. Additional savings in hardware costs are achieved through the smaller footprint of the new ultracapacitor-based power supply.

SmartSynch customers have provided very positive feedback on this version of the SmartMeter, which entered distribution in early 2003. Customers have reported that the A3 SmartMeters in the field are easy to install and operate, have better product integration, are working well, and are meeting or exceeding all expectations. The performance improvements and price reduction of the SmartMeter resulting from the

Maxwell Technologies, Inc.
Worldwide Headquarters
9244 Balboa Avenue
San Diego, CA 92123
USA
Phone: +1 858 503 3300
Fax: +1 858 503 3301

Maxwell Technologies SA
CH-1728 Rossens
Switzerland
Phone: +41 (0)26 411 85 00
Fax: +41 (0)26 411 85 05

Maxwell Technologies GmbH
Brucker Strasse 21
D-82205 Gilching
Germany
Phone: +49 (0)8105 24 16 10
Fax: +49 (0)8105 24 16 19

Maxwell Technologies, Inc. -
Shanghai Representative Office
Rm.2104, Suncome Liao's Plaza
738 Shang Cheng Road
Pudong New Area
Shanghai 200120, P.R. China
Phone: +86 21 5836 5733
Fax: +86 21 5836 5620

MAXWELL TECHNOLOGIES CASE STUDY: Smart Sync

migration to Maxwell Technologies' BOOSTCAP ultracapacitors are so significant that SmartSynch considers the components a key selling point of the SmartMeter.

The Right Component Enables the System Solution

SmartSynch's end-to-end AMR solution enables the utility meter to perform myriad new functions, which are possible only with the integration of new components. Conventional components are inadequate because of their cost, size, performance, and reliability. The success of the system required the integrator to identify new alternative components and suppliers. Suppliers such as Maxwell will be successful in building new markets for themselves and for their customers because they have recognized the need to drive down the cost and enhance the performance of these new components and have made substantial investments in time and capital to do so. By adopting new component technology, SmartSynch increased the performance and reduced the cost of its AMR meter, in turn providing greater value for its customers and building new markets for its systems.

Information flow and the systems upon which the information age relies are enabled by the interaction of technologies at both the component and the system levels. The successful companies will be those that understand how to effectively integrate new capabilities while driving down costs, thus developing entirely new systems solutions and opening up new markets.

Maxwell Technologies, Inc.
Worldwide Headquarters
9244 Balboa Avenue
San Diego, CA 92123
USA
Phone: +1 858 503 3300
Fax: +1 858 503 3301

Maxwell Technologies SA
CH-1728 Rossens
Switzerland
Phone: +41 (0)26 411 85 00
Fax: +41 (0)26 411 85 05

Maxwell Technologies GmbH
Brucker Strasse 21
D-82205 Gilching
Germany
Phone: +49 (0)8105 24 16 10
Fax: +49 (0)8105 24 16 19

**Maxwell Technologies, Inc. -
Shanghai Representative Office**
Rm.2104, Suncome Liauw's Plaza
738 Shang Cheng Road
Pudong New Area
Shanghai 200120, P.R. China
Phone: +86 21 5836 5733
Fax: +86 21 5836 5620

info@maxwell.com – www.maxwell.com