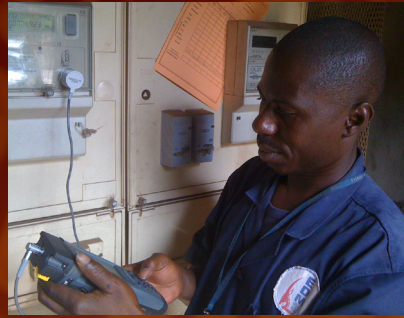# Handheld Computers Improve Data Collection, Operations and Customer Experience for Energie du Mali

Situation
Paper-Based System Resulting in Inaccuracies and Inefficiencies

Delivering energy and water to Mali's population over a vast and varied African landscape is demanding enough. Compounding these challenges for the country's electricity and water company, Energie du Mali, was a paper-based system for data collection of meter readings to determine customer usage and invoices accordingly.

As with many other paper-based systems, inefficiencies and inaccuracies plagued operations. Data collected manually on the ground had to be entered by hand again in the billing system, leading to a high occurrence of human error, redundant data entry, billing delays and a high rate of erroneous invoices. Manual filing and tracking of paperwork caused additional difficulties.

Energie du Mali made a measured and forward-looking decision to transition to a computer-based information processing system that would allow its Zone Agents, or meter readers, to use handheld computers in the field to collect meter readings and transmit the data back to the billing system.

The computer equipment would need to work reliably in challenging environmental conditions ranging from extremely hot and dusty to rainy, wet and muddy. The harsh terrain also necessitated a computer that could survive drops to the hard ground. And because certain territories covered wide expanses of rural areas with limited access, the computers would require a long battery life and secure storage of data.

Approach
Integrated Solution with Rugged Handheld Computers

Beginning in late 2004, Energie du Mali transitioned to an integrated solution using the CE5000B-series handheld computers from DAP Technologies and system development, software and support from AS Consulting.

The solution takes a system-wide approach to solving the inefficiencies of the paper system with embedded software on the handheld computers, a server to manage the dispatching of data, and the ability to integrate the data collected on the ground into the billing system.

DAP's CE5000B, the rugged handheld at the heart of the initial solution for Energie du Mali, is used for collecting meter readings and accurately updating the billing system with the information. The computer's quick data capture, intuitive and easy-to-use design, and reliable data storage make it easy to use in the field, and the company utilised 200 handheld units in the initial launch of the automated system.

The computer serves a dual role by reading both the Medium Average data (MT) and the electrical low tension and water meters (BTO). As the Zone Agents read the meters along their routes, the information they collect is securely stored in the computer until it is transferred to the billing system.

In Mali, where the average year-round temperature is 30°C (86°F), a computer that performs in heat is important. DAP's

CE5000B operates up to 50°C (122°F) and can be stored up to 60°C (140°F). Its sunlight-viewable 3.5" diagonal color LCD screen with LED backlight displays easily readable data, even under the blazing sun.

Sealed to IP67, the computer offers protection against the dust-laden Saharan desert that covers much of Mali, as well as against driving rains when storms roll across the country. The computer also meets and exceeds IEC 68-2-32 and MIL-STD-810F ratings for extreme temperatures, thermal shock and free-fall drop.

Results
Operational Efficiencies and Cost Savings

Energie du Mali's transition to a computer-based system has produced both operational efficiencies and cost savings.

With the paper-based system, Zone Agents averaged about 800 readings per 10-day period. Transitioning to a computer-based system has resulted in a 50 percent increase in the number of meters read during the same period. Zone Agents now average approximately 1,200 meters during a 10-day period.

From a data management standpoint, the computer system has helped ensure the integrity of data. Whereas paper forms are

> " *Transitioning to a computer-based system has resulted in a 50 percent increase in the number of meters read during the same period.* "

compromised by the rain and can blow away in the wind, the rugged DAP computers—impervious to weather conditions—have allowed the Zone Agents to collect and safeguard data no matter what weather systems are encountered.

By automating meter reading, data is entered just once and transferred to the billing system automatically. The outcome of this process improvement is fewer errors and less duplication of effort, as well as a reduction in paperwork and shortening of the billing cycle.

Both Energie du Mali and its clients have benefitted from fewer erroneous invoices. The company has achieved a drastic reduction of errors detected after billing, with the claim rate declining from 500 claims per monthly billing period to fewer than 10 claims per month today.

The billing period is also better controlled. In the past, the billing cycle took about 40 days. With the computer system, Energie du Mali has been able to reduce that to fewer than 30 days, as required by the company's board management.

Overtime and overwork for both the Zone Agents and Invoice Makers have also been reduced, resulting in direct savings for the company. Now recruitment of new Zone Agents is to facilitate expansion into new neighborhoods and cities rather than a strategy to reduce overtime and overwork.

At the Heart of the Solution
Features of DAP's CE5000B rugged handheld computer used in the Energie du Mali solution:

Base Unit
Processor
- XScale (Bulverde) – PXA270, 520 MHz

Operating System
- Windows® CE 5.0

Memory
- 256 MB Storage Flash for WIN CE and file system (approximately 192 MB available to user)
- 128 MB SRAM (approximately 64 MB used for OS)
- Optional: Additional storage via PCMCIA/CF Flash cards and USB connected memory devices and SD Memory Flash Cards

Display
- 3.5" diagonal (89 mm) QVGA TFT active matrix transflective color
- LCD with LED backlighting for the best match of indoor/outdoor readability
- Two display formats available: portrait (240 x 320 pixels) or landscape (320 x 240 pixels)
- **Connectivity**
- Ethernet 10BaseT
- Wireless Edition adds Bluetooth® Class 2 and 802.11 b/g

Ports
- Internal, user accessible and environmentally sealed
- 3 serial ports (TTL level)
- 1 USB Client
- 1 USB Host
- 5 Volt Power for external devices
- 1 PC Card Type I & II (CF Card via adapter)
- 1 Secure digital (SD or SDIO) slot

Environment
Immersion, Rain and Humidity
- Meets MIL-STD-810F method 512.4 procedure I
- IP67 (Immersion 1 m) for 30 minutes
- Meets MIL-STD-810F method 506.3 procedure I (wind blown rain)

Humidity
- 95% non-condensing

Available Options
- Universal Imager (3MP color camera with zoom, auto-focus, flash, video capture, 1D/2D barcode reading, OCR*)
- Laser barcode scanner
- SiRFstarIII GPS

The Solution for the Future

Energie du Mali is transitioning to DAP's CE3240B rugged handheld computer.

Base Unit

Processor
- XScale (Bulverde) – PXA270, 520 MHz

Operating System
- Windows® CE 5.0

Memory
- 256 MB Storage Flash for Windows® CE and file system (approximately 64 MB available to user)
- 128 MB SRAM (approximately 64 MB used for OS)
- Optional: Additional storage via PC Card, CF or SD cards

Display
- 3.5" QVGA TFT color LCD with LED backlighting
- Indoor/Outdoor display
- Scratch and shock resistant touchscreen can be used with a stylus or finger

Connectivity
- Internal 802.11 b/g and Internal Bluetooth® Class 2 [Wireless Edition]
- Ethernet 10 BASE-T [through cradle]
- Optional integrated 5-bands, GPRS/EDGE/UMTS 3G mobile WWAN; internal antenna

Environment

Rain and Humidity
- IP65
- MIL-STD-810F method 506.4 procedure I (wind blown rain)
- Humidity: 95% RH, non condensin

Ports
- USB (Host/Client) via cradle
- Ethernet 10 Mbps via cradle [B Edition]
- 1 SDIO card slot
- 1 PC card slot or 3G WWAN radio

Available Options
- Universal Imager (3MP color camera with zoom, auto-focus, flash, video capture, 1D/2D barcode reading, OCR*)
- Laser barcode scanner
- SiRFstarIII GPS
- HID Prox Card Reader (125 KHz)
- High resolution fingerprint sensor
- Magnetic Stripe Card Reader
- Smart Card Reader - contact and contactless (FIPS-201 certified)
- Security Access Modules (SAM)

* 1D/2D barcode reading and OCR capabilities require an optional software licence.

On the Horizon

A Transition to the Next Generation of Handheld Computers

After experiencing the benefits of a computer-based system over the past several years, Energie du Mali is upgrading its computer equipment to realize additional efficiencies. The company chose to invest in DAP Technologies' new CE3240B handheld computers after careful consideration and due diligence.

With DAP's CE3240B, data will be transmitted by Wi-Fi over the local area network and also by GPRS real-time to the back-office server. From there, the integrated solution automatically will update the billing system. The outcome will be a faster, more efficient transfer of data that eliminates the need for the Zone Agent to physically visit the main office to download the data.

DAP has also customised a special connector for Energie du Mali that will be used to carry out the indices readings by probe, thereby reducing manual data entry. The new connector allows an automatic, faster reading of the meter index using an optical probe. Whereas the Zone Agent can spend 10 minutes performing a manual reading, the information is transmitted in seconds using the new connector.

While the CE3240B packs in many of the same features as its predecessor with enhanced functionality and processing power, the design of the computer has been overhauled. Smaller, lighter and ergonomically designed, the handheld computers were engineered to lessen user fatigue. The device weighs only 454 grams with the extended-life battery, which is designed to provide a full charge for an entire 8-hour shift and is field-swappable.

The Bottom Line

DAP Technologies and AS Consulting have developed an integrated and flexible solution for Energie du Mali that streamlines operations, boosts efficiency and saves money. The solution is unique to the company's needs, yet presents a workable model for companies considering a similar strategy.

About DAP Technologies

DAP Technologies is the premier provider of fully rugged, highly customisable mobile computers for harsh outdoor environments. DAP designs and manufactures mobile computers for a range of demanding industries including Utilities, Field Service, Emergency Services, Public Safety, Transportation and Logistics. DAP's handheld and tablet computers provide solutions for the utility industry's diverse needs in meter-reading, data collection, communications and field service. With local software partners, DAP uniquely serves utility industries throughout continental Africa and the world.

DAP Technologies employs a talented team worldwide, benefits from an extensive network of partners and resellers (VARs), and markets its computers in more than 60 countries. DAP is based in Quebec, Canada, and has offices in the United States and United Kingdom.

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