Solar inspection and administration system developed for the SABS

by Armand van der Merwe, AfriGIS

Abstract

The South African Bureau of Standards (SABS) is a leading global provider of standards, management systems, business improvement and regulatory approval information. A solution for auditing and quality assessment of solar installations was required to better inspect each installation and location of solar geysers.

AfriGIS developed a flexible, detailed, secure and paperless data capturing and information management system using both mobile and web based solutions. The solution addresses the lengthy process and enables the SABS to:

- Manage the surveying of solar geyser installations in specified areas on a mobile platform
- Upload captured data wirelessly to the database while the inspectors are out in the field
- Monitor the management and distribution of tasks to task managers and inspectors
- View inspections and plan routes to receive exact directions to the desired locations/installations
- Verify data
- Perform audits on the quality of installations in terms of the approved quality standards

The solution has two functions: firstly, the field inspection process and secondly, the data management and reporting to ensure that standards are met and installations are correct.

Thousands of addresses were geocoded to determine the location of the installed solar water heating systems. These addresses were then visited, inspected and recorded for reporting purposes.

In the past such an auditing process was an extensive manual process of capturing details and then returning the data for further manipulation to produce reports for evaluation.

The technology allows the SABS to conduct their surveys electronically; eliminating the use of paper forms and in turn reducing inspection turnaround times. They now have access to information captured in the field and are able to create daily progress reports for Eskom on project, as well as “flagged” issues, reported on the solar water geyser installations.

The bespoke solution for the SABS was created with a combination of AfriGIS products and services including the AfriGIS Forms framework, AfriGIS Navigator and AfriGIS Mapserver Technology.

The project was not without challenges and innovative solutions were found for areas with poor cellular coverage and remote management of devices. The SABS has been able to successfully conduct the audit and reporting of the solar geyser installations and the locations thereof.

Keywords

SABS, AfriGIS, Eskom, solar geyser, administration, inspection, mobile workforce

Introduction

The South African Bureau of Standards (SABS) is a leading global provider of standards, management systems, business improvement and regulatory approval information. A solution for auditing and quality assessment of solar installations was required to better inspect each installation and location of solar geysers.

AfriGIS developed a flexible, detailed, secure and paperless data capturing and information management system using both mobile and web based solutions. The solar inspection and administration solution comprise two components: firstly, the field inspection process and secondly, the data management and reporting function to ensure that installations are correct and standards are met.
SABS requirements for the project

The South African Bureau for Standards (SABS) required a mobile and web solution for auditing and quality assessment of solar installations, where approximately 44 000 installed solar water heating systems needed to be inspected and relevant data and requirements had to be recorded for each installation.

Field inspection processes comprise the following:

- Data capturing through BlackBerry 9300 devices
- Viewing of inspection tasks
- Exact directions to the desired locations/installations
- Uploading of captured data wirelessly to the database

Data management and reporting processes comprise the following:

- Audit inspection results
- Verification of all captured and audited data
- Compilation of comprehensive reports on each installation
- Performing of various status reports, correlating results and trends in various groups for analyses purposes e.g. regions, installers, manufacturers, etc.
- Management and distribution of tasks to relevant task managers and inspectors

The database management application is a stand-alone web application and can be accessed via these web browsers:

- Internet Explorer 8 and 9
- Firefox 4 and higher version including latest version
- Google Chrome

The application is capable of receiving data from remote data-capture devices via a service provider and populating the database with this data. It is capable of sending and receiving data for up to 150 devices at a time. The database stores the records of all completed inspections, as well as data from re-inspection of reworked installations. Inspections are based on responses to a standard checklist and include free-form fields for comments, as well as low resolution geo-tagged photographs and data identifying the relevant inspector.

In instances where reporting is not satisfactory, auditors have the ability to request that inspectors provide any outstanding data, including re-inspections. SABS staff members have read-only access to the data for the purpose of generating reports via standard menu options.

The database management system provides standard reports that can be created or printed at any time. All new tasks can be made available to task managers and task allocators. Task managers allocate and send tasks to inspectors via the administration console and all inspectors receive their allocated tasks on their BlackBerry devices.

Reporting

Reports include the following components and requirements:

- Complete report on the inspection of a specific address including GPS coordinates or a bar code
- Summary report of inspections and trends done per time period; day, week, month
- Summary of results/trends per installer
- Summary of results/trends per brand name
- Summary of results/trends per region
- Summary of results/trends per location
- Summary of results/trends per inspection finding(s) or fault e.g. leaks, incorrect piping etc.
- Real time statistical reports

Data capturing

Approximately 100 inspectors were equipped with a BlackBerry Curve 3G 9300 device with the SABS inspections application installed to record the findings of inspections.
Although BlackBerry devices are capable of connecting to the major cell phone network providers (MTN, Vodacom or Cell C) for the transmission of data and photographs that are captured during inspections, the SABS opted to make use of the Vodacom network in South Africa.

Data recording includes making entries as required by the inspection, entering comments into free-form fields and taking of photos. For each inspection the device records the GPS coordinates, date and time for all photos taken. Upon completion of the inspection, data is submitted and uploaded to a central database with user login verification for location, tracking and access rights and security purposes.

Offline functionality allows field agents to complete inspections on the BlackBerry device without data coverage. Forms captured offline are automatically submitted to the server as soon as network coverage becomes available.

**Navigation component (AfriGIS Navigator)**

A navigation component is included in the solution as a separate application on the handset. The application allows inspectors or task managers to use the route planner and navigate to an inspection site, by searching for the inspection site address on the application. Routes are downloaded from the server via the data network, but data is not required for actual navigation.

**Inspections**

Inspections contain the following statuses throughout the project lifecycle:

- **New**: All inspections start as “New” tasks. New inspections are assigned from the administration level to the task manager, who in turn assigns the new inspections to a selected inspector.
- **Assigned**: Once an inspection has been assigned to the selected inspector, the task is updated to “Assigned”.
- **Submitted**: The status of the inspection is updated to “Submitted” when the inspector has uploaded the complete inspection.
- **Approved**: The inspection status is updated to “Approved” when an auditor approves an inspection.
- **Rejected**: The inspection status is updated to “Rejected” when an auditor rejects any question on the inspection

**Inspector ratings**

In order to facilitate an efficient auditing process, a rating mechanism is required in order to quantify the level of work performed by an inspector. The rating achieved by the relevant inspector allows the system to evaluate the percentage of questions to be audited for a specific inspector.

The ratings of inspectors are reviewed continuously and are based on the performance of historic results.

**Auditing**

Auditing is done via a process where all inspections are checked by a set of appointed auditors. The system allows auditors to audit only certain questions per inspection, based on the rating of the relevant inspector. This saves time by not auditing all the questions for inspectors with a good rating, while maintaining a high confidence level.

Batches are formed in instances of eight un-batched inspections per inspector. Should an inspection fail an audit, the original batch ID attribute is saved per inspection. At a later stage the inspection is then allocated into a new batch but with the original batch ID maintained used for trend reporting. The system places the batches in a queue based on the batch priority, namely normal queue and priority queue.

All inspections captured contain a priority based on their location, as provided by the SABS.

**Conclusion**

The solar geyser inspection and administration solution for the SABS was created with a combination of AfriGIS products and services including the AfriGIS Forms framework, AfriGIS Navigator and AfriGIS Mapserver Technology.

Inspectors received their daily inspection lists electronically and then captured the actual inspections on Blackberry devices. Thousands of addresses were geocoded to determine the location of the installed solar water heating systems. These addresses were then visited, inspected and recorded for reporting purposes.
Key functionalities in the application included a geo-fencing capability to ensure that the correct site was inspected, as well as advanced communication components to deal with interruptions in coverage and partial submissions.

In the past such an auditing process was an extensive manual process of capturing details and then returning the data for further manipulation to produce reports for evaluation. The technology allows the SABS to conduct their surveys electronically; eliminating the use of paper forms and in turn reducing inspection turnaround times. They now have access to information captured in the field and are able to create daily progress reports for Eskom on project, as well as “flagged” issues, reported on the solar water geyser installations.

This massive project yielded no less than 1,2-million photographs, totaling more than 317 GB of data in one of the biggest field verification projects to date. Tens of thousands of sites were visited in just over half a year and the SABS has been able to successfully conduct the audit and reporting of the solar geyser installations and the locations thereof.

Contact Armand van der Merwe, AfriGIS, Tel 087 310-6400, armand@afrigis.co.za