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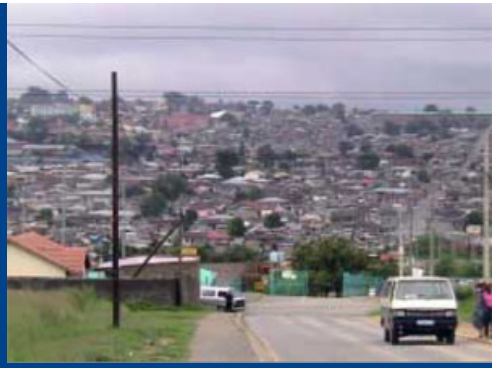
Articles

GRINPAL SUCCESS STORY IN ALEXANDRA

Background

Alexandra Township is situated on the North-Eastern outskirts of Johannesburg. Established in 1905 after being acquired from a farmer, it is one of Gauteng's most densely populated townships, with about +/-2 million residents. Just like many other Black townships during apartheid years, the residents were deprived basic services like housing, electricity and water, which were provided to only a few privileged ones and government institutions like the Municipality, schools and clinics.



This is an overview of Alexandra township, a tale of 2 cities. You see the most affluent houses on one side and at the same time there are shacks where people live in abject poverty

ADVANTAGES OF PRE-PAID ELEC-TRICITY THEN WERE (AND STILL ARE NOW):

•CONSUMERS CAN BUY ELEC-TRICITY BEFORE CONSUMING IT. THIS ALLEVIATES UNPLEASANT SURPRISES THAT COME WITH ELECTRICITY BILLS AFTER A CERTAIN CONSUMPTION PERIOD, AND HELPS CONSUMERS TO MANAGE THEIR ELECTRICITY USAGE.

Electrification Project
In 1990 Eskom and the government embarked on the electrification programme in rural areas and Black townships that did not have electricity, and prepaid meters were installed in such areas.

Non-Payment
Due to the culture of non-payment and other problems like crime, some residents learnt how to by-pass the prepaid meters and consumed electricity without paying for it. The problem became very big when most of the residents began paying these criminals a fee to have their meter also by-passed, and Municipalities began to suffer financially. What worsened the situation was that the utility did not have a way of establishing immediately when a consumer has by-passed or tampered with the meter in any way. They depended entirely on tip-offs from honest consumers, members of the Community Policing Forum and random audits. Unfortunately, not many community members would

•THE TOKEN THAT IS LOADED WITH ELECTRICITY OR NUMBER PRINTED ON THE SLIP CAN BE USED BY THE SPECIFIC CON-SUMER ONLY, SO NO ONE CAN STEAL YOUR ELECTRICITY.

•THE PROBLEM OF METER READING, WHICH HAS ALWAYS BEEN DEBATABLE, IS AUTO-MATICALLY SOLVED.

•THE UTILITY DOES NOT HAVE TO SEND OUT BILLS EVERY MONTH, AND THIS IS A SAVING ON THEIR SIDE.

•THE UTILITY DOES NOT HAVE TO SPEND SO MUCH TIME, AS THEY USED TO IN THE PAST, TO CUT OFF CUSTOMERS WHO DID NOT PAY THEIR ELEC-TRICITY BILLS.

provide information, obviously for fear of their own safety. At the same time, the municipality came under a lot of pressure from the government to collect revenue for basic services, and electricity especially (because electricity is the municipality's cash-cow). The municipality therefore had to look for a more effective way to collect revenue, identify those who stole electricity and punish them and their "clients". Unfortunately, though, as soon as these thieves learnt that the municipality was busy with the audits, they would quickly reverse the by-pass and when the municipality arrived at their places, they would find no by-pass. The Johannesburg Metropolitan Council approached Grinpal, a then 50-50 joint venture between Palace Engineering Services (trading as Palace Technologies) and Saab Grintek, to supply the council with meters that are more difficult (almost impossible) to tamper with, and which could prove a tamper or bypass even after it was reversed, so that they could bring the transgressors to book.

Pilot Project in Smart Metering

This pilot project was launched in 2002, with only a few sections of Alexandra Township installed with these prepaid meters.

AT THE BEGINNING OF THE PROJECT, OUT OF 60 000 HOUSEHOLDS ON PREPAID, JOHANNESBURG CITY POWER, THE MUNICIPALITY'S SUPPLIER OF ELECTRICAL SERVICES, WAS COLLECTING ONLY
R250 000 PER MONTH FOR ELECTRICITY CONSUMPTION.

Grinpal installed smart meters into clients' households where tampering/ bypassing had been established, and in houses that did not have electricity before, 20 000 households in total. The aim of this pilot project was to improve revenue collection, detect tampering and improve customer services. After installation of the meters by Grinpal, payment levels increased gradually.

PRESENTLY THE UTILITY RECEIVES NO LESS THAN R1.6 MILLION MONTHLY FROM THOSE 20 000 HOUSEHOLDS. 48 000 HOUSEHOLDS STILL NEED TO BE ELECTRIFIED, AND ONE CAN IMAGINE HOW GREATLY REVENUE WILL IMPROVE IN ALEXANDRA.

Left to right: Dineo Mokgathi wiring the relays. Kenneth Mahlaule also from the production section hard at work. Portia Motsei working on the final part of the relay development process.

Grinpal's Smart Metering

The IM001, as the Grinpal smart meters are called, are different in that the meter is separated from the ready-board, hence the term "split meter". The meter is installed by mounting it onto the street pole outside the house, where only Grinpal employees are permitted to work on the meters. This has deprived would-be criminals the opportunity to learn the system, and the positioning of the meter is so high that it requires a ladder in order to tamper with the meter. However, even if a transgressor were to climb onto the pole and try to tamper, as soon as they open the meter box, a tamper alarm installed in the kiosk sends a signal to the central server at Grinpal's Customer Support Centre (to find out if Grinpal knows about the opening of the kiosk). The operator then can establish from the relevant technician whether they are working on the meter. If not, then it established that it is a tamper, and proper action is taken against such persons. The technology is such that if a tamper is established, the meter can be switched off remotely, without the need to expose staff to the dangers of being attacked by unruly people who don't want to pay for electricity.

Other features, advantages and benefits of Grinpal's smart metering system are:

Direct, two-way communication based on Power line communication (PLC);
• Possibility to choose between almost all existing communication media (PLC, RF, GSM, GPRS, etc.);
• The ability to function both as prepaid and conventional meter (AMR), without having to use additional means like cards, tokens or numbers;
• Reduced administrative costs;
• The ability to automatically load free electricity units to indigent customers;
• Electricity is loaded onto the customer's meter within seconds of having purchased electricity;
• Multi-tariff operation means energy management initiatives like load shedding/load shifting, time-of-use etc can be

exploited to the benefit of both the utility and consumers;
• Low installation, operation and maintenance cost;
• Remote anti-tampering facility enhances the client's revenue collection;
• Bad debt recovery can be speeded up, and
• Retentions of data, for example previous balance after power outage.

These are some of the cables that Palace collected during a cleanup campaign. They were used for illegal connections .

Kids were playing next to bare wires

Scalability, Flexibility and Openness
The system can be scaled according to the amount of customers/ connections, starting from a single server infrastructure handling up to a thousand connections, growing to an interconnected system with potentially millions of customers, across different areas. The flexibility of the system is such that it can be owned and managed by the client, or managed and maintained for the client by Grinpal, with the client only having to read and act upon reports and information sent to him on a regular, scheduled basis. Multiple communication methods and vending interfaces are available (although GPRS is the preferred method), and the system already accommodates multiple third party vendors, cell phone based vendings, as well as Automated Vending Machines, with future expansion directly to ATMs. The systems architecture and design allows for fast development to accommodate clients' specific needs. The design was done specifically so that new products and technologies can be integrated with ease and without having to remodel the entire system, thereby keeping the system up to date and up to speed with al the latest communication and hardware technologies.

Basic Technology
Technology implemented and used in the system are the following:

• PLCc - Power Line Carrier communication. The "last-mile" communication medium to the customer's premises. Allowing bi-directional communication and active monitoring of all events and data flow.
• GPRS APN - GPRS is the basic data communication method provided by cell phone service providers, but using a private access point network (APN) to ensure security and stability of the communication network.
• Microsoft based servers with SQL databases, structured in size, layout and quantity based on the amount of customers and the client's needs.

System manufacturers
The system and all its components is designed, manufactured and assembled by Grinpal., a Palace Group subsidiary It is a proudly South African product, with all the intellectual property developed in-house by a leading team of hardware, firmware and software developers. Understanding the unique challenges faced by local electricity service providers and
distributors are key to the development of the product; ensuring robustness, reliability, flexibility and scalability. This makes Grinpal's in-house developed solution far more suitable for South African climate, conditions and infrastructure.

System Evolution

The system has evolved from a complex, technically orientated system to an easy to use, easy to implement and easy to maintain solution. With initial systems based on trunk radio communications, the hunger for more bandwidth to relay information faster and with greater ease pushed the development towards a GPRS based infrastructure.

Along with this migration came the need to process more data, make information more easily and quickly available, and being able to display and interact from a common platform. These factors necessitated the move to web-based client interaction, easy to use and maintain client privileges and a lot more factors that were built into the latest top-end software platform. This top end, currently in its final testing stages, allows users access to online, task specific help in a language platform of their choice. Any new language can be added and can be incorporated seamlessly into the system once the necessary translation has been done, allowing scalability and flexibility for any customer. The basic language used in the system is English. The system is continuously being evolved with future development aimed to provide graphic overviews and one-click interaction with the system in a large Network Operations Centre (NOC) environment, providing a live, real-time overview of the status of the system, from the "big picture" overview right down to what is happening at the customer's premises where the meter is installed!

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SYSTEM APPLICATION DOMAINS

- Electrical Energy Metering
- Demand Management
- Loss Control
  - Anti-tampering
  - Remote Switching
- Multi-tariff Usage

SYSTEM POTENTIAL USERS

- **Utilities**
- **Municipal Services**
- **Power Services of Enterprises**
- **Co-operative consumers**

Inside the customer's house is only the display. Even if you break the display, it doesn't affect the metering system. The display only shows you the balance on your account and your last payment.

The meters are installed outside the house in a pole-top box. This makes it almost impossible for a person to open the box and tamper with the meter.

Some current customers:

- Eskom
- City Power
- Emalahleni Municipality
- Thabazimbi Municipality
- Thaba Chweu Municipality
- Kwadukuza Municipality

New business beyond SA's borders:

- India

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