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THE ECONOMIC BENEFITS OF USING GSM PEPPER GAS ALARM SYSTEMS IN ELECTRICAL DISTRIBUTION SUBSTATIONS: **(AN eTHEKWINI MUNICIPALITY CASE STUDY)**

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Abstract

Theft and vandalism in electrical substations of various parastatals such as eThekweni metropolitan municipality are a continuous target due to the ease of access into these buildings and the concentration of the non-ferrous and ferrous metals located within these buildings. eThekweni metropolitan municipality has been deploying GSM Pepper gas alarm systems in these substations over the last 3 years and the findings have yielded positive results. These mitigating steps have not only protected the entities substations but has also been ensuring that service delivery revenue has been sustained.

KEY WORDS:

PEPPER GAS, ALARM SYSTEM, SYSTEM LOSSES, RISK MANAGEMENT, FINANCIAL IMPACT





Introduction

- Ntamo Technologies (Pty) Ltd has been mitigating cable-conductor theft and substation vandalism for the past 15 years.
- **This is achieved by using our Intelligent-Interactive-Innovative Security Technology solutions designed and manufactured in-house.**
- One such a technology is the deployment of our GSM Pepper gas alarm systems.
- **Deployment of this technology has been done in municipalities such as eThekweni, Tshwane, Ekurhuleni, City Power and Transnet Freight Rail to name a few.**
- The deployment strategy has proven to be a most affordable and successful tool to mitigate substation vandalism.
- **The key factor with the operation of the alarm is the ability to deal with the immediate threat and does not need human intervention to contain the risk.**





Background

- ❖ eThekweni Metropolitan municipality is the 3rd largest municipality in South Africa.
- ❖ **Situated in the province of KwaZulu-Natal.**
- ❖ Geographical coverage of 2 291km².
- ❖ **Population of 3 442 361 (Census 2011).**
- ❖ Population density > 1500 per km².
- ❖ **The main economic sector breakdown of eTekwini municipality are, finance (22%), manufacturing (22%), community services (18%), trade (16%), transport (16%), construction (3%) and electricity (2%).**





Background (Continued)

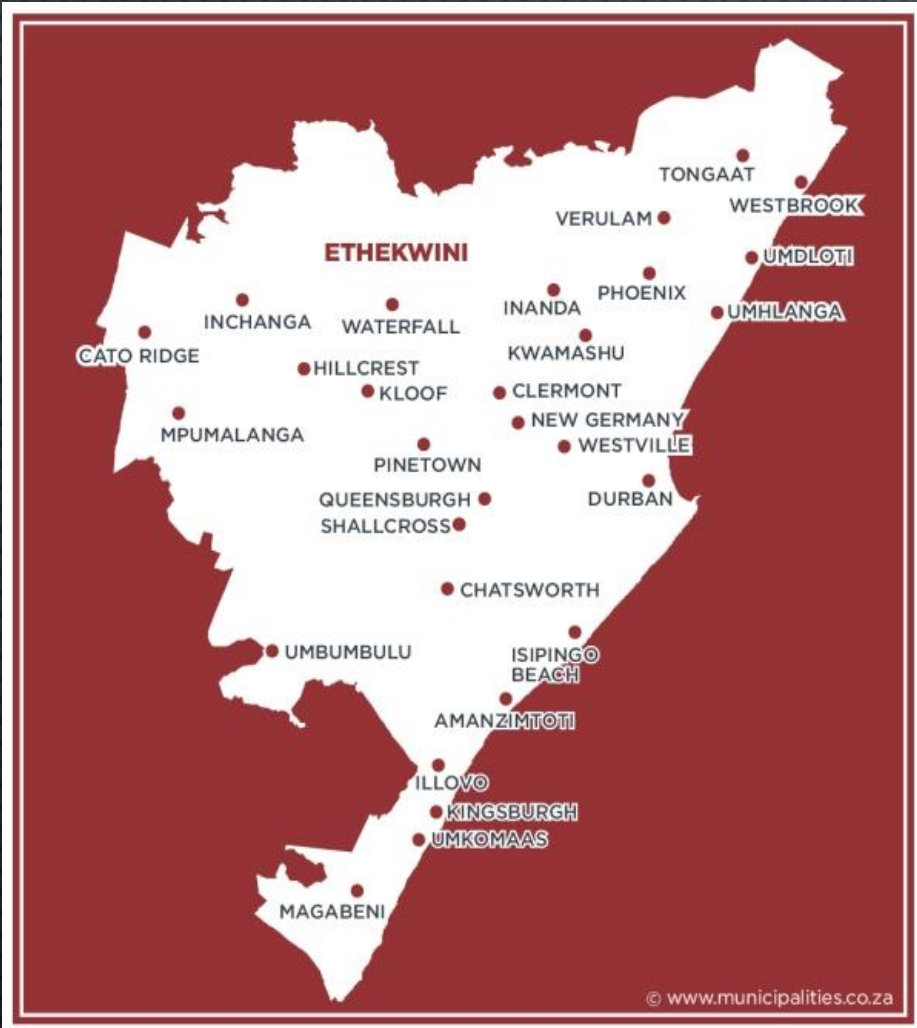
- ❖ For the financial year 2014/2015 the revenue generated by the entity was approximately R 27 billion.
- ❖ **Service delivery charges totalled almost R 14.5 billion, approximately 54% of the revenue generated by the municipality.**
- ❖ ESKOM a state owned company generates the largest portion of electricity in South Africa (approximately 95%) and approximately 42.9% of this generated electricity is sold to intermediaries such as municipalities.





Background (Continued)

- ❖ According to the “Financial Census Municipality report” from statistics South Africa for year ending 2015 approximately 65% of the **total municipal service income nationally** earned was derived from the sale of electricity and which has increased by 6.6% year on year.
- ❖ It is evident from research done that the municipalities in the urban areas are highly dependent on this income as is the case with eThekwinini municipality and cannot afford any un-intended losses.





Problem Statement.

- **eThekweni Municipality electricity suffers a loss of R 40.2 million per year due to theft in their distribution substations.**
- **South African Chamber of Commerce and Industry (SACCI) copper theft barometer for April 2015 indicates R 13.6 million, a 7.6% increase oppose to the previous month.**
- **The report further highlights that recent estimates put the loss to the economy between R 5 and R 7 billion per year.**





Problem Statement (Continued).

- eThekweni is no stranger to this epidemic and the loss of revenue is exacerbated as a result of system losses (technical and non-technical) due to incorrect or inadequate infrastructure, aging equipment in dire need of maintenance, electricity theft and equipment tampering.
- **P Antman concedes in his paper presented to the World Bank group energy sector strategy in July 2009, that developed countries suffer negligible non-technical losses, but highlights the fact that developing countries have a significantly different situation.**
- He further states that the elimination of these losses should be considered as a matter of high national priority.





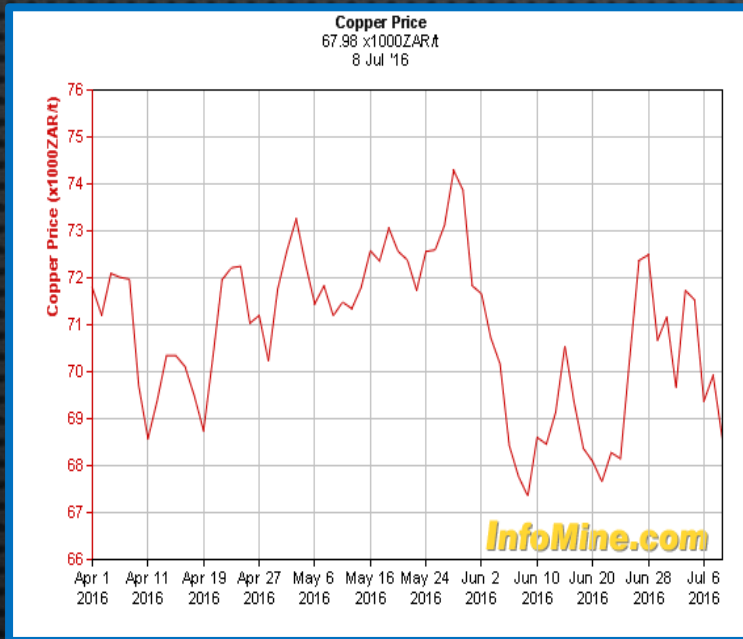
Problem Statement (Continued).

- Substation vandalism and theft has been part of the risk loss equation in the eThekweni municipality business continuation risk model for some time now and is being consistently well managed with various strategies in place.
- **One such mitigating strategy is the deployment of pepper gas technologies, which has been implemented as early as 2013 to address the associated problem.**





Problem Statement (Continued – Market demand).



Copper price last 3 months



Copper price 12 years



Lead price 1 year





Mitigating Methodology.

- ✓ The pepper gas technology method of operation is designed to discharge the gas every time there is an illegal intrusion in the substation when the system is armed or when the system is tampered with even in a disarmed state.
- ✓ **The system will notify the relevant authorities via the GSM network with no intentional human intervention.**
- ✓ These systems are also not sold to the entity but rented under a service level agreement contract and includes the continuous management and monitoring of the systems, which is considered a vital part of the successes achieved thus far.



Mitigating Methodology (Continued).



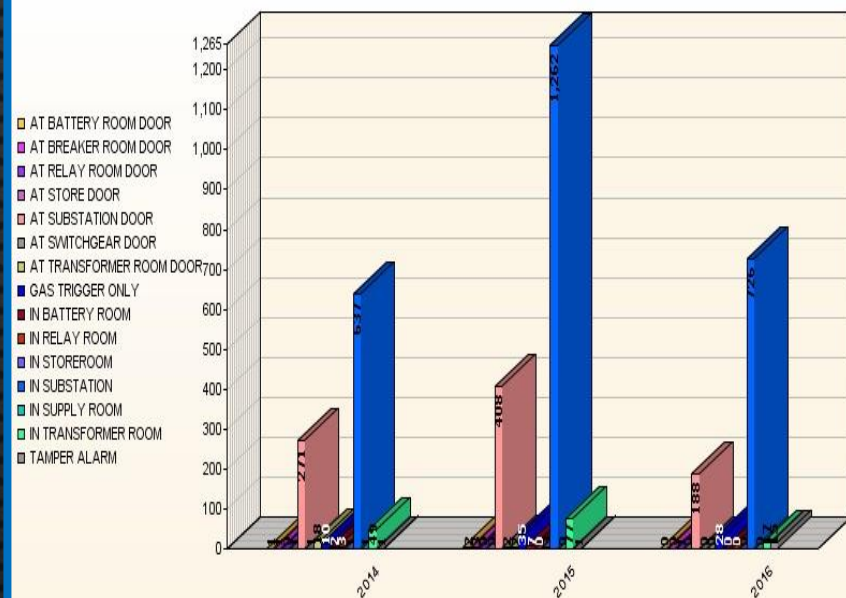
- ✓ Pepper gas is a non-lethal substance used for self and private defence and has been excluded from the dangerous weapons act 15 of 2013, which allows it to be used lawfully in these types of environments.
- ✓ All pepper gas formula installed in these substations have been tested by the South African Bureau of Standards for adverse effects on humans such as carcinogenesis, but also for flammability due to operation in high voltage electrical environments which is a very important consideration.



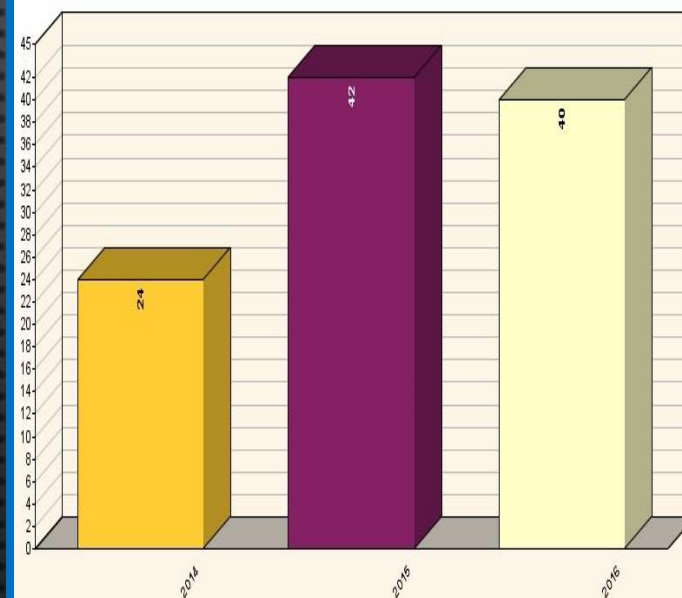


Results and Findings (Post installation)

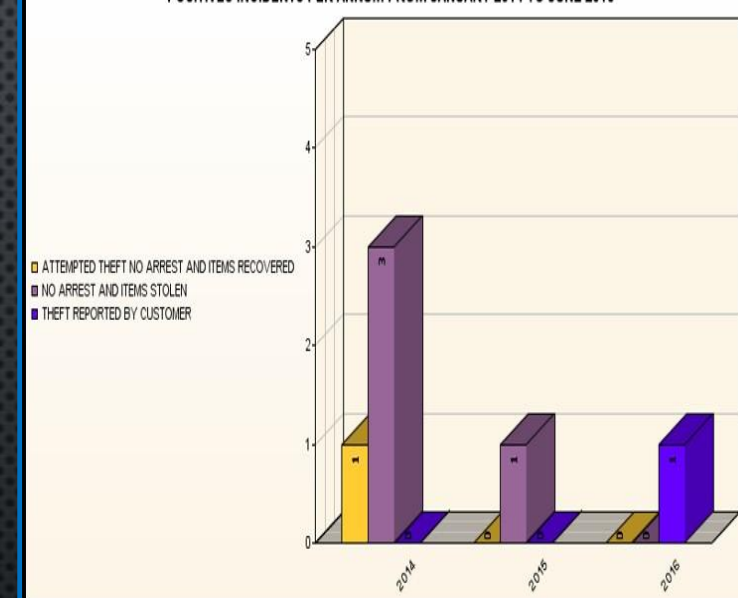
INTRUDER ALARMS ETHEKWINI PER ANNUM FROM 01 JANUARY 2014 TO JUNE 2016



UNAUTHORISED ACCESS ETHEKWINI FROM JANUARY 2014 TO JUNE 2016



POSITIVES INCIDENTS PER ANNUM FROM JANUARY 2014 TO JUNE 2016





Cost of incidents (Mitigating Impact)

- **It is recorded that the average cost per incident is approximately R 240 000.**
- This cost includes labour, travel and materials but excludes the loss of revenue.
- **The general formula for mitigation of the installation of a pepper gas alarm system is defined as the time lapse of between incidents (2 to 3 incidents per site), where thereafter a pepper gas alarm system is deployed if budget permits.**
- If a conservative approach was to be followed based on 2 incidents per site at R 240 000 per incident, one could safely assume the perceived total loss to eThekwin municipality would be quantified in the order of **$160 \times 2 \times \text{R } 240\,000.00 = \text{R } 76.8 \text{ million}$** , if no pepper gas technologies were to be deployed at these particular sites.





Cost of incidents (Mitigating Impact)

- With Pepper gas alarm installed there has been 6 recorded positive incidents over the past 3 years where the alarms have been deployed and have been unserviceable at the time of the incidents.
- **These 6 incidents x R 240 000.00 would conclude a loss of R1.44 million, 1.9% of total perceive loss of R 76.8 million.**
- The deployment of these technologies in these various sites has thus ensured a perceived loss reduction of 98.1% to eThekweni municipality business risk.





Conclusion

- Due to severe losses suffered by eThekweni Metropolitan municipality as a result of theft in their substations a risk management strategy was deployed.
- **Mitigation of these theft occurrences was contained by deploying GSM Pepper Gas alarm systems in strategic areas within the municipal boundaries.**
- Deploying these technologies has ensured a perceived loss reduction of 98.1% in the business risk management equation.
- **Sustainable revenue protection, where these substations are concerned have been mitigated.**
- Direct consequences of acceptable quality of supply levels to its customers has been maintained, adding value to all stakeholders.





Thank You

Company Details

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