



A Division of Allied International Support

# An Discussion WhitePaper

## SECURITY FOR PIPELINES AND REMOTE INSTALLATIONS

*"an Effective Security Shield"*

[www.AISecuritySolutions.com](http://www.AISecuritySolutions.com)

## The Security Dilemma:

Motives for terrorist attacks are often unclear – combination of economic/ political/ attention-seeking etc.

→ This was the case in Algeria in Jan 2013

- Ain Amenas gas plant was attacked
- Al-Qaeda in the Islamic Maghreb (AQIM) had run short of funds after paying for the conflict in neighbouring Mali.
- Amenas was relatively unprotected, extremely remote with the potential to extract a high price from the oil companies BP and Statoil.

- Lucrative oil and gas exploration has often been conducted in remote areas with limited security infrastructure.
- The deadly attack on Ain Amenas gas complex will do little to discourage the drive for lucrative energy exploration in northern Africa and the Gulf.

- Oil companies now forced to increase personnel & physical security after largely ignoring the risks of operating in the remote desert region.
- The risks are never going to outweigh the rewards from working in these environments.

### Lessons from this:

- Energy companies will have to study operations for possible flaws & upgrade their contingency plans with information gleaned from the attack.
- It is clear that well-guarded permanent facilities with visible deterrence and physical security are less likely to be attacked vulnerable than pipelines or remote temporary exploration facilities.
- Therefore security solutions for pipelines and remote facilities will become more and more prevalent in the marketplace.



**Figure 1: The challenge of pipeline security**

## Pipeline Security:

- ☐ Pipelines offer a complex linear security challenge and are of particular concern in the MENA region.
- ☐ They are often in the most remote areas extending over hundreds, if not thousands, of miles.
- ☐ When a pipeline is damaged significant revenues will be lost, damage is caused to the local environment and the leakage is a potential hazard to the local population and wildlife.
- ☐ Often the damage is not apparent to the pipeline operator for weeks and often it takes days to accurately pinpoint the location of the damage.

## The problem

- Oil & gas producers and pipeline operating companies appreciate the consequences of attacks on pipeline networks
- A few have managed to teach personnel 'on the ground' how to identify vulnerable network locations and recognise methods of target assessment and attack from the perspective of the total pipeline network.
- ❑ The terrorist groups are mobile and the required area to cover is huge and impossible to police with patrols.
- ❑ These small, agile groups have the element of surprise.
- ❑ Security solution deployed needs to fully understand the mechanism of the threat and how to mitigate it.
- ❑ The counter needs to be rapidly deployable and agile.



**Figure 2: Where to Look**

## “THINK LIKE THE TERRORIST”:

- The first key concept of a Security Solution program is to ‘Think Like The Terrorist.’
- Once we understand the terrorist, the potential motives, we can begin to:
  - Manage
  - Respond
  - Act
- All security personnel will need to think like terrorists to fully master the function and integration of the security solution.





**Figure 3: Understanding the complexities and behaviour of the threat**

The solution for protection of pipelines shall combine:

## **Security Training:**

Training is required to:

- Understand the critical processes and security challenges
- Identify vulnerable locations and key assets by learning how to recognise methods of target assessment and attack.
- Recognise terrorist preferencing in target assessment & attack methodologies – “Think like the Terrorist”
- Plan and conduct effective pipeline inspections to deter and detect intrusions (on land, mounted/dismounted, air, satellite)

- Create a workable inspection plan.
- Design and develop specialised incident location search techniques
- Document and develop a comprehensive Incident Scene Database
- Analyse incident information using to forecast potential incident locations and terrorist attack methodologies.
- Develop Standard Operating Procedures (SOPs) for Security personnel.

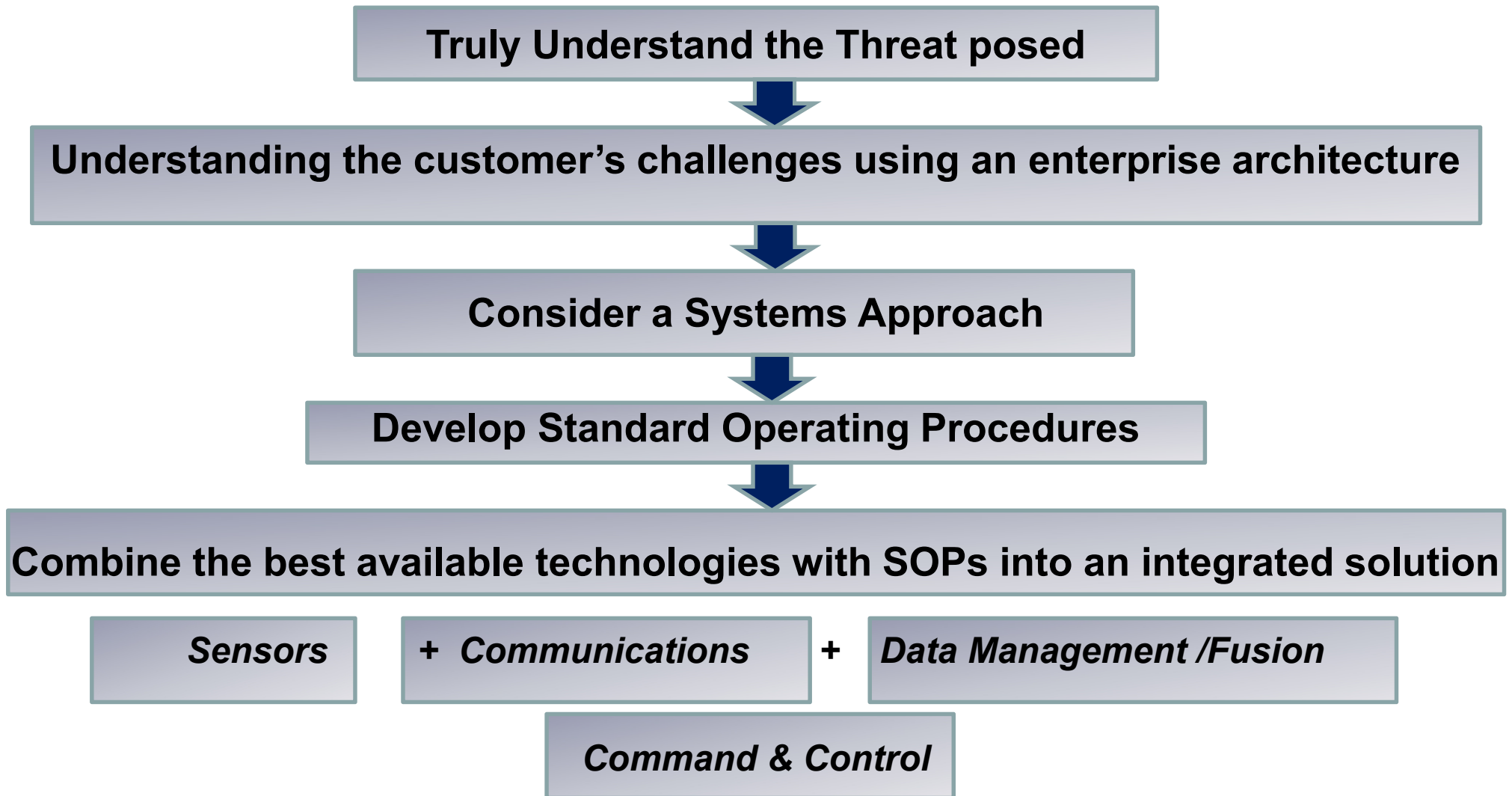
## Security & Protection Measures:

- Systems for protection must have a **high probability of detection** with a **very low probability of false alarm** activations
- The **ability to pinpoint the location** of any incident is also a vital requirement if loss is to be avoided or minimized.
- Solutions for protection of pipelines exist that are agile, can be rapidly deployed and can provide a high degree of protection to pipelines and terminals.
- These can be networked and interfaced with other sensors into a **Common Operational Picture (COP)** providing **Total Domain Awareness (TDA)** over the whole infrastructure.



## Common Operational Picture of Pipeline Security

# Addressing the Surveillance Dilemma



## Technologies

- Within the last 10 years, effective and reliable technologies for pipeline surveillance have entered the market.
- With a clear understanding of how these can be integrated into a wider security solution, security integrators (such as AIS Security Solutions) are able to provide a degree of protection as required by pipeline operators.

## The Technology

- Miniaturised sensors, embedded and on-surface – seismic & acoustic
- Standardised data-processing techniques
- Remote Communications technology

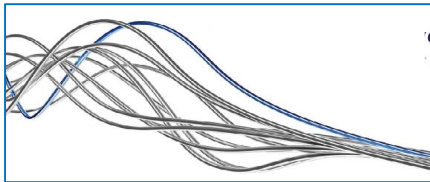


Pipeline security sensors detect external threats to the pipeline by detecting leakages or other abnormalities

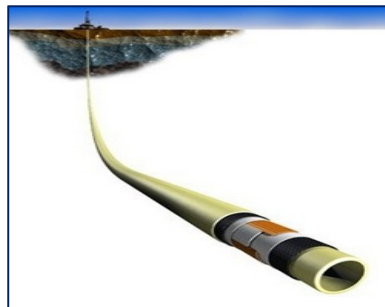
Technologies for monitoring & detection include:

- **ACOUSTIC** based sensors
- **THERMAL** based sensors
- **SEISMIC** based sensors

1. Acoustic



2. Thermal


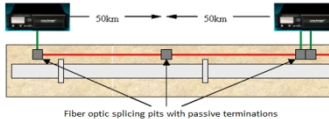

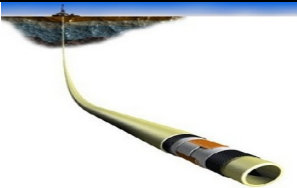



3. Seismic





# Sensor Technology Table

Product	Company	Technology	Surveillance Type	Details)
<i>OptaSense</i>	<b>OptaSense</b>	<i>Distributed Acoustic Sensors via single mode telecom fibre</i>	<b>Acoustic</b>	
<i>Pipeline Defender</i>	<b>Fiber Sensys</b>	<i>Single fibre interferometry</i>	<b>Acoustic</b>	 Fiber optic splicing pits with passive terminations
<i>BODAS</i>	<b>Genet</b>	<i>Acoustic buried geo-phones</i>	<b>Acoustic</b>	
<i>DITEST-AIM</i>	<b>Omnisens</b>	<i>Distributed temperature, and strain sensing</i>	<b>Thermal</b>	
<i>Seismic Sensor</i>	<b>Senstar</b>	<i>Seismic sensors (buried pipelines)</i>	<b>Seismic</b>	

## Acoustic Sensors

- Optasense - uses standard telecom fiber optic cables as listening devices to detect any threats to the pipeline. Any acoustic event can be detected allowing safety concerns to be monitored
- The acoustic foot print can give the operator a nature and depth of the threat giving him ability to quickly and appropriately mitigate the threat
- The system has no field sensors making one optical fiber into 4000 virtual microphones.
- OptaSense is able to turn standard single mode telecoms fibre into a listening device up to 50km in length

## Benefits

### ➤ **Retro fit to to your environment**

Uses existing fibre optic cable and requires no modifications

Low infield power consumption

No new infield equipment locations required

### ➤ **Smart zones & custom user interface**

OptaSense can be tailored to your pipelines

### ➤ **Classification engine**

Intelligent software effectively minimises nuisance alarms

### ➤ **Cues other security platforms**

Integrate with other platforms such as CCTV & UAVs (OPC, Pelco and others supported)

### ➤ **Management reporting & forensic analysis**

Instantly review historical data of activity around your pipeline

## Distributed Temperature Sensors

- DITEST™ (Distributed Temperature and Strain sensing) is a distributed temperature and/or strain monitoring system
- It uses standard telecommunication-grade single mode optical fiber as the sensor.
- DITEST™ owes its high signal-to-noise ratio and long term stability to Stimulated Brillouin Scattering (SBS) measurement.
- ❑ Using this technology it detects and accurately locates pipeline leaks, and disturbances such as ground movement or third-party intrusion, to within a meter along the entire pipeline.
- ❑ False alarms are discarded based on pre-set rules



**Figure 5: Embedded Robust Sensors on Pipeline**

- ❑ The system then analyzing very small variations in temperature or strain accurately on the pipeline
- ❑ Abnormal conditions and threats are detected and an alarm is triggered showing to within a meter the position of the threat
- ❑ Detected events are communicated in real time to SCADA or third-party controls via TCP/IP.
- ❑ The system allows operators to anticipate and respond to failures at a very early stage, reducing the risk of catastrophic pipeline failures. The operators can make timely decisions based on continuous, real time information reflecting actual pipeline conditions.

## Performance benefits of Temperature Sensors

- ✓ Distance: offers long range measurement of up to 50 km per channel from a single interrogator. Based on the use of low loss single mode optical fiber which maintains performance over long distances.
- ✓ Accuracy: spatial resolution from 0.5 m for temperature and strain, detects temperature and/or strain events as they develop.
- ✓ Precision: measurement resolution from 0.1°C (temperature) or 2 microstrain (strain), detecting small changes before they become catastrophic
- ✓ Speed: fast acquisition time - one second for dynamic monitoring to one or two minutes for high resolution measurements so changes which might affect the operation of the asset can be quickly diagnosed and appropriate action taken.

- ✓ Power: large optical budget available, ensuring the asset is monitored despite challenging application conditions.
- ✓ Durability: performance even where hydrogen penetration or radioactivity can cause fiber darkening
- ✓ Flexibility: user definable configurations to optimize measurement for each application.



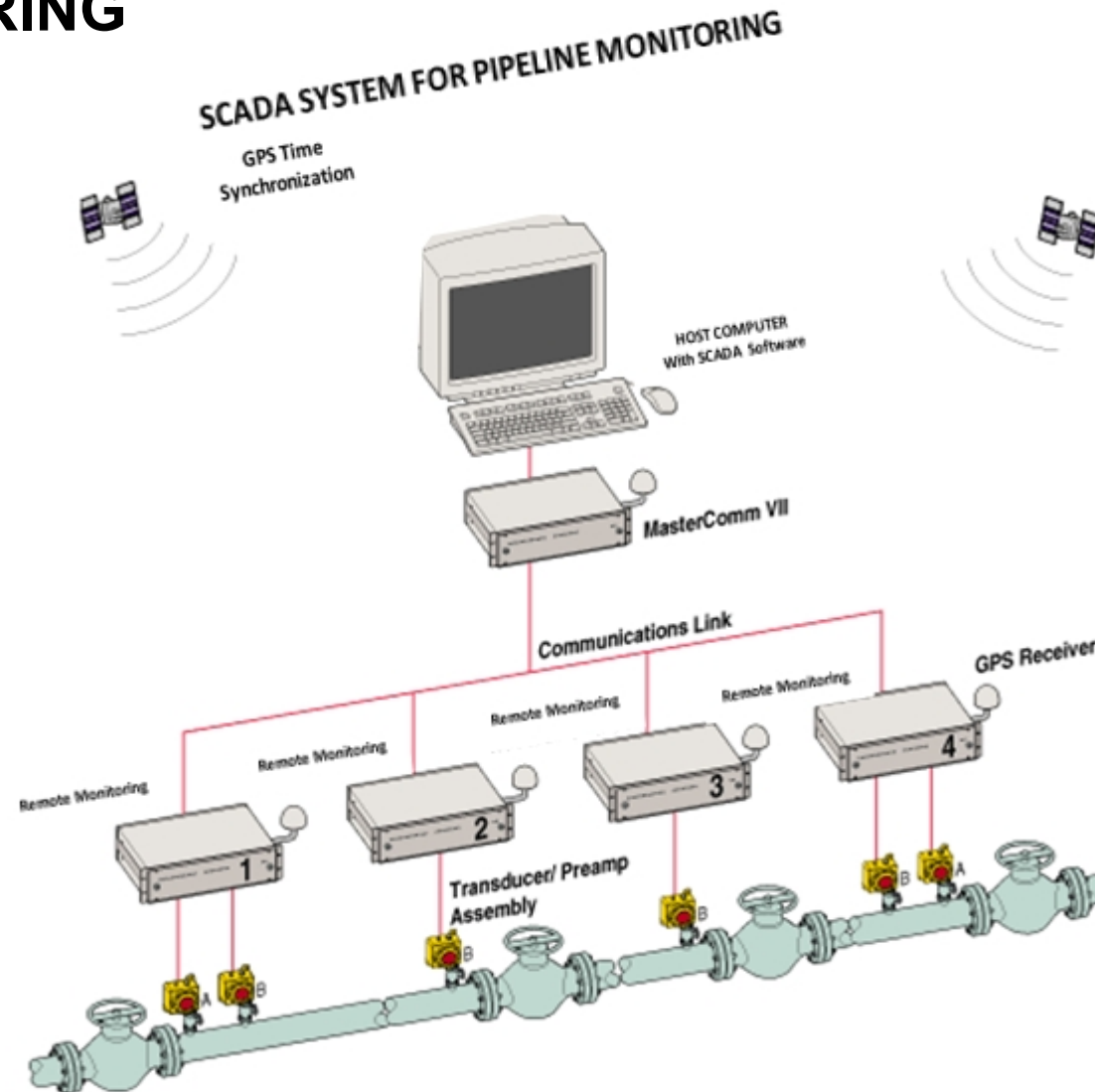
## Seismic Sensors

- Seismic Sensor is an innovative, patent pending security system, aimed to protect pipelines, tunnels, prisons and other buried assets from terrorism, theft, sub-terrain excavation and damage.
- It combines geophones with advanced technology intrusion recognition algorithms that analyze the seismic signals to effectively filter out false alarms.
- This intelligent signal processing provides a high Probability of detection (Pd) and an extremely low False and Nuisance Alarm Rate (FAR / NAR).
- Seismic Sensor is a covert intrusion detection system designed to generate an alarm when a real and concrete threat is identified by digging in the vicinity of the pipeline - either with hand-tools or machinery.

## Benefits

- ☐ Innovative technology designed to guard buried pipelines, regardless of length
- ☐ Detects potential intrusion attack and alerts authorities before potential harm or damage occurs
- ☐ Protects against advertent damage caused by digging /construction
- ☐ Suitable for all pipelines - operational and new grids under construction
- ☐ Easily integrated into a full turnkey security solution - including detection systems, perimeter protection and security management system
- ☐ Does not interfere with site aesthetics
- ☐ Tamper-proof

# PIPELINE MONITORING



**Figure 6: SCADA Solution for Pipeline Monitoring**

Our solution offer secure encryption to protect data over SCADA communication links, which is vital for critical infrastructure to be properly protected

- The modular structure of our SCADA solution facilitates adaptability for both standard tasks and special demands.
- This modularity also assures easy expansion for higher functions, such as diagnostics, simulation, and optimization.
- These functions are easily integrated within the system on demand.

## AIS Security Solutions – an Effective Security Shield

**AIS Security Solutions** provides the complete security protection combining electronic and physical security and deterrence with the active measures to prevent further attack – ***an Effective Security Shield***. Our solutions for pipeline protection are designed to protect Gas, Oil and Liquid Pipelines and other utility pipeline distribution networks.

For further information, please contact:

AIS Security Solutions  
Suite 805, SunTech Tower  
Dubai Silicon Oasis  
Dubai, UAE



Ray Minhas  
Tel: +971 50 919 8408  
[ray@aissecuritysolutions.com](mailto:ray@aissecuritysolutions.com)

Prarthana  
Tel: +971 52 890 6895  
[prarthana@aissecuritysolutions.com](mailto:prarthana@aissecuritysolutions.com)

MaryAnn Lumang  
Tel: +971 52 890 6896  
[maryann@aissecuritysolutions.com](mailto:maryann@aissecuritysolutions.com)