Solution Overview

Tom Henson
Vice President, Marketing
Solution Overview Topics

5 Components of Innovative Solutions

- 3 Type of Hazards in “The Moment”
- 2 Time Periods
- 1 Life
The Future of Gas Detection...

Is Today’s Technology Reality
## Component of Innovation: Smart Phones

<table>
<thead>
<tr>
<th>Sensors</th>
<th>Devices</th>
<th>Connectivity</th>
<th>Cloud SW</th>
<th>Services</th>
</tr>
</thead>
<tbody>
<tr>
<td>Touch</td>
<td>Display</td>
<td>Power</td>
<td>Centrally Accessible Data</td>
<td>Services &amp; Experiences based on data in the cloud</td>
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<tr>
<td>Photoelectric</td>
<td>Buttons</td>
<td>Audio</td>
<td>Web-Based Applications</td>
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<tr>
<td>Camera</td>
<td>Speakers</td>
<td>Cellular</td>
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<tr>
<td>Temperature</td>
<td>Vibrating Motor</td>
<td>Wifi</td>
<td></td>
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<tr>
<td>Gyroscope</td>
<td>Operating System</td>
<td>Bluetooth</td>
<td></td>
<td></td>
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<tr>
<td>Accelerometer</td>
<td>Applications</td>
<td>NFC</td>
<td></td>
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<tr>
<td>GPS/Location</td>
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</tbody>
</table>

- **Sensors:** Touch, Photoelectric, Camera, Temperature, Gyroscope, Accelerometer, GPS/Location
- **Devices:** Display, Buttons, Speakers, Vibrating Motor, Operating System, Applications
- **Connectivity:** Power, Audio, Cellular, Wifi, Bluetooth, NFC
- **Cloud SW:** Centrally Accessible Data, Web-Based Applications
- **Services:** Services & Experiences based on data in the cloud
Example: Home Security

- Sensors
- Devices
- Connectivity
- Cloud SW
- Services
Example: Health/Fitness Tracking

- Sensors
- Devices
- Connectivity
- Cloud SW
- Services

![Image of fitness tracker and smartphone with app interface]
Example: Retail & Experience Optimization

Sensors

Devices

Connectivity

Cloud SW

Services
“All of that data goes into the platform, which runs it against our analytics engine, which looks for patterns and anomalies to make recommendations,” says Mark Bartolomeo, who leads Verizon’s IoT Connected Solutions division. “The idea is, if you’re the farmer, it shows exactly what you should do.”
One by one, 3 utility workers descended into a manhole. One by one, they died.

By Samantha Schmidt  January 18

Louis O'Keefe, 49

Elway Gray, 34

Robert Wilson, 24

Leonardo Moreno, injured in rescue attempt
Worker dies on Dakota Access Pipeline

By Kalsey Stults on Aug 27, 2016 at 4:16 p.m.

they weren't working in pairs," he said. "So when the accident happened, who knows how long it was from when he got injured until the foreman found him."

UPDATE: Man Dies in Midland County Oilfield Accident

MIDLAND COUNTY - Midland County authorities have identified a man who died in an oilfield accident Wednesday morning.

It happened just after 10:00 Wednesday morning in Midland County near South County Road 1040 and East County Road 120.

Midland County authorities say a crew was working on a pulling unit when a swivel hit 24-year-old Esau Villeral DelaRosa in the head.

He was rushed to the hospital where he died of massive head injuries.

Authorities say the death was completely accidental.
It may not take much...

...to prevent “completely accidental” deaths in dangerous areas
IoT (Internet of Things) Frameworks

Keep It Simple...
## IoT for Safety & Productivity

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</table>
| • Environment  
  • Condition  
  • Time  
  • Location  
  • Motion  
  • Accuracy and reliability | • Fit for Purpose  
  • Easy to Use  
  • Certs & Approvals  
  • Industrial Ruggedness  
  • Power  
  • Size | • Maintain  
  • Communicate  
  • Simple to Connect  
  • Reliable  
  • Cost Effective  
  • Leverage Infrastructure in Place | • Centrally Accessible Data  
  • Web-Based Applications  
  • Integrated Systems / Single Views  
  • Business Rules to Trigger Actions | • Maintenance  
  • Monitoring  
  • Response  
  • Analytics  
  • Training & Support |

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**Gas Detectors**

**Docking Stations & Gateways**

**Software & Services**
Gateways – Getting Data to the Cloud

Receiving data in one communication protocol and transmitting it to the cloud through a different communication protocol

- Infra-Red
- Bluetooth
- Wi-Fi
- LENS™ Wireless

- Ethernet
- Wi-Fi
- Cellular
- Satellite
Solution Overview Topics

- 5 Components of Innovative Solutions
- 3 Type of Hazards
- 2 Time Periods
- 1 Life
“The Moment”

a life is saved or lost due to...

Environmental Hazards

Mechanical Hazards

Behavioral Hazards
“The Moment”

a life is saved or lost due to...

Environmental Hazards

Mechanical Hazards

Behavioral Hazards
A toxic or combustible gas is accumulating in the work area.

The sensor hasn’t been calibrated recently and will measure lower than actual.

The user turns off device when it does alarm so he can finish tightening the last 2 bolts...

“The Moment”

a life is saved or lost due to...

Environmental Hazards

Mechanical Hazards

Behavioral Hazards
• Accurately Sense
• Effectively Warn Worker
• Isolate, Avoid, Engineer Out

• Properly Maintain & Test
• Replace/Repair
• Isolate, Avoid, Engineer Out

• Identify
• Train
• Isolate, Avoid, Engineer Out

“The Moment”

a life is saved or lost due to...

Environmental Hazards

Mechanical Hazards

Behavioral Hazards
Solution Overview Topics

• 5 Components of Innovative Solutions
• 3 Type of Hazards
• 2 Time Periods
• 1 Life
Prepare For, Avoid, Eliminate

Risk is reduced
~99.9999% of the time

Mechanical & Behavioral Hazards

Identify, Predict, Eliminate

“The Moment”

A life is saved or lost
~.0001% of the time

Environmental Hazards

Real Time

React & Respond
Prepare For, Avoid, Eliminate

Hierarchy of Control

- Elimination
- Substitution
- Engineering Controls
- Administrative Controls
- PPE

“The Moment”

React & Respond

Identify & Eliminate Hazards
Prepare For, Avoid, Eliminate  

“The Moment”

It all starts with the sensors and devices...
Prepare For, Avoid, Eliminate

It all starts with the sensors and devices...

"I have to replace the sensor after each exposure"

"You think those orange device are hard to clean"

"I need some data for an SPCA audit"

"The alarm isn't loud enough"

"I can't tell if my sensor is asleep"

"Other devices close to me are making mine chirp"
Prepare For, Avoid, Eliminate

“The Moment”

It all starts with the sensors and devices...
Prepare For, Avoid, Eliminate

“The Moment”

Calibrate Without Opening

Secure On-Off Switch

Sampling Pump Audio Driver

1 & 5 Bay Charger

Rugged, Compact

Multiple Gases

9 Hour Run-time

Accurate, Temperature Compensated Sensors

Model MX240
Dual-Sensor Oxygen & Methane Gas Monitor

Provides for greater personnel protection in mines

Features
- Monitors oxygen (O₂) and methane gas (CH₄) continuously.
- Provides fast, accurate response to changes in ambient concentrations.
- Audible alarm (88 dB @ 3”) warns of low- and high-level alarm conditions.
- Battery charge indication for each sensor.
- Operates 9 hours or longer when replaceable nickel-cadmium battery packs is fully charged.
- On-Off switch design prevents accidental shutdown.
- Quick, easy calibration without opening case.
- Stainless steel case provides maximum protection for shock-resistant solid-state circuitry and sensor elements.
- Rear compact design of its type now available.
- Optional accessories enhance operating flexibility.

Application
The NMS MX240 dual-sensor instrument is designed for use in mines and other work environments to assure optimum personnel protection against both oxygen (O₂) deficiency and hazardous levels of methane gas (CH₄). The small, lightweight, rugged oxygen-methane monitor is particularly suitable for mine rescue teams and fire bearers. It also can be used efficiently in coal processing and storage facilities. The MX240 instrument can eliminate the need for an oxygen monitor and the logger, however, real-time data is not in use.

The MX240’s fast-response sensor measures O₂ and CH₄ simultaneously to provide continuous, accurate readings on ambient concentrations of both gases. The oxygen level is indicated continuously on a digital liquid crystal display (LCD). Remote pumps on the LCD are obtained by pressing a small switch on the side of the dual-light water-resistant, stainless steel case. Oxygen readings range from 6 to 100%, in 0.1% increments. Methane is measured by a unique NMS-developed catalytic sensor (Model 1508E) that provides accurate measurements ranging from 0 to 30%, in increments of 0.1%.
Prepare For, Avoid, Eliminate

“The Moment”

Services
Software
Connectivity
Devices
Sensors
Solution Overview Topics

- 5 Components of Innovative Solutions
- 3 Type of Hazards
- 2 Time Periods

1 Life (Mapping Our Solutions)
Prepare For, Avoid, Eliminate

- Chargers, Datalinks, Pumps
- Day since/until Bump/Cal
- Field Replaceable Sensors/Batt
- Customizable UI
- Confidence Indicators

“The Moment”

- Accurate, Reliable, Rugged
- Audible-Visual-Vibrating Alarms
- Sensor Options
- Prevent Shutdown in Alarm
- DualSense™
Prepare For, Avoid, Eliminate

• Automated Bump/Cal
• iGas® Cal Gas Mgmt
• Free SW Upgrades (Cloud)

• Equipment Status
• User Behavior
• Gas Hazards
• Alerts & Reports

“The Moment”

• Equipment Always Ready
• Predictable Fixed Costs
• No Warranty Claims
• No Excess Inventory
Prepare For, Avoid, Eliminate

“The Moment”

- Alarm Action Messages
- Acknowledgeable Gas Alerts
- Full Screen Alarms
- Dedicated Panic Button
- Man Down Alarm
- Multi-Color Lights

- MX4 Accessory Compatible
- Custom Start-Up Messages
- Dock Overdue
- Multi-color Nameplates
- Lockable Settings
- DualSense™

Let the worker focus on the job at-hand

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Prepare For, Avoid, Eliminate

• Easily Identify Workers
• Auto Site Assignment
• Manage Restricted Areas

“The Moment”

• Share Readings & Alarms
• Tap to Connect
• Reliable Self-Healing Mesh
• No Infrastructure Req’d
Prepare For, Avoid, Eliminate

“The Moment”

- Real-time Data to Cloud
- “Fit for Purpose”
- No Pairing
- No IT Setup

- Map – Location & Status
- Text/Email Alarm Alerts
- Configurable Alert Triggers
- Standalone or Integrated
Prepare For, Avoid, Eliminate

“The Moment”
Prepare For, Avoid, Eliminate

“The Moment”

Implementation

More Gateways

Predictive Analytics

Monitoring Services

More Gateways

Onsite Services

Smart PPE Data

More Applications, Sensors, Devices

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Thank you