Underground Communication and Tracking Systems

www.minesite.com.au

Australia: Sydney-Kalgoorlie-Mt Isa-Mackay  Canada: Sudbury  USA: St Louis
Our mission

Enhancing Safety and Production

Via

- Specific communication technologies and devices designed for the mining industry
- Safety enhancements through use of communication technologies
- Process control through the use of these technologies
- Systems designed to a more stringent standard for the mining industry I.E. Cell Phones.
MST is the global leader in underground communications

- **PED** – a text message system to every miner underground
- **TRACKER** – a system to track location of people and equipment in zones
- **ICCL** – integration of PED and Tracker into a light weight cap lamp battery
- **ImPact** – wireless technologies.
- **VDV Leaky Feeder Radio** - two way voice radio system
Over 250 clients in 5 Continents

Canada:
- 3 ImPact Systems
- 12 PED/BlastPED Systems
- 3 VDV Systems

United States:
- 2 ImPact Systems
- 20 PED Systems
- 2 BlastPED Systems
- 10 VDV Systems

Sweden:
- 1 PED System

Mongolia:
- 1 ImPact System

China:
- 15 PED Systems
- 4 TRACKER Systems

Australia:
- 3 ImPact Systems
- 72 PED Systems
- 55 VDV Systems
- 40 BlastPED Systems
- 4 TRACKER Systems

Tanzania:
- 3 BlastPED System

- MST Office
- MST Distributor

20 Years of Mining Innovation
Some of our Valued Customers Include:

- bhpbilliton
- NEWCrest MINING LIMITED
- Peabody
- RIO TINTO
- xstrata
- BARRick
- Codelco
- ANGLO Coal
- PLACER DOME
- Centennial Coal
- ANGLOGold Ashanti
- INCO
- Falconbridge
Following Moura 1986 explosion, 12 fatalities.
Underground infrastructure destroyed.

Development started in 1987
Review of previous research
Fire evacuation notice. Sunshine Mine, Kellogg, Idaho
May 2, 1972 - 91 Killed

Contact U/G-- with surface antenna, text had more usefulness

Commercially available 1990
MSHA approved June-1991

COMMUNICATIONS during a mine emergency are a critical part of fire fighting and evacuation activities. A successful evacuation or fire fighting operation is dependent on the quality of the information that is communicated. The sooner miners are notified of a problem, the greater the chance of escape and/or fire fighting activities can begin.
TIME IS NEVER YOUR FRIEND
U.S. Department of Labor Mine Safety and Health Administration
ULF Mine Wide Text messaging system

Safety:
- Mine Wide Warning. (Is not limited to line of sight)
- Everyday communication tool.
- Custom text messages detail hazard, evacuation route, update situation, etc.
- Remote, surface blast initiation.

Productivity:
- Contact personnel wherever they are in the mine.
- Efficiency through remote control of fans, pumps etc.
- Effective remote blast initiation.
PED Receiver - from “Add ON” to Integration

1989 Prototype Receiver

1990 BeltPED 1 – 3.2 kg

1992 BeltPED 2 – 3.1 kg

1995 BeltPED 3 – 2.4 kg

2005 ICCL – 0.8 kg

2007-2008 2-Way
PED® Operation Schematic

System designed for self-diagnostics, ground fault, open antenna, lighting etc.

PED Receivers can be:
- **ICCL** Personal Receiver (shown)
- **AutoPED** Vehicle Receiver
- **ControlPED** for Equipment Switching
- **BlastPED** for Remote Blast Initiation
Push button to Light up Display or Recall Stored Messages

Push Button Lights Display so time can be read, after 5 seconds the last message received is displayed.

Liquid Crystal Display Screen
Can display up to 32 character message
Communication Coverage

Phones – 5%
Leaky Feeder – 20%
PED – One-Way +98%
**PED® Antenna - Wallarah Colliery**

Surface antenna protected from blast and fire.

12,000 ft & 8,000 ft Surface Antennas

Powered by one Transmitter
PED® Antenna - Kanowna Belle

5,000 ft Underground Antenna
**PED® Antenna - Moranbah North Coal Mine**

Broader coverage by increasing antenna size!!

33,000 ft Surface Antenna.
PED® Antenna - Springvale Coal Mine

20,000 ft Underground Antenna.

Surface antenna could be used in an emergency.
## PED Installations and Usage

### Australia

<table>
<thead>
<tr>
<th>Mine</th>
<th>Year</th>
<th>Antenna and Depth</th>
<th>Pagers</th>
<th>Messages/Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cook</td>
<td>1991</td>
<td>Surface – 30,000 ft</td>
<td>45</td>
<td>10-20</td>
</tr>
<tr>
<td>North Goonyella</td>
<td>1993</td>
<td>Surface – 29,000 ft</td>
<td>140</td>
<td>20-30</td>
</tr>
<tr>
<td>Newstan</td>
<td>2000</td>
<td>U/G – 35,000 ft</td>
<td>250</td>
<td>40-50</td>
</tr>
<tr>
<td>Myuna</td>
<td>2001</td>
<td>U/G – 28,000 ft (Covers 3 seams)</td>
<td>200</td>
<td>35-45</td>
</tr>
<tr>
<td>Oaky North</td>
<td>1998</td>
<td>Surface – x 2</td>
<td>245</td>
<td>30-50</td>
</tr>
<tr>
<td>Clarence</td>
<td>2000</td>
<td>U/G – 32,000 ft</td>
<td>120</td>
<td>25-35</td>
</tr>
<tr>
<td>Moranbah North</td>
<td>1997</td>
<td>Surface – 33,000 ft</td>
<td>320</td>
<td>40-50</td>
</tr>
<tr>
<td>Crinum</td>
<td>1997</td>
<td>Surface – 27,000 ft &amp; 35,000 ft</td>
<td>280</td>
<td>40-60</td>
</tr>
<tr>
<td>West Cliff</td>
<td>2001</td>
<td>Surface – 29,000 ft &amp; 44,000 ft</td>
<td>260</td>
<td>50-60</td>
</tr>
</tbody>
</table>
# PED Installations and Usage

## United States / Australia

<table>
<thead>
<tr>
<th>Mine</th>
<th>Year</th>
<th>Antenna Type</th>
<th>Pagers</th>
<th>Messages/Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Andalex</td>
<td>1997</td>
<td>U/G – 40,000 ft</td>
<td>100</td>
<td>30-40</td>
</tr>
<tr>
<td>Genwal</td>
<td>1998</td>
<td>U/G – 38,000 ft</td>
<td>50</td>
<td>20-30</td>
</tr>
<tr>
<td>Dendrobium</td>
<td>2004</td>
<td>U/G – 34,000 ft</td>
<td>180</td>
<td>40-50</td>
</tr>
<tr>
<td>Springvale</td>
<td>2001</td>
<td>U/G – 20,000 ft</td>
<td>250</td>
<td>35-45</td>
</tr>
<tr>
<td>Beltana</td>
<td>2003</td>
<td>Surface – 22,000 ft</td>
<td>80</td>
<td>25-30</td>
</tr>
<tr>
<td>Glennies Creek</td>
<td>2001</td>
<td>U/G – 25,000 ft</td>
<td>50</td>
<td>20-30</td>
</tr>
<tr>
<td>Broadmeadow</td>
<td>2005</td>
<td>Surface – 33,000 ft</td>
<td>140</td>
<td>30-40</td>
</tr>
<tr>
<td>West Wallsend</td>
<td>2000</td>
<td>Surface &amp; U/G – 27,000 ft &amp; 20,000 ft</td>
<td>170</td>
<td>40-50</td>
</tr>
<tr>
<td>Enterprise</td>
<td>1998</td>
<td>U/G – 15,000 ft</td>
<td>690</td>
<td>60-80</td>
</tr>
</tbody>
</table>
## PED Installations and Usage

### United States

<table>
<thead>
<tr>
<th>Mine</th>
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<th>Messages/Shift</th>
</tr>
</thead>
<tbody>
<tr>
<td>Co-op</td>
<td>U/G</td>
<td>40</td>
<td>20-40</td>
</tr>
<tr>
<td>Dugout</td>
<td>U/G</td>
<td>75</td>
<td>20-30</td>
</tr>
<tr>
<td>BHP</td>
<td>Surface X 2</td>
<td>150</td>
<td>40-50</td>
</tr>
<tr>
<td>Air Quality</td>
<td>U/G</td>
<td>50</td>
<td>30-40</td>
</tr>
<tr>
<td>Laurel Mountain</td>
<td>U/G</td>
<td>21</td>
<td>25-30</td>
</tr>
<tr>
<td>North American Rock Salt</td>
<td>U/G</td>
<td>50</td>
<td>20-30</td>
</tr>
<tr>
<td>Robison Run</td>
<td>U/G</td>
<td>X</td>
<td>20-30</td>
</tr>
<tr>
<td>18 total U.S. ****</td>
<td>1ST 1996</td>
<td>70 -100% Coverage</td>
<td>Antenna Dependent</td>
</tr>
<tr>
<td>World wide</td>
<td>140 systems</td>
<td>+ 10,000</td>
<td></td>
</tr>
</tbody>
</table>
You always know who is IN, or OUT of the mine.

You know the location of Personnel and Equipment within clearly defined zones underground.

Enables you to control mine logistics.

Integrates with a mine’s existing systems.

Significant benefits can therefore gained in:

- Safety Management
- People
- Equipment-Asset Management
- Supplies
**Tracker Tagging System - Basic Operation**

- Readers/Beacons are set up at Strategic Locations throughout the mine.
- 150 ft reading radius.
- An active Tag, worn by personnel or mounted on vehicles, radiates a unique “ID” to the Reader Beacons.

MSHA - approved 2003
20 Years of Mining Innovation

TRACKER Display Software
### TRACKER Display Software

![Image of TRACKER Display Software interface]

- **Tag Holder**: List of names such as Derek, Steve, and others with details like their job title and location.
- **Locations**: Various locations like Portal Out, 4 Level Safe, and Sub Base Out.
- **Dates and Times**: Specific dates and times for each entry, e.g., 30/06/2003 and 9:52:33 AM.

#### Administrator Information
- **156 Tags**
- **Start**: Icon indicating the start of the program.

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**20 Years of Mining Innovation**

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![Image of mining innovation]

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**MINE SITE TECHNOLOGIES**
Large Format LED Units allow Tag numbers into zones to be displayed to control access, such as:

- Personnel numbers can be displayed relative to a pre-set limit (e.g. because of availability of SCSR’s or CABA re-fill points).
- Diesel equipment limitations can be automatically displayed to control access dependent on ventilation requirements.
Tagging System - Personnel Safety

Improves safety management of personnel, by knowing their location underground at all times. Benefits include:

- Streamlines access control into ventilation districts in line with available self rescue apparatus inbye – removes tag board delays.

- During an emergency the withdrawal of personnel can be monitored.

- During an evacuation the location of items (e.g. PJB) that may assist their evacuation can be known and advised.

- These safety enhancements are paid for by the vehicle/asset cost benefits

- Potential to extend Tag technology into Proximity Detection
Thank you!!