Advances in Mine Wireless Communications
Solutions That Work
Tunnel Radio of America, Inc.

Ideas for Today and Tomorrow
Presented by Mark D. Rose
Why do we do this stuff?
For Them!
2-Way Radio System Features...

**Basic System Requirements**
- Person to Person wireless
- Communication across network
- Surface to Underground Use
- Mobile Relay Functional

**Advanced System Requirements**
- Multi-Channel Capable
- Wireless Data Transmission
- Enhanced Range for Emergency Use
- Personnel & Equipment Tracking
- Emergency Operational features
- IP and Ethernet Compatible
Ultra High Frequency Communications (300 – 900 MHz)

Result -

• Radio technology offering unmatched radio coverage,

• Voice + Wireless Data layer working

• Wi-PAD Tracking Compatible

• High reliability design, simple to install and service

• Fully Mine tested (2-Way)
‘Leaky Feeder’ VHF System

Coupling Loss at 20 Feet
65dB

UHF Antenna System

Coupling Loss at 20 Feet
<40dB

30 dB = 1000X more effective power over VHF
UHF Bands 300 – 900 MHz

Greater Range      Obstacle passage      Hi Reflected Energy

PROPROPAGATION IN TUNNELS

150 MHz  350 ft.

500 MHz  1000-3000 ft.

1500'

8'
Integrated Wireless Systems

- Wi-PAD
  Wireless Tagging Tracking
- TMS
  Data Acquisition
- Mine Stat Voice-Alert
  Remote Operation
- Radio Over IP
T-PAD
Wireless Personal Alert Device

- T-PAD Wireless Repeater Network and multifunction Tag
- True Wireless/Cableless Data Repeat and Relay to Surface
- Capture software shows location and alert status
- Gas and Ground monitoring Capable
T-PAD
Wireless Personal Alert System

- Tag incorporates emergency and man-down alert
- Position Reporting to Capture software
- Cableless network between reader/repeaters
- High Post Event survivability & 24 hour Batt
- Quick damage repair cycle
T-PAD Personal Alert Device
Personal ID tag and communicator

- **Features**
  - Continuous Location Transmission
  - Man-Down Alert
  - Emergency Button Alert
  - Signals are captured to near Reader Repeater and passedwirelessly to host
  - 3 year battery life
  - Small size
  - May be integrated into Portable battery case
  - VoIP transmission capable
T-PAD tracking and UHF 2-Way Network

100% Wireless Wi-PAD layer

1. Repeater w/T-PAD location PC
2. Wi-Pad equipped UHF Amplifiers
3. Gas

UHF Radio layer
TMS
Tunnel Monitoring System
Wireless Data Monitoring and Control

Key Benefits

- Wireless monitoring of utilities and vehicles via PC
- Get Real-Time Overview of System with innovative SCADA based software
- TMS + complements Modbus based software platforms
- Compact, low cost radio RTU units with excellent service record

Features

- Control and Monitor Utilities
- Diagnostics for Radio system
- Comprehensive Offsite Capabilities
- TMS+ 128 KB long range wireless databuss
- Gas sensing, rock mechanics data collection & ?
Mine-Stat
Control and status

Key Benefits
- Remote control equipment with Portable Radio from anywhere in the mine/surface
- Immediate remote ACK of command
- Voice response ACK of commands optional
- Dry contact closure or mom, AC relay, PLC control, remote stench release

Features
- Wireless remote control
- UltraComm or TROIP system compatible
- Integrated radio, antenna, battery, and power supply
- User programmable
- Fast installation – self contained unit
Advanced Digital Safety Signaling Options
Programmable features in SOA Portables

• One Button Emergency Signaling from Portable
• User I.D. is Displayed and Logged to Console
• Emergency All-Call From Console
• Radio Check Features
• Man-Down and Lone Worker capable
TROIP IP-Based Mine Radio – How it works

- Convert audio into data packets for network transfer
- Audio is divided into 10-40ms packets, compressed and put on the network
- Packets are transferred, decompressed, converted to analog and played
- Existing LANs, WANs and Internet allow for radio connection to dispatch facilities
- ROIP units incorp wireless node, all voice traffic stored for retrieval
- Position location captured to server display in control room
Tunnel Optic TROIP
System Application

- Uses TROIP UHF Repeaters
- Simulcast operation of all nodes
- Uses Standard Ethernet Highway
- Location of transmissions Captured
- T Configuration Provides Redundancy
Ideal Applications for TRIOP

- Remote/redundant/emergency back-up radio control systems
- Affordable technology migration
- Maximizing Mine Ethernet installation
- Interoperability
Closing thoughts – Finally!

- Mining as an Industry, why are we 19 out of 20?
- How can we move up to the top 5?
- A safer work environment
- A high tech work environment
- The American Miner needs well deserved public support, we need media help to fix it!
- Mining – The savior of our economy?
- “The Lord your God is bringing you into a good land, a land with streams of water, with wheat and barley, a land where bread will not be scarce and you will lack nothing; a land where you can MINE (dig) iron and copper out of the hills.” Duet 8:6-9

MINING, God’s plan for a sound economy!
A Tribute to the Men who started it all…

- The late Albert (Al) Isburg
- R.W. Bob Haining
- US Bureau of Mines
- British Coal Board