Thank you for the opportunity of speaking before you today on the subject of -

**Wireless Communications and Tracking in a Mining environment**
A brief introduction to mine.com
minecom holds ISO9001-2000 quality assurance certification from SGS
minecom has offices and factories in Australia and South Africa, with distributors located around the world.
We are represented in the USA by-

Pyott-Boone Electronics

a world renown company in the field of mining electronics equipment
MineCom has been designing & manufacturing products for the mining industry for the last 19 years
• Leaky Feeder Backbones
• Wireless Automations Systems
• Personnel & Vehicle Tracking Systems
  • Block-Light Systems
  • Heavy Duty Radios
  • Collision Avoidance
• Traffic Management Systems
“Redundant Communications to protect a mine’s Assets”
‘ASSET’

One dictionary quotes the following –

An asset is a resource having economic value that a corporation controls with the expectation that it will provide future benefit.
‘People are Assets’

….therefore they MUST be protected, so that they can continue to provide ‘future benefit’ to the corporation they work for
‘Redundancy’

Dictionary quotes in relation to Electronics

+ Duplication or repetition of elements in electronic equipment to provide alternative functional channels in case of failure

+ a system design that duplicates components to provide alternatives in case one component fails
‘Redundancy’

Dictionary quotes in relation to *Electronics*

+ Repetition of parts, or all of a message, to circumvent transmission errors.

+ Repetition of messages to reduce the probability of errors in transmission.
TENDER

Mine Communications System

Moncks Mining Corporation requires a ‘fully redundant’ communications system for their Moncks No. 1 underground coal mine. The communications system MUST BE fully redundant i.e. continue to operate under all conditions, including explosion/rock fall/ cable break

Contact – Ed Jones
Tel:- 804-363-7112
minecom introduced RINGFeeder®
the first REDUNDANT leaky feeder based communications system 5 years ago
Similar to a Fibre Optic Self Healing Ring Architecture

....if the fibre ring was broken, the traffic would be automatically routed around the cable break.
In 2005 mineCOM introduced **SMARTReverse** the FIRST
FULLY REDUNDANT leaky feeder based communications system
**SMARTReverse**

was originally developed for main line rail tunnel networks, to provide continuous communications under all conditions.
For \textit{SMARTReverse} to be ‘fully redundant’ there must be at least (2) TWO egress points into the underground tunnel network
Secondary egress can be via a -

- Return Air Shaft
- Skip or Cage shaft
- Escape way shaft
- Vehicle decline
- Bore Hole

The bore hole can be as small as 4 inches dia, it only needs to carry one or 2 cables
SMARTReverse... **NO** - only one egress point

Hard Rock Mine
SMARTReverse...... **YES** - TWO egress points

Return Path = Wireless - Fibre - Copper Pairs
SMARTReverse......YES - TWO egress points

Return Path = Wireless - Fibre - Copper Pairs

Hard Rock Mine
SMARTReverse... **NO** - one egress point only
With only one egress point SMARTReverse cannot operate in this mine
Option 1

Drill a 4 inch bore hole from the surface down to the working level to provide the return path for SMARTReverse.
The leaky feeder cable can then be run from the underground to the surface

...and could then be run strung from poles back to the main shaft, which would also provide additional surface cover
Alternately the leaky feeder cable could be interfaced to a fibre optic cable (RF to Fibre interface) and run up from underground to the surface.

The fibre optic cable could be run in a trench back to the main shaft, however this method would not enhance RF surface coverage.
Option 2

Utilise second shaft to provide the return path for *SMARTReverse*
The leaky feeder cable can then be run up the shaft from the underground to the surface.

...and could then be run strung from poles back to the main shaft, which would also provide additional surface cover.
SMARTReverse

OR…..Interface it to the mines fibre optic network
The SMARTReverse return path can be via use of a -

• Leaky Feeder cable
• Fiber Optic Cable
• Wireless Link

Even the old faithful -

• Copper Cable (pairs)
The **minecom SMARTReverse** is a Reversible Bi-Directional Amplifier using custom-built* helical filters to provide selectivity & act as duplexers to provide sufficient isolation between the UPLI NK and DOWNLI NK paths.

* in UHF frequency bands only
Should the cable be damaged, single pole double throw RF switches, with high isolation characteristics ‘electrically reverse’ the normal uplink and downlink RF paths of the Amplifier.
SMARTReverse is a fault tolerant leaky feeder system that can operate in the harsh mining environment & provide reliable communications on both sides of a damaged cable.

The direction of the Bi-Directional Amplifier is controlled by the presence, or absence, of a ‘control tone’, which emanates from the SMARTReverse Controller, located in the Head End rack.

The SMARTReverse ‘control tone’ is transmitted downlink (@141.745 MHz standard) & is amplified or boosted, as it passes through each individual amplifier.
SMARTReverse amplifiers are equipped with ‘drive-by’ diagnostics in the form of ultra bright LED’s indicating the condition of the amplifier to staff as they pass by.

An optional, PC based diagnostics package is available to monitor key parameters of the amplifiers and power couplers for remote monitoring of the system from a surface control room.

Windows® based software allows control room staff to monitor the health of the system 24 hours a day.
SMARTReverse is presently available in FOUR versions.....

MCA1000SR - VHF band.....150 to 175Mhz

MCA2000WSR - UHF wide band...400 to 500Mhz

MCA2000NSR - UHF narrow band...400 to 500Mhz

MCA3000NSR - UHF wide band...800 to 900Mhz
VHF SMARTReverse Amplifier

Example

172MHz

156MHz

20 - 120Mhz

Normal Condition

Copyright MineCom 2006
Example

UHF SMARTReverse Amplifier

465MHz

455MHz

20 - 175Mhz

Normal Condition
Example

UHF SMARTReverse System

Normal Condition
Example

UHF SMARTReverse System

These two amplifiers will reverse direction

Example

Normal Condition

These two amplifiers will reverse direction
Example

UHF SMARTReverse System

Cable Break
Example

UHF SMARTReverse System

Cable Repaired - system returns to normal operation
Example

UHF SMARTReverse System

Normal Condition
Many mines only used their leaky feeder communications backbone for voice communications, not realising its full capability and true potential.
Since minecom introduced its range of ‘SMART’ products into the market 5 years ago, mines have been adding additional functionality and services to their leaky feeder backones....
ONE cable carries ALL

VOICE
DATA
VIDEO

TRACKING
TELEMETRY

WI RELESS AUTOMATION
SMARTAmp Telemetry

Control/ Monitor
- Pumps
- Fans
- Environmental Sensors
- Sub Stations
- Remote Alarms

Simply cut the cable and install a SMARTAmp Telemetry unit offering -
- 8 x Analogue INPUTS
- 8 x Digital INPUTS
- 8 x Digital OUTPUTS
...SMARTAmp’s will continue to operate on BOTH sides of a blast or cave in.
SMARTCam Video

MONITOR - VIEW...
- Assembly Points
- Rescue Chambers
- Conveyor belts
- Sub Stations
- Remote Locations

Simply cut the cable and install a SMARTCam Video camera unit offering -

Real-Time video B & W, colour or thermal images from underground back to the surface
...SMARTCam’s will continue to operate on the DOWN side of a blast or cave in.
SMARTTrak Tracking

Simply cut the cable & install a SMARTTrak Tracking unit offering -
Real-Time tracking/ location/ direction of personnel & vehicles underground & on the surface
Tracking & Location

...SMARTTrak readers will continue to operate on BOTH sides of the blast/cave in, cable break.
SMARTCage Automation

Two Way Voice Communications
Emergency Stop
Monitoring functions
Control functions
Knocker Bell
Shaft Maintenance

SMARTCage - provides real time Automation or Semi Automation over a Cage and/ or Skip
...SMARTCage will continue to operate on BOTH sides of a blast/ cave in.
minecom offers a range of Passive and Active Tagging Systems
ePROX Personnel Tracking

ePROX electronic Tag Boards used to track the movement of personnel around the mine utilise small electronic tags that do NOT require a battery to power them. A range of models are offered with or without LCD displays.
Second generation ePROX II Tag Readers with expanded range, reads multiple Tags up to 12 meters away simultaneously. ePROX II Tags can be read at speed & DO NOT require a battery to power them. A range of Tag Readers and Tags are offered.
TelTAG personnel and vehicle tracking system utilise small electronic transmitters (tags) that are powered from a miners caplamp, or small lithium battery to power them. A range of models are offered which can be used for tracking people, vehicles.
LAMPS Personnel Tracking

LAMPS IS approved electronic personnel tracking system utilises small self contained electronic transmitters (tags) that are powered from a small internal lithium battery. Tag readers can be linked by Fibre or Wireless.
Termite II

A rugged vehicle radio designed for open cab mine vehicles - Waterproof - IP66
Heavy duty, shock proof
12 or 24VDC powered
Emergency Evacuation alarm
Back lite LCD display and keypad
TermiteFAB

A rugged wall mounted radio designed for wall mounted installation in underground mine tunnels

- Waterproof - IP66
- Heavy duty, shock proof
- 110/240VAC powered.....OR
- Leaky feeder cable powered version
- Emergency Evacuation alarm
- Back lite LCD display and keypad
minecom GUARANTEE

minecom provides a written guarantee that wherever you install a minecom leaky feeder system to an approved design criteria, good quality Voice, Data and Video communications are guaranteed.