

# **Advanced Solutions**

**Extending Equipment Life** 



Honeywell

# Mobile Equipment Health Monitoring

- Extending life and Saving Money
  - Past 5 years have been increasingly successful at applying technology to maximize the effectiveness of our heavy production equipment
  - Equipment Condition monitoring systems are providing significant improvements to an increasing number of mines.



 Share some of our experiences from our clients sites and the impact that monitoring programs have had on their productivity

# Mobile Equipment Health Monitoring

- The Challenge:
  - Mines are under heavy pressure to reduce costs and improve reliability of their critical heavy equipment – haul trucks, shovels, loaders
  - Equipment is heavily instrumented but Maintenance and Operations are generally not able to access the extensive data available on the equipment to manage equipment performance

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- The Solution
  - Cost effective tools are available to provide remote, real time monitoring of equipment and operator performance
  - Monitors all alarms and sensor data remotely in near real time
  - Provides notification of developing failures BEFORE the failure occurs
  - Optimize performance of the equipment and operators

### Mobile Equipment Monitoring The Next Big Step in Asset Performance

- Management Gap:
  - Most equipment has plethora of sensors and data
  - The challenge has been access to that data
  - Variety of systems are in use to use this data for diagnostics



- Applying advanced condition monitoring tools and techniques has proven valuable to companies investing the time and resource to manage equipment performance in real time
- The Solution
  - Mobile Equipment Monitor provides remote, real time monitoring of equipment and operator performance
  - Monitors all alarms and sensor data remotely in near real time
  - Provides notification of developing failures BEFORE the failure occurs
  - Optimize performance of the equipment and operators

### Mobile Equipment Monitoring The Next Big Step in Asset Performance

- The Technology:
  - Wireless communications in the mine has come of age with sufficient bandwidth and coverage in our mines – Rajant, and others
  - On board data collection on equipment provides access to all available truck, shovel, loaders etc. alarms and data in near real time
  - Visualization and analytical tools provide access to alarms and operating data (temps, pressures, position, payload, etc.) in real time.
  - Enables real time monitoring of equipment performance, developing faults and optimization of equipment and operator performance





### Matrikon Mobile Equipment Monitoring The Next Big Step in Asset Performance

- Experience
  - Matrikon (now part of Honeywell) has been installing commercial real time equipment monitoring systems for 4 years
  - Previously pioneered mobile equipment monitoring with a system built for Syncrude in 2002/2003
  - Over 20 years experience optimizing operations in refining, power and mining process industries
  - Much of those tools and learnings are now being applied to optimizing mobile equipment
  - Current users include:
    - Freeport McMoRan
    - Peabody Energy
    - ASARCO
    - Xstrata Coal

- ArcelorMittal
- P&H
- Kinross



### Matrikon Mobile Equipment Monitoring The Next Big Step in Asset Performance

- Business Process:
  - Most success has come from real time monitoring program – fleet monitor "supervises" fleet and is able to react to developing issues and predict failures
  - Work with Maintenance to proactively manage fleet health and performance
  - Integrate with dispatch to maximize utilization of the fleer



## What our clients are seeing.....



# **Abusive Shifting**

- Issue:
  - Shifting through neutral at high RPM
- Risk:
  - Increased where and significant reduction in life and reliability of power train
- Resolution:
  - User Defined Alarm created to identify abusive shifts, and a report card was handed out to operators at the end of their shift
- Outcome: They saw a 70 80 percent reduction in the occurrence of abusive shifts overnight.

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# Swinging In the Bank

- Issue:
  - Extensive Swing Impact alarms were identified.
    Pressure to reduce cycle time resulted in operators starting to swing while still engaged in the bank



- Risk:
  - Causes significant stress on the boom, bearings, gears & motors reducing component life.
- Resolution:
  - Operators made aware of the issues, were retrained on the proper method of loading a truck and are graded on this alarm.
- Outcome:
  - They saw a 60 to 70% decrease in swing impact alarms.

# **Fuel Injector Failure**



Issue:

- Alarm received indicating a fuel injector fault and engine developing low power. Large difference found between right and left EGT
- Risk:
  - Oil contamination from fuel and valve train damage
- Resolution
  - Truck downed and broken injector spring found and injector repaired
- Outcome:
  - Injector repaired with no further damage, downtime minimized.

# Body Up Alarm

- Issue:
  - Operators driving with dump body up position. User defined alarm identified driving with body up over 3 mph.
- Risk:
  - One to one correlation found between high body up alarm incidence and frame cracks found in 3 trucks in a 3 week period.
- Resolution
  - Reports provided to operators and training revised to address the issue
- Outcome
  - Immediate reduction in alarms reported
  - Reduced stress on frame, bearings, lift cylinders



# Plugged Oil Filter

- Issue:
  - Fleet Monitor received oil filter pressure differential alarm occurred at 14 PSI
- Risk:
  - Catastrophic engine failure from lubrication starvation
- Resolution
  - Maintenance decided to keep truck in service
  - 14 hours later second alarm occurred truck taken out of service, engine replaced
  - Filter clogged with metal, but catastrophic failure prevented destroying of engine core
- Resolution:
  - Saved \$200,000 engine core



### **Priority Alarms Reported**



## MEM Trends – Real Time Diagnostics



## MEM Trends – Real Time Diagnostics



### MEM Trends – Real Time Diagnostics



# **Torque Converter Overheat**

- Issue:
  - Maintenance was seeing increase in torque converter overheats significantly shortened service life
- Risk:
  - Significantly reduced component life and premature failure
- Resolution:
  - Alarms mapped on mine site indicated that almost all alarms were at two one dump locations at the crushers
  - Fallout from beds had built up significant berm at crusher, so trucks had to back up a 30 degree slope to dump, causing the overheats
- Outcome:
  - Dozer dispatched to crushers cleared berm and overheat alarms disappeared

## **Torque Converter Temp Event**



# Alarms mapped to GPS location



# Summary

- Mines employing real time equipment monitoring programs are seeing significant reductions in catastrophic failures, improved preventive programs and extended component and equipment life
- Bottom line is significant saving in maintenance, operation and life costs
  - Maintenance savings of 5+%, unplanned downtime reduction of 10%
- Important difference in capabilities of systems available on the market that can greatly affects the return on your investment.



# Thank You! – Questions?

### **David Fisk**

Manager - Mining Solutions Honeywell Advanced Solutions (416)620-4564 x 228



http://www.matrikon.com/mem