Advanced Solutions

Extending Equipment Life

POWERED BY MATRIKON

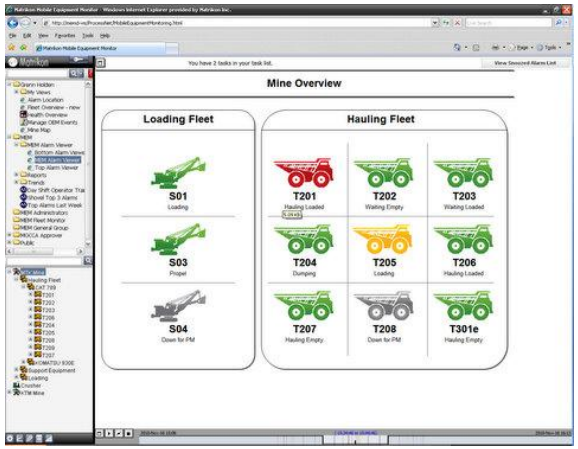
Honeywell

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



- 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

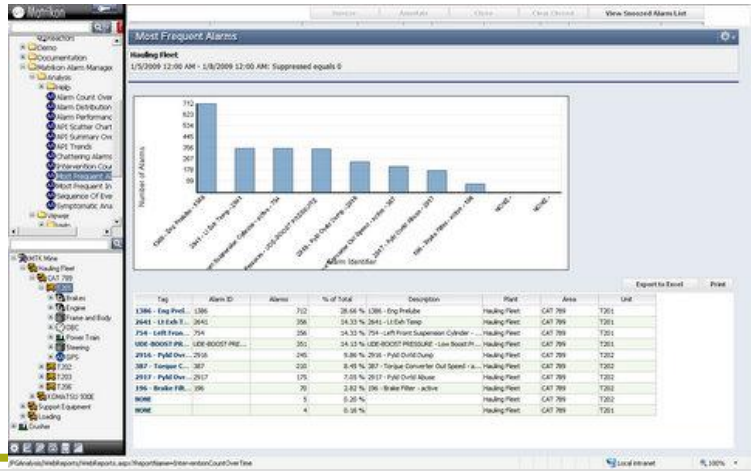
- Management Gap:
  - Most equipment has plethora of sensors and data
  - The challenge has been access to that data
  - Variety of systems are in use to use this data for diagnostics
  - Applying advanced condition monitoring tools and techniques has proven valuable to companies investing the time and 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

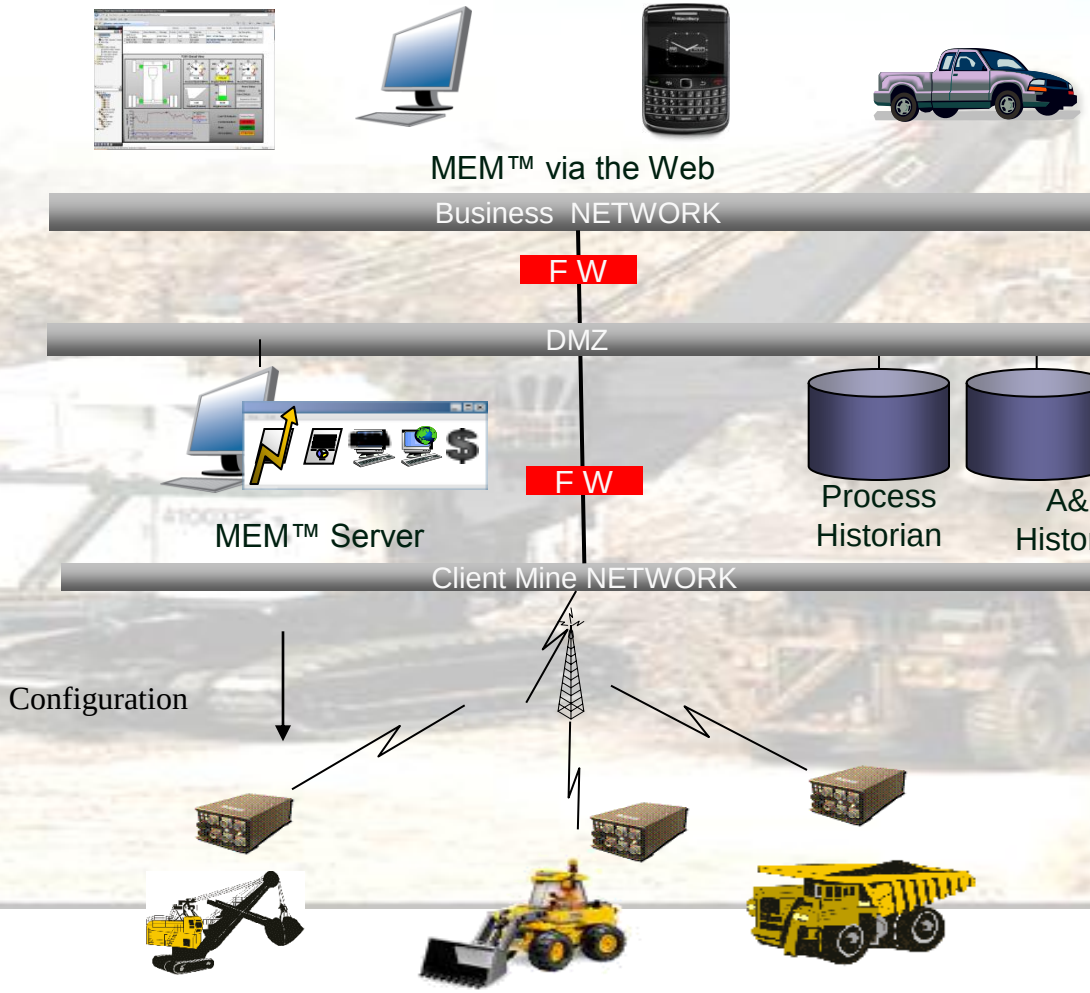
Mobile Equipment Monitoring

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

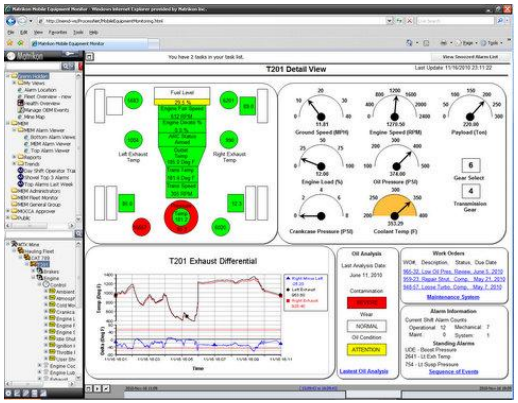


MEM Architecture



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

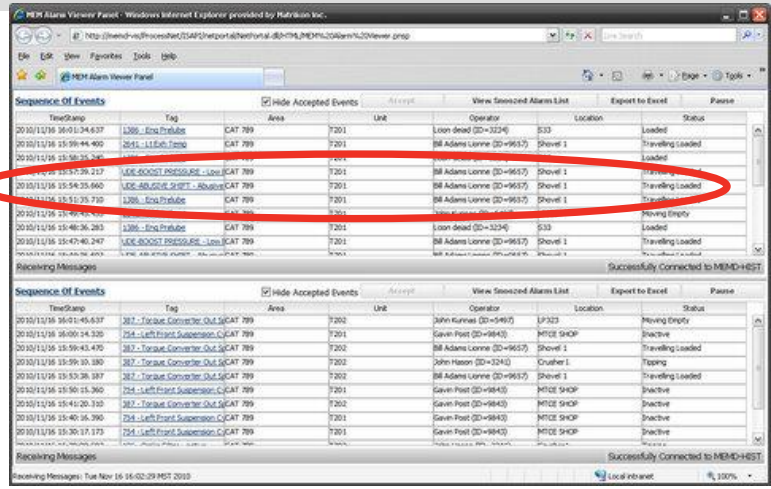
Matrikon Mobile Equipment Monitoring

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

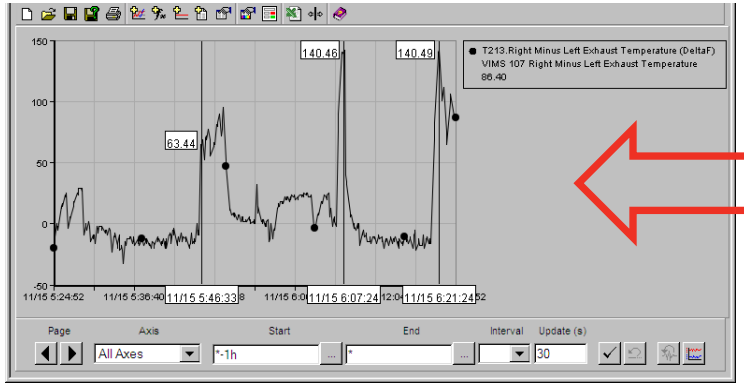


- Issue:
  - Shifting through neutral at high RPM
- Risk:
  - Increased where and significant reduction in life and reliability of power train
- Resolution:
  - User Defined Alarm created to identify abusive shifts, and a report card was handed out to operators at the end of their shift
- Outcome: They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

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



L & R EGT Differential

- 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.

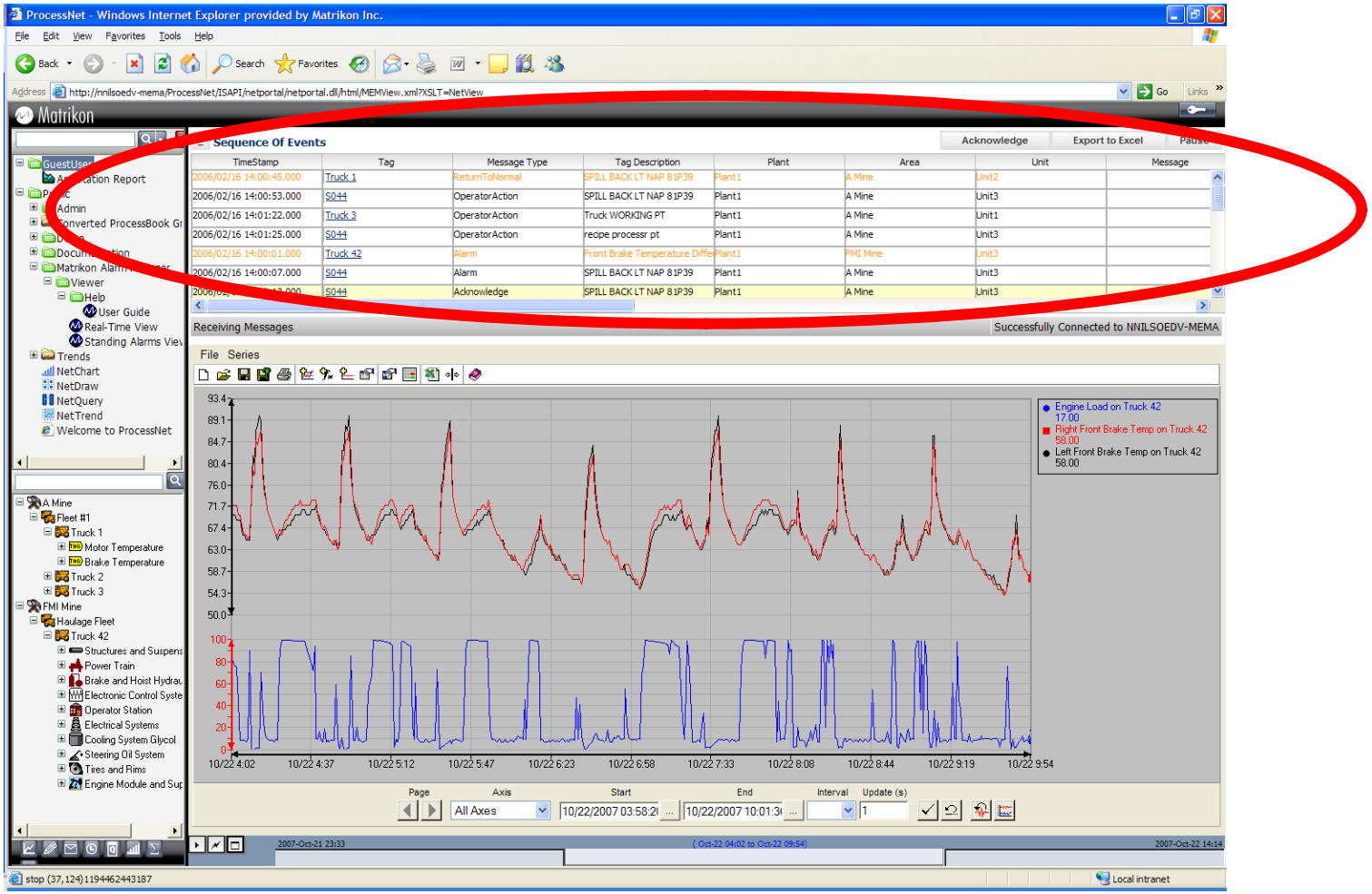
Body Up Alarm

- 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

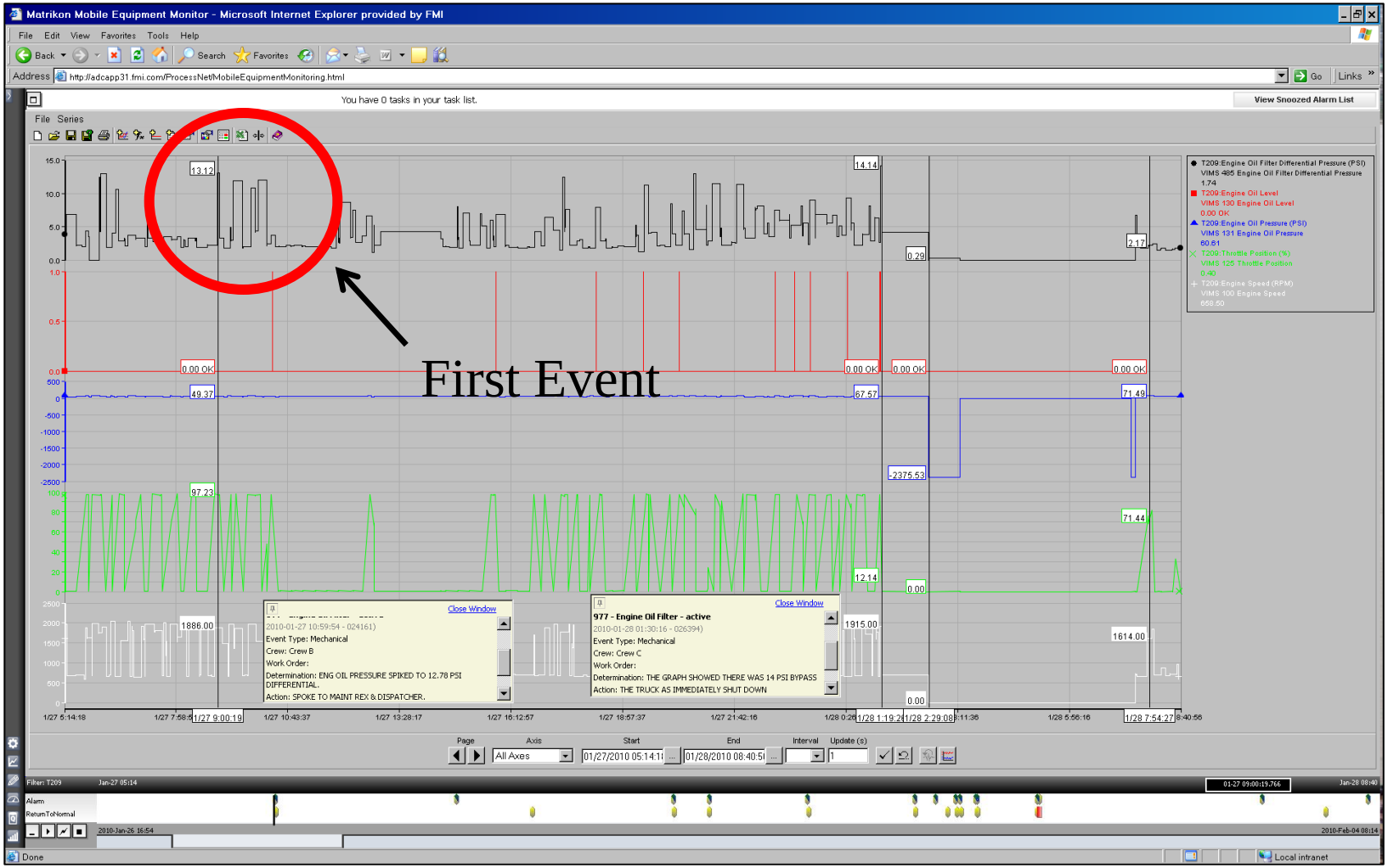
Plugged Oil Filter

- 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

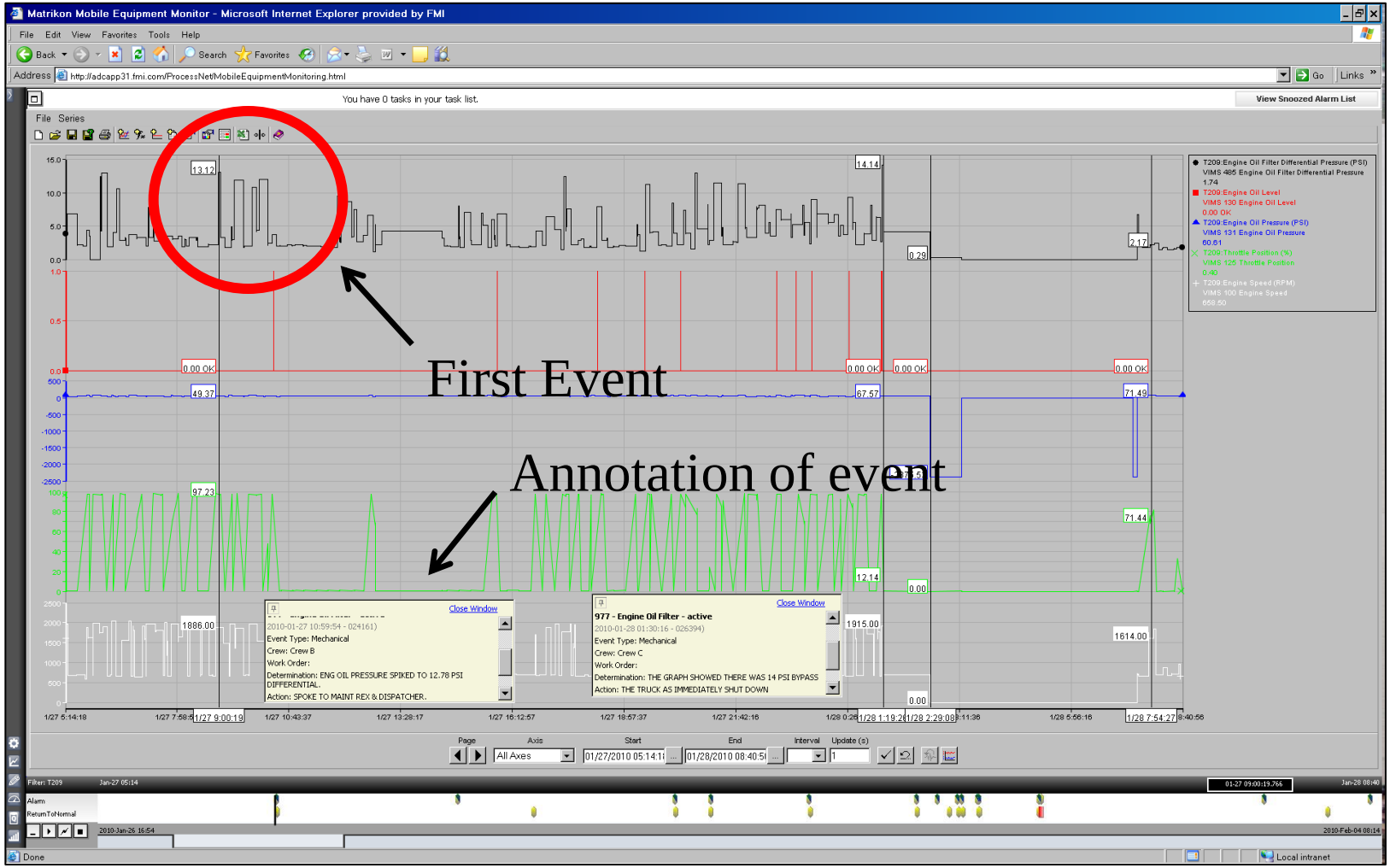
Priority Alarms Reported



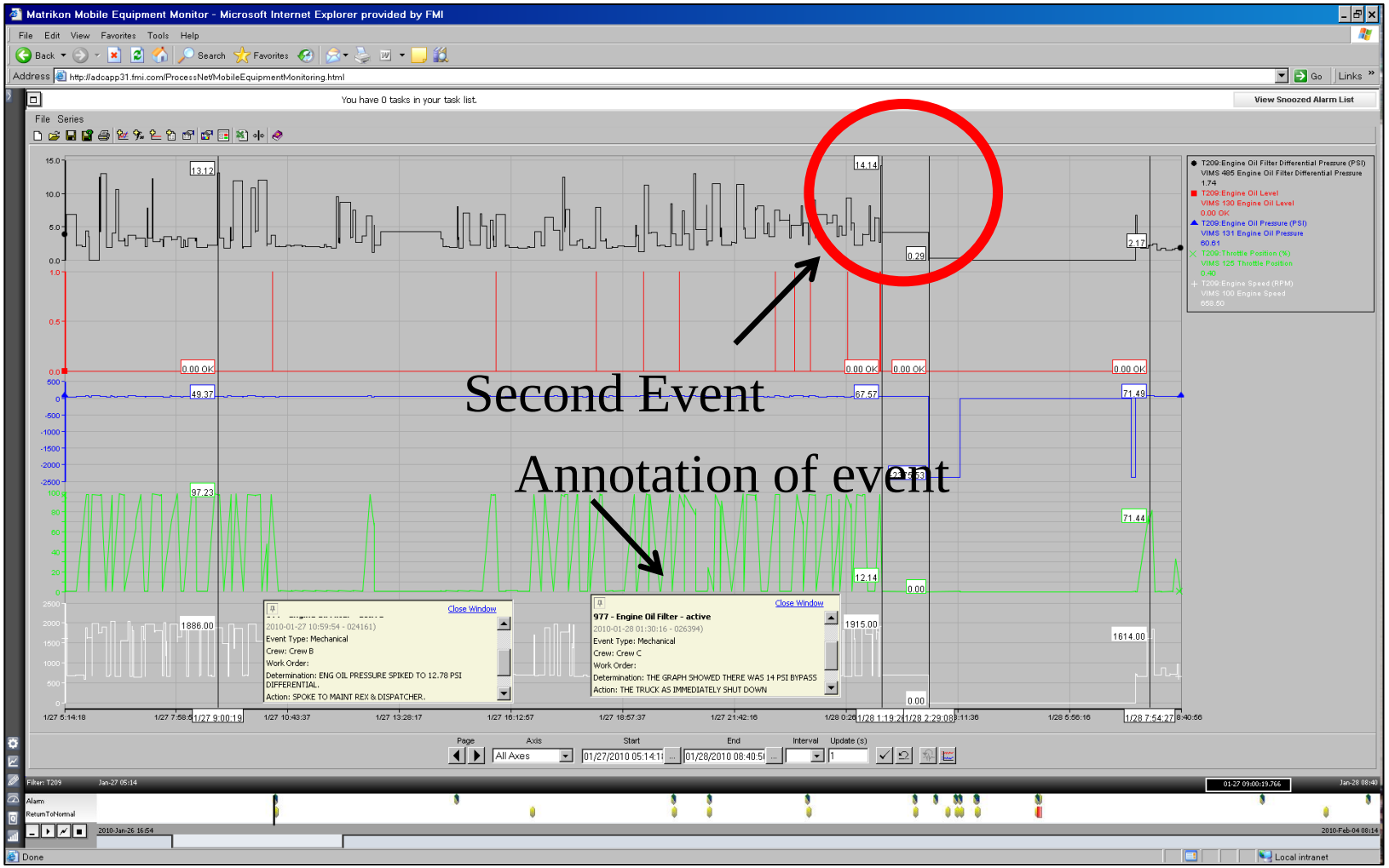
MEM Trends – Real Time Diagnostics



MEM Trends – Real Time Diagnostics



MEM Trends – Real Time Diagnostics

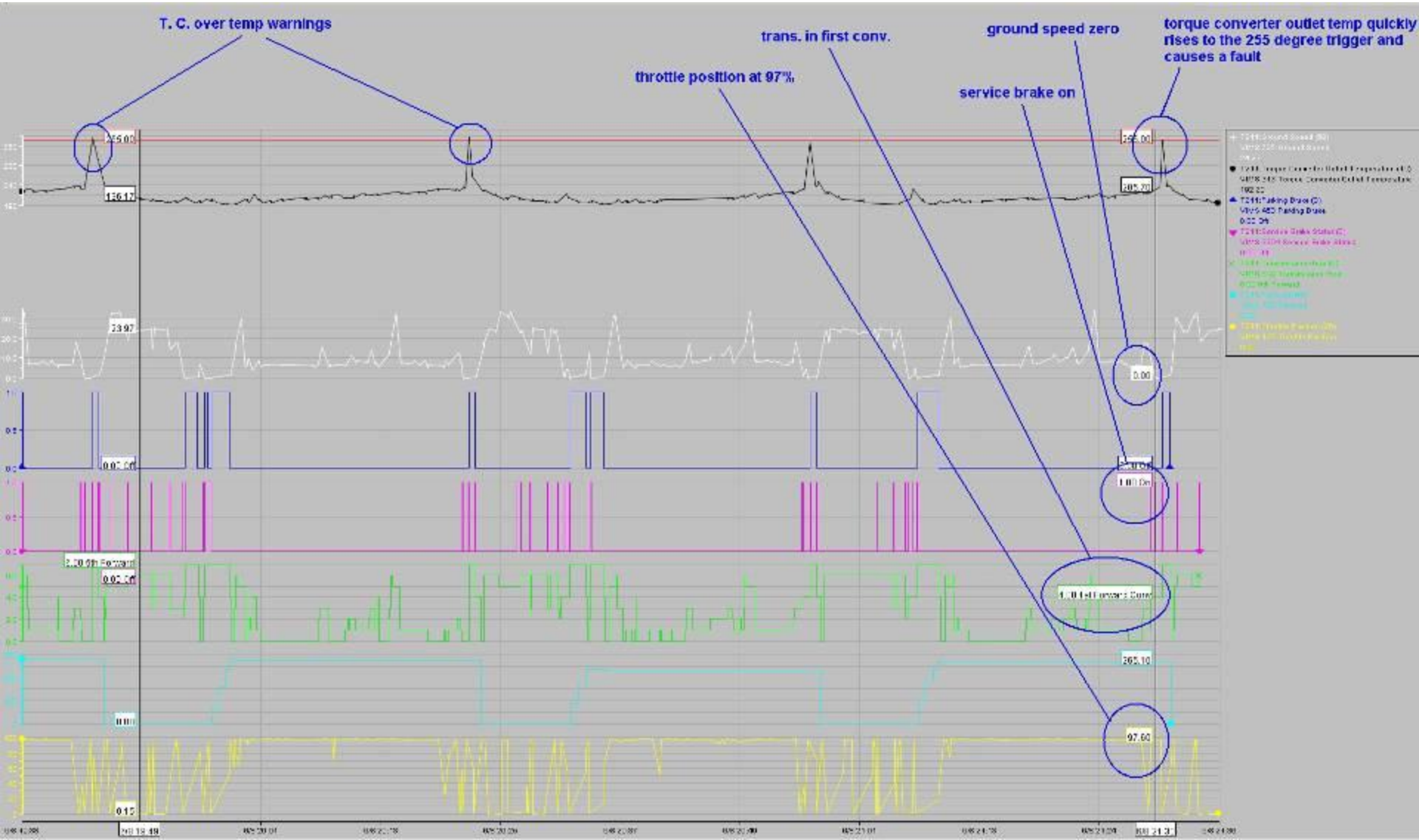


Torque Converter Overheat

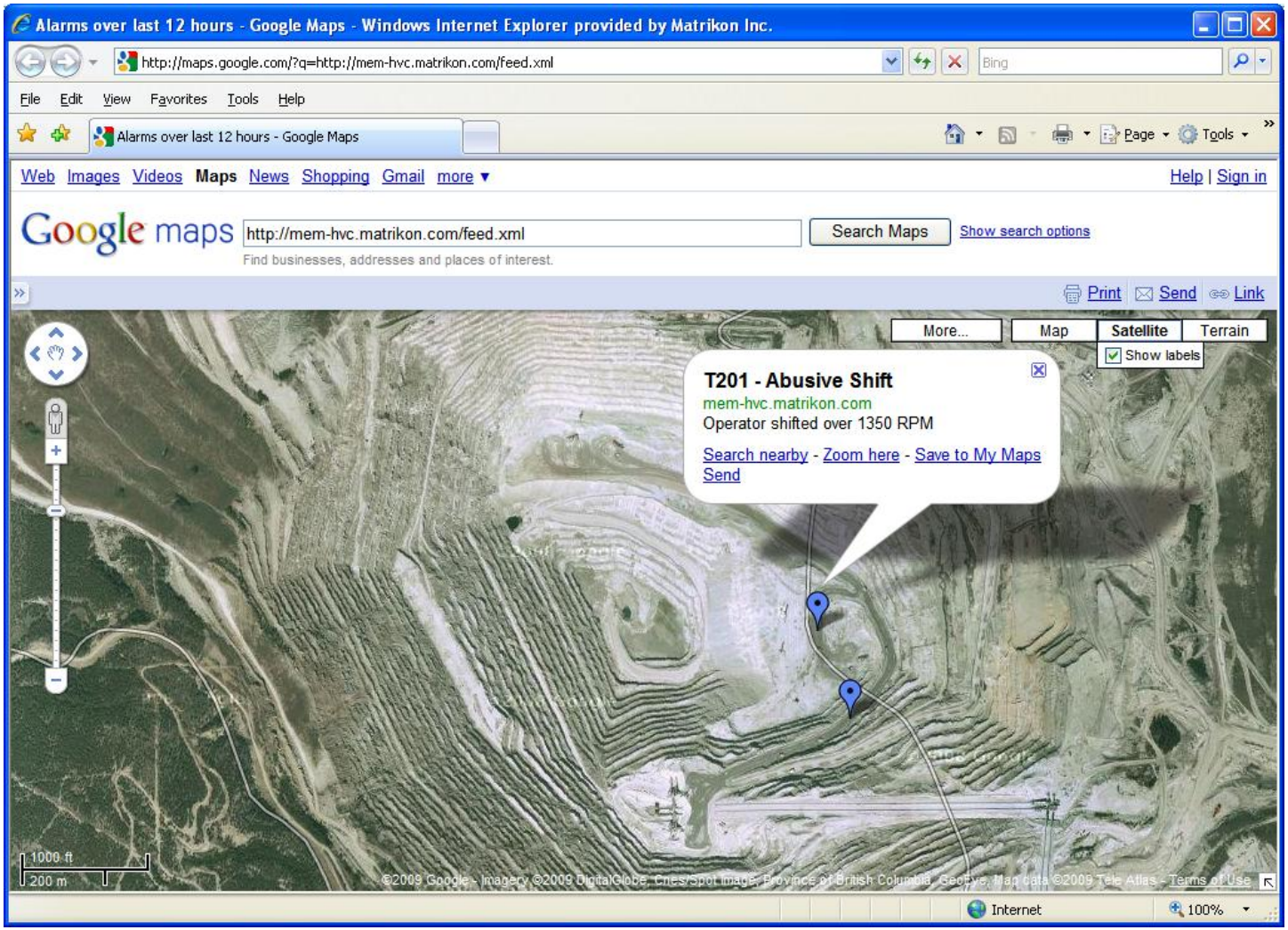
- Issue:
  - Maintenance was seeing increase in torque converter overheats – significantly shortened service life
- Risk:
  - Significantly reduced component life and premature failure
- Resolution:
  - Alarms mapped on mine site indicated that almost all alarms were at two one dump locations at the 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

Honeywell

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