



Mine Software Innovations

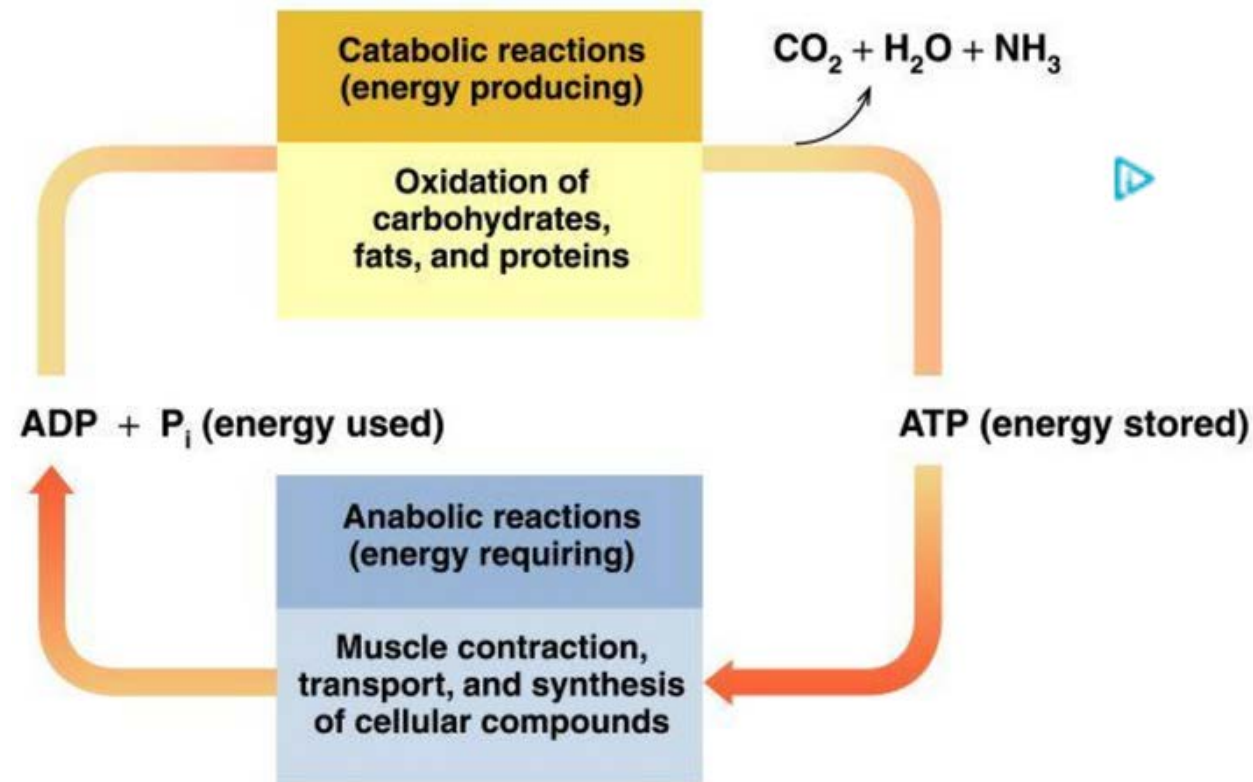
Kentucky Professional Engineers in Mining Seminar (PEM)

**September 11, 2015
Marriott Griffin Gate Resort & Spa
Lexington, Kentucky**



Jhon Silva, UK Department of Mining Engineering

Metabolism: Enzyme-catalyzed reactions that allow organisms to grow and reproduce, maintain their structures, and respond to their environments.



Mining is part of the “metabolism” of the civilization (George Orwell).

Road to Wigan Pier, 1937

How we should do mining?

Safer

Smarter (Productive, low energy consumption, etc.)

Better (Reduced environmental impact)

In other words: *Innovative*

“A constant success factor throughout the history of mining has been the adoption of new technologies.



Mining companies are considering key investment in mining management software and systems, vehicle related technologies, data analytics and safety management (2012). After 2012, we are facing tough times.

The universe of software used on the average mine is huge. From programs that track resumes and job applications to data management systems, from the ones used by engineers for designing, accounting software to the ever-present word processing software, there is no end.

In mining innovations, software always is present in:

- Automated machines
(<https://www.youtube.com/watch?v=s0RCSX95QmE>)
- Ore processing methods
- Simulation technology

- Mineral identification (Portable x-ray equipment)
- Geological, mining, modeling software
- Safety equipment (<http://smartcaptech.com/>)
- Data collection, analysis and interpretation (Big Data in mining)

Software to:

- Make better and faster decisions from the rock face to the port.
- Use the mineral resources more efficiently eliminating wasteful practices.

Software accelerates and simplifies the mine design and planning process, and provides variants and options to explore variable cut-offs and other mining constraints.

WHAT IS NEW?

World's biggest software Vendors

Mine design and planning

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& OPERATOR
TRAINING SERVICES



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SIMULATION | OPERATOR TRAINING

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DATAMINE

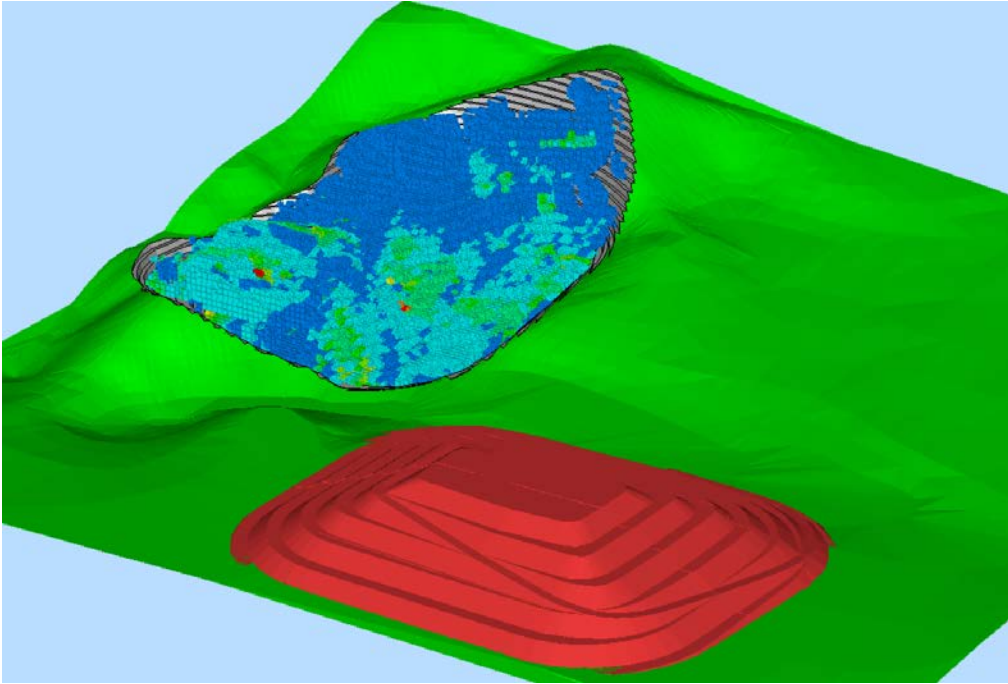
www.dataminesoftware.com

Exploration field work, database storage, resource modelling and all levels of mine planning from strategic optimization to detailed design and short term decision-making.

In July 2015, Datamine was acquired by Vela Software – an Operating Group of Constellation Software Inc (TSX: CSU), Canada’s largest software company.

CAE MINING

- Cloud computing, no software installed locally
- Open pit optimization, medium to short planning (Studio OP).



- Schedule and blend material from multiple sources whilst honoring operating constraints, haulage limitations and production targets

CARLSON



CARLSON

- Upgraded every year and coincident with new AutoCAD releases.
 - Solids: modeling, drawing and labelling solid.
 - Expansion of 3-D capabilities, bench pit design,
 - Block sequence mining improved,
 - Augmentation of haul-truck cycle analysis routines,
 - Enhanced visual feedback in underground timing sequencing; improvement in reports presentation,
- Focus in take field data from any source and use real-time data to update and improve the models.
- Machine control.

Dassault Systèmes GEOVIA

Gemcom Software was acquired by Dassault Systèmes, in July 2012



Surpac

GEMS

Minex

Whittle

MineSched

PCBC

Hub

InSite

Geology And Mine Planning



Surpac

GEOVIA Surpac™ is the world's most popular geology and mine planning software. It delivers efficiency and accuracy through ease-of-use, powerful 3D graphics, and workflow automation.

[+ Learn More](#)



GEMS

GEOVIA GEMS™ provides collaborative geology and mine planning capabilities that support cross-functional teams involved in exploration, modelling, mine design, long-term planning, and production scheduling.

[+ Learn More](#)



Minex

GEOVIA Minex™ provides the best geology and mine planning tools for coal and other stratified deposits, ensuring resources are evaluated accurately and mined efficiently.

[+ Learn More](#)



Whittle

GEOVIA Whittle™ is the world's most trusted strategic mine planning software used to determine and optimise the economics of open pit mining projects.

[+ Learn More](#)



MineSched

GEOVIA MineSched™ is the most innovative scheduling software experience for mining puts you back in the driver's seat to maximize productivity and profits.

[+ Learn More](#)



PCBC

GEOVIA PCBC™ is used by virtually every major mining company involved in block caving who rely on its comprehensive functionality to assist with feasibility studies, design, and production management.

[+ Learn More](#)



Dassault Systèmes GEOVIA



- Focus on the underground tools upgrades
 - Stope design tools improved, now more interactive,
 - Meshing algorithms improvements,
 - Automation of procedures (automatic ramp design)
 - Dump scheduling and haulage planning tools improved
 - Data sharing capabilities improved “the cloud”



MICROMINE



EXPLORATION & MINE DESIGN

- ▶  Micromine
Micromine 

DATA MANAGEMENT

- ▶  Micromine
Geobank 
- ▶  Micromine
Geobank^{Mobile} 

MINING SOLUTIONS

- ▶  Micromine
Pitram 



MICROMINE



- Improved pit design algorithm → automatic design,
- Enhanced geological modelling techniques (Algorithms)
- Focus on the integration between software and machine guidance systems



EXPLORATION

MINESIGHT EXPLORATION includes tools for managing drillhole data and interpretation of geologic data in 3D, plan and section.



BLAST

The HxM BLAST package incorporates HxM Blast and MineSight's drillhole management software. With one license, design and manage drill and blast patterns interactively on screen while storing design (and actual) information in a SQL database.



GEOLOGY

Recommended for resource work, the MINESIGHT GEOLOGY Basic package arms geologists with CAD tools for extended interpretation assistance, face mapping, drillhole/model coding, interpolation and reserves reporting.



SURVEY

The MINESIGHT SURVEY Basic Package is recommended for open pit survey management and volume calculations. It includes all of MineSight's sophisticated surface intersection and volumetric tools. The package exudes functionality with multiple direct import wizards.



LONG TERM PLANNING FOR OPEN PIT

Optimize pit designs, report mineable reserves, and schedule mining sequences with MINESIGHT LONG TERM PLANNING for OPEN PIT. Generate life-of-mine schedules, including rapid evaluation of alternative plans to maximize net present value.



LONG TERM PLANNING FOR UNDERGROUND

Visualize your development activities more clearly with the LONG-TERM UNDERGROUND ENGINEERING package.



13 MineSight packages

MINESIGHT (MINTEC)



- Focus on the integration of mine planning/scheduling with a 3D framework “elimination of spreadsheets as working tools” also implementation of data sharing capabilities
 - Modular system (13 different packages)
 - Scheduler optimizer
 - Automatic designs

RungePincockMinarco (RPM)

Enterprise Mine Planning	Execution	Financial	Mine Design & Reserving	Scheduling
Enterprise Planning Framework	Ultra Short Term Planning – XECUTE	XERAS For Enterprise XERAS Reader Financial Modelling – XERAS	Geology Integration – COAL SEAM AGG Data Visualisation – FRACSIS Geology Integration – BLOCK AGG	Oil Sands – XPAC Solution Open Cut Coal – XPAC Solution Open Pit Diamonds – XPAC Solution Open Pit Metals – XPAC Solution Quarry – XPAC Solution Short Term Mine Scheduling – XACT Underground Coal – XPAC Solution XACT For Enterprise XPAC – Mine Scheduling

Global Presence
Working in the mining industry across 118 countries

[LEARN MORE](#)



Products

Vulcan

Vulcan software provides the mining industry with the most advanced 3D geological modelling, mine design and production planning solutions.

I-Site

I-Site 3D laser survey technology combines long range laser scanning hardware with processing and modelling software for industrial survey projects.

BlastLogic

BlastLogic is an accuracy management system that streamlines tasks and processes in open cut drill and blast operations to improve mineral recovery.

Evolution

Evolution provides enterprise level strategic and tactical mine planning tools for scheduling and optimisation for open cut mining.

Eureka

Eureka provides an interactive 3D environment for visual interpretation of exploration data including drilling, geophysical surveys, maps, imagery and GIS.

PerfectDig

PerfectDig is an intuitive system to rapidly compare excavations against designs in the field, improving decision making and resource recovery.

Sentry

Sentry is an integrated laser based spatial solution for detecting and tracking surface movement in open cut mines and civil environments.

Airborne Mapping

Maptek offers a fast, safe and accurate system for airborne data capture and photogrammetric mapping using an unmanned aerial vehicle.

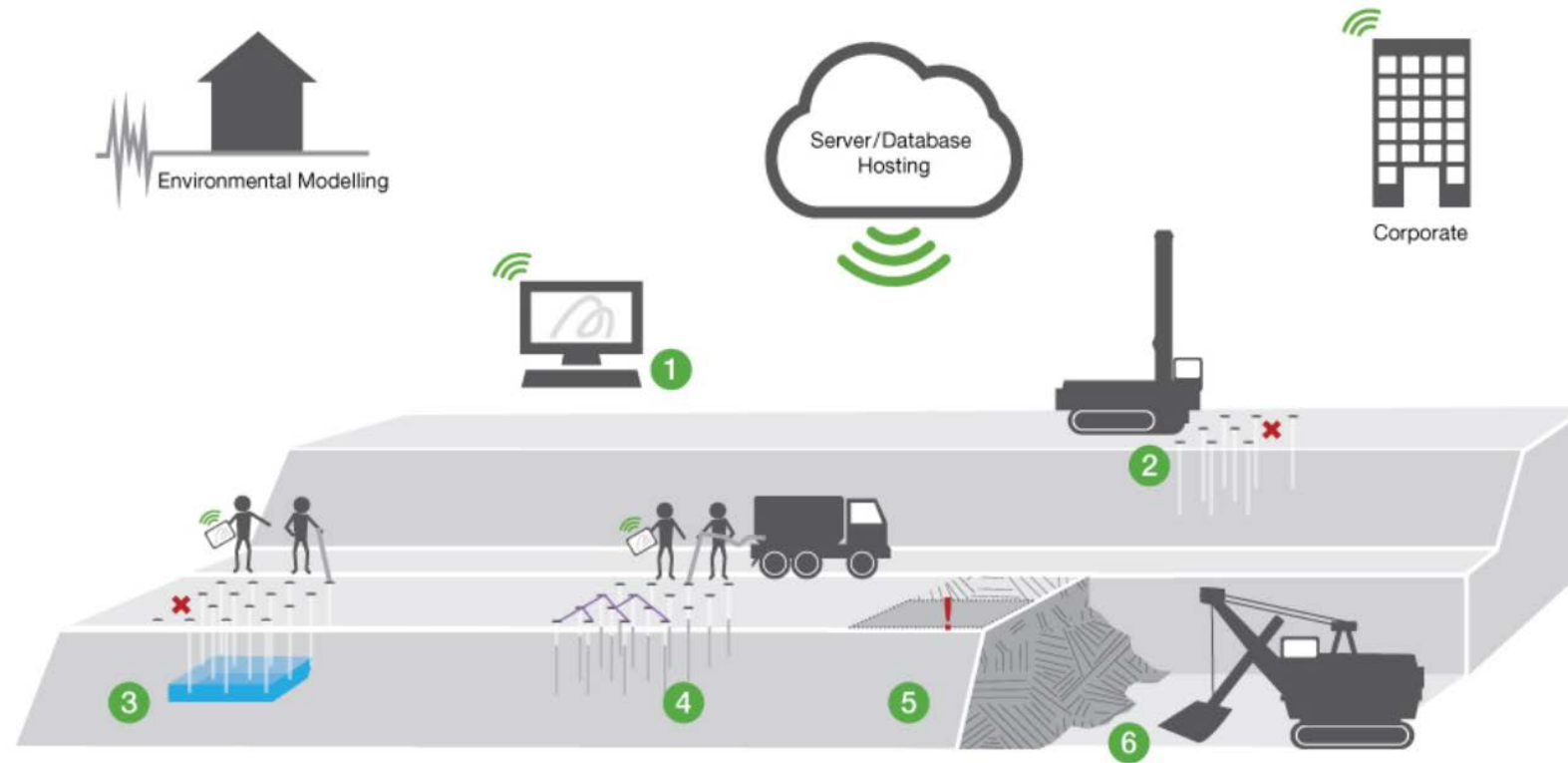
MAPTEK

- Focus on new algorithms (“Evolutionary” algorithms) and automated mine design tools (Surface – Underground).
 - Grade-tonnage curves generation more efficient,
 - Open pit design tools improved (“Rapid pit design”)
 - Two more products:
 - PerfectDig: 3D non-topographic comparison of scans Vs Designs.

(<http://www.maptek.com/products/perfectdig/index.html>)

MAPTEK

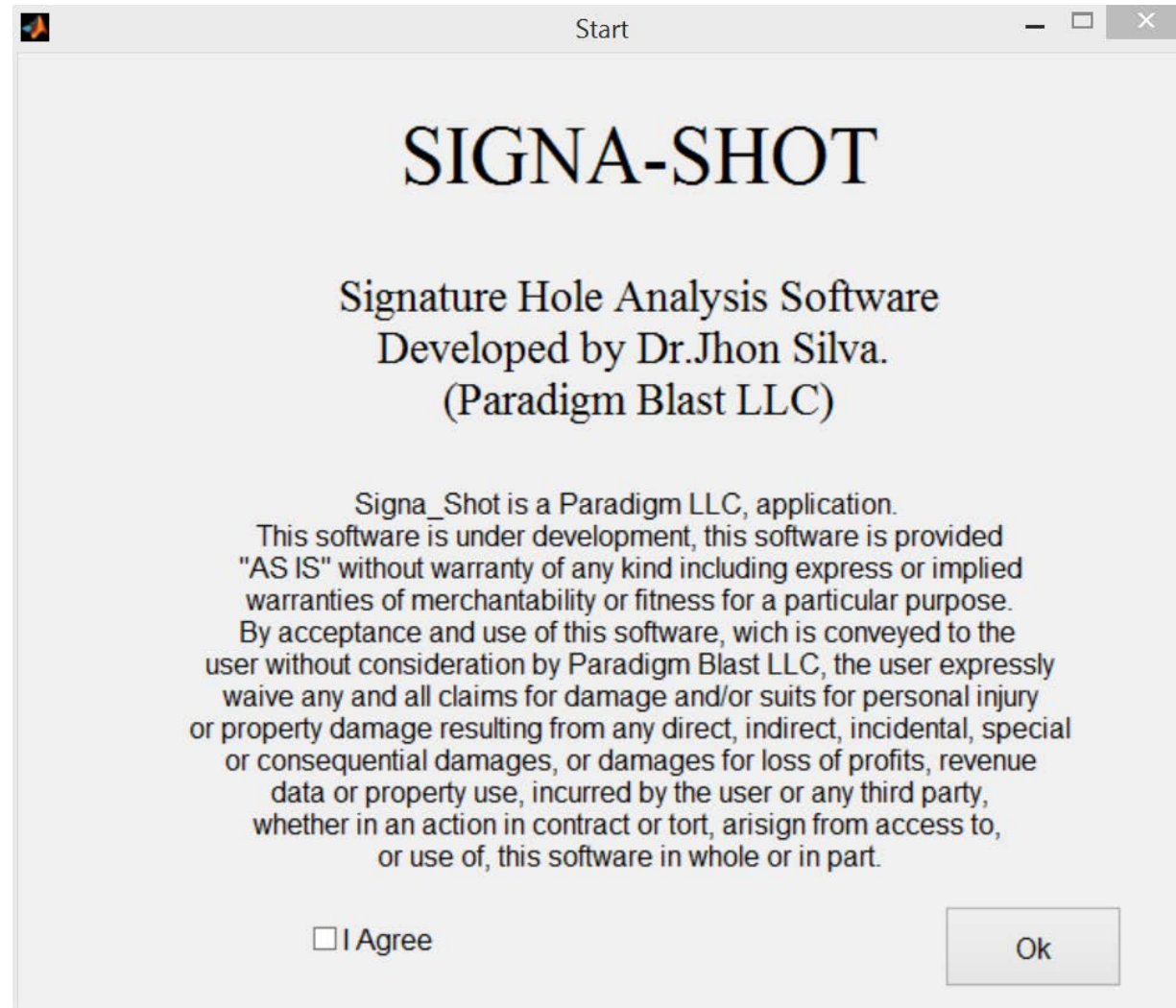
- BlastLogic



- 1 Design the blast
- 2 Drill & validate holes
- 3 Enter dipping data, QA hole conditions
- 4 Execute load plan & record actuals
- 5 Review performance & results
- 6 Reconcile production data

SignaShot – Signature Hole Analysis

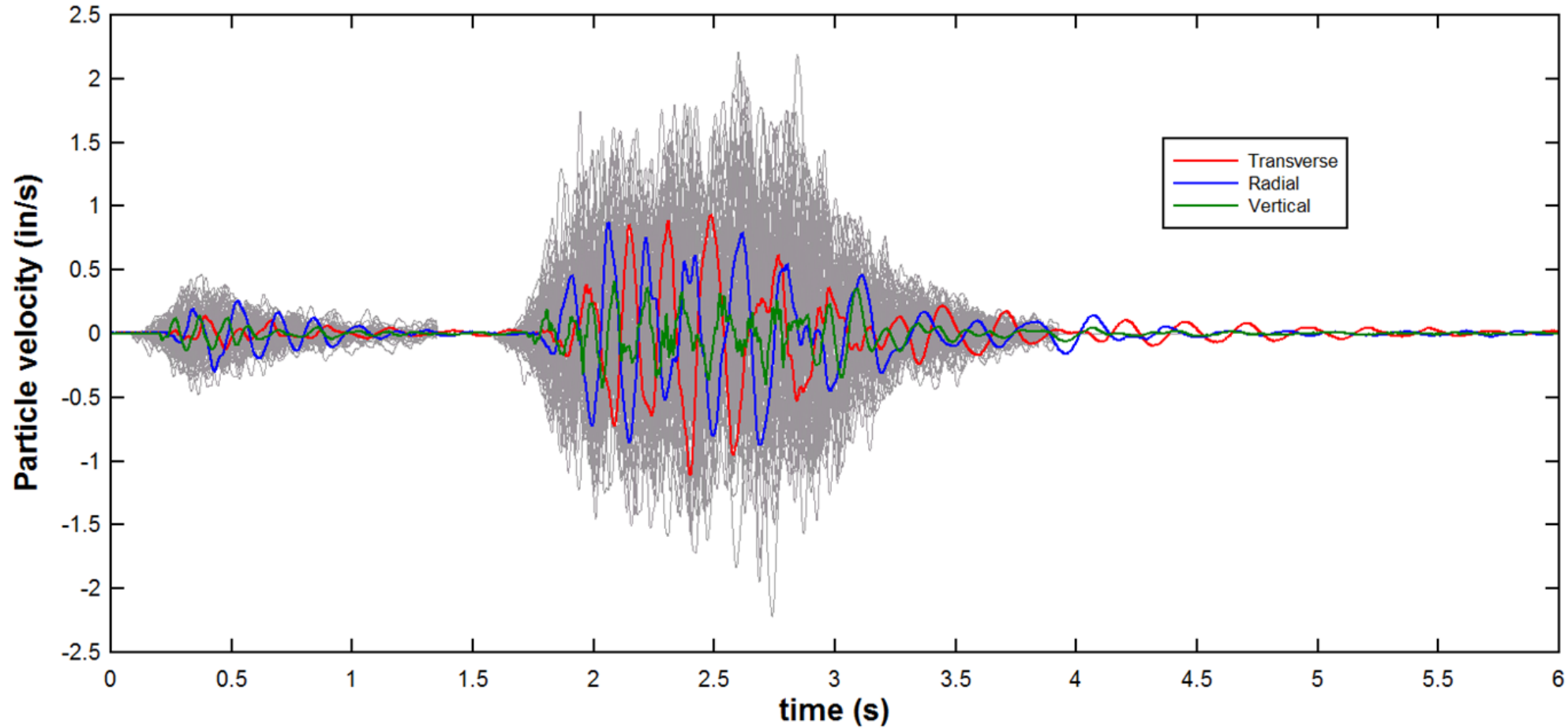
- Blast Vibration Modeling Software



SignaShot

- Blast Vibration Modeling Software

Prediction Vs Reading (Including Signature)



Other mining areas...

Mineral exploration

- Leapfrog
- Geosoft
- Strater-4 form Golden Software
- Rockware
- ...

Mineral processing

- JKTech
- AVEVA
- Aggflow
- ...

Ventilation

- VnetPc
- Cradle
- Ventsim Visual
- ...

Rockmechanics

- Rocscience
- Itasca
- ...

Mine Software Innovations

Summary

- The universe of software used on the average mine is huge.
- Software is important as it is fast, flexible, dynamic and can be used to assess the best outcome by changing scenarios and conducting sensitivity analyses.
- Mine planning software must be able to quickly update and recast the bottom line to alert management and investors as soon as possible.
- New technologies generates new algorithms that are incorporated to the software to create faster solutions “real time” analyses.

Mine Software Innovations

Summary

- Industry Trends:
 - Automation (robotics)
 - “Big” data (security, process, analysis and decision making).
 - Operational control
 - “Real time” information

The challenge is how to digest all of the data collected throughout the mining lifecycle and turn it into profitable decision making information.

Mine Software Innovations

! THANKS!