# SMI JKMRC

Julius Kruttschnitt Mineral
Research Centre

Rock Mass Characterisation for
Mine to Mill Processes

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22/02/18

Purpose of characterisation – Link rock properties with mine to mill processes

**Rock mass characteristics**

Mine to mill processes

**Predict and Optimise
Process Performance**
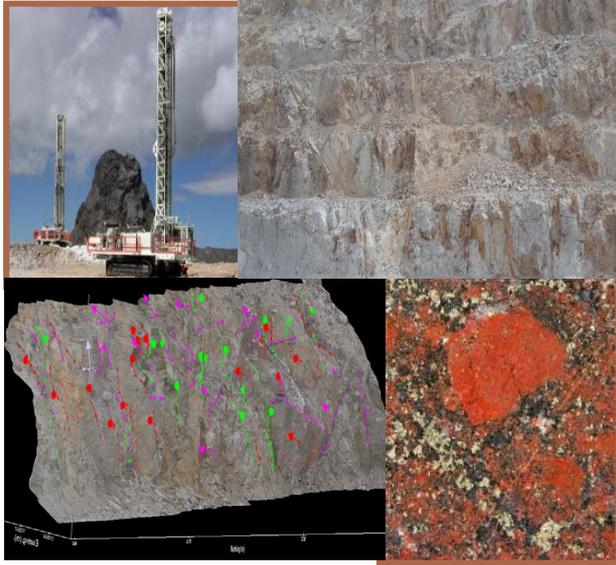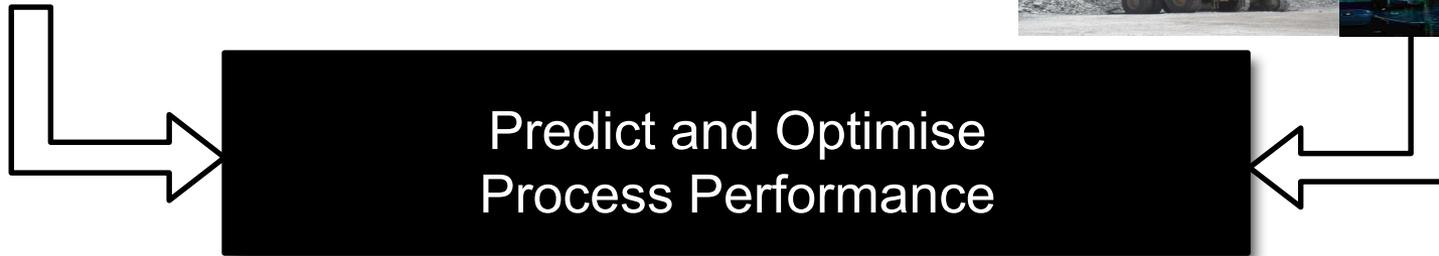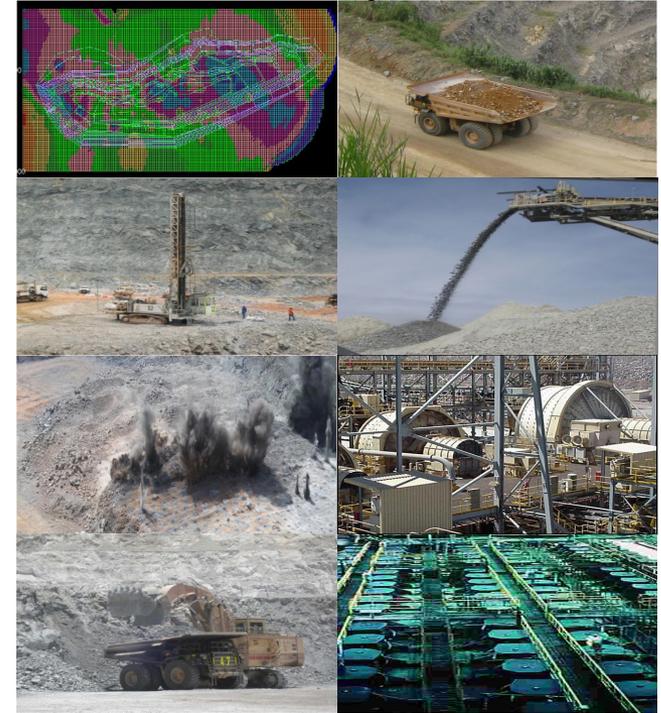
Current practice

Cores or
Grab samples

Laboratory tests

Block model

Process performance

**Blastability
Grindability
Flotability**
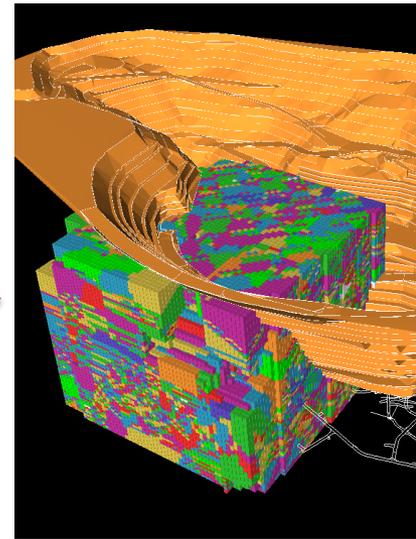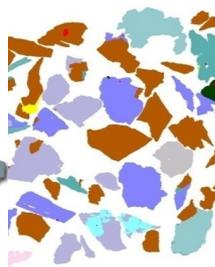
Challenges

Rockmass variability

– Variation in properties

– What proportions ?

Sample representation

Information availability in time

Fractured

Soft and friable

Massive and hard

4. 8. 1999

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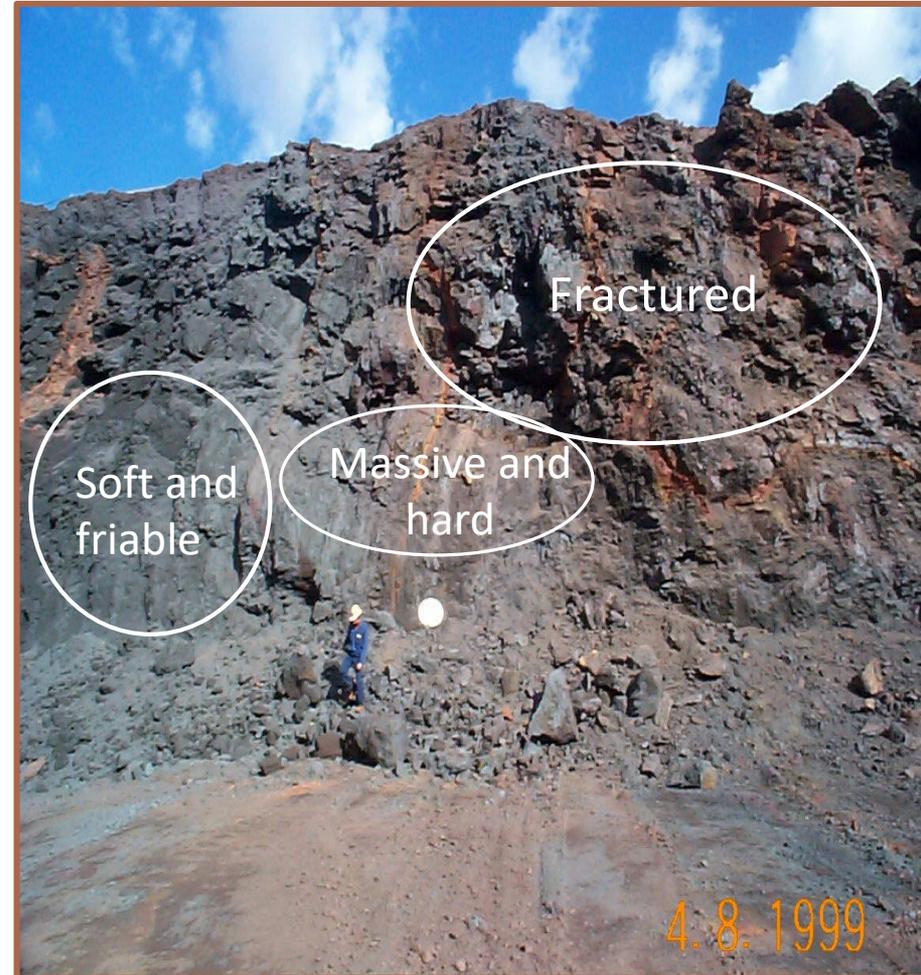
Research

- Use of MWD and MAD data to reduce uncertainty

- New testing method to understand intrinsic variability

- New integrated models to predict, control and optimise mine to mill processes

SMI Integrated blast model
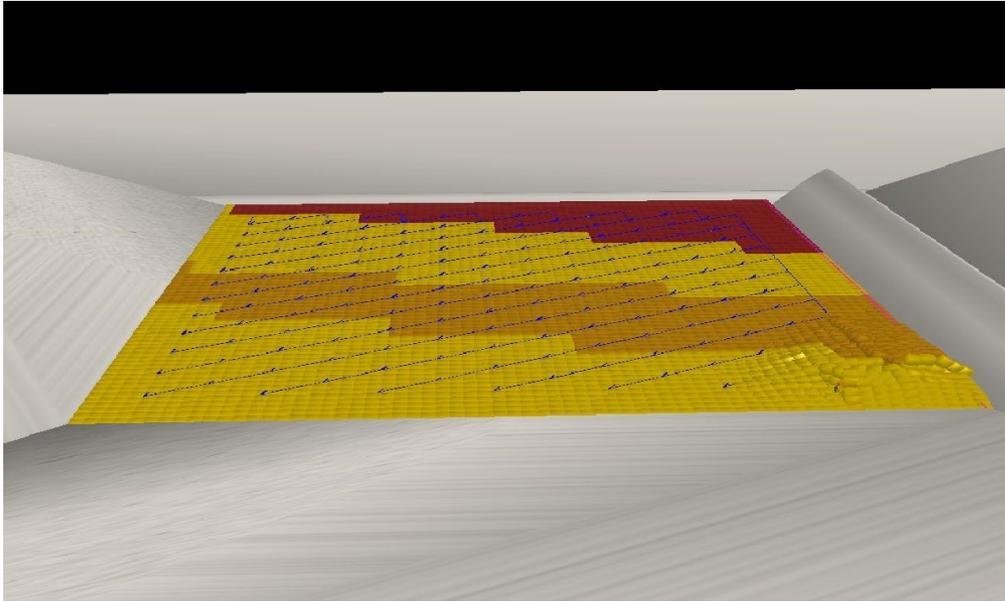
Key Features

- Multi hole and variable rock properties
- Models fragmentation and movement in a realistic time frame
- Uses rock hardness parameters same as metallurgists
- Can use the actual mine surfaces
- Can track post blast properties of a muck pile - fragmentation, dilution, ore loss or any other property stored in the block model
- Ultimately can estimate value of each bucket / truck load
- Needs calibration with actual measurements
- Can model real blast (sizes) in a reasonable time

- Part of mine work flow uses existing systems
- Imports data from existing systems and exports to them to take decisions in time

Block model inputs:
- Grade
- Lithology
- In-situ block size
- Hardness (A*b, UCS)
- Or any other block model data

|	High Grade	Medium Grade	Waste
Grade (g/t)	1.1	0.75	0.25
Hardness (A*b)	52.64	84.92	154.56
In situ block size (m)	0.75	0.5	0.25

Model predictions
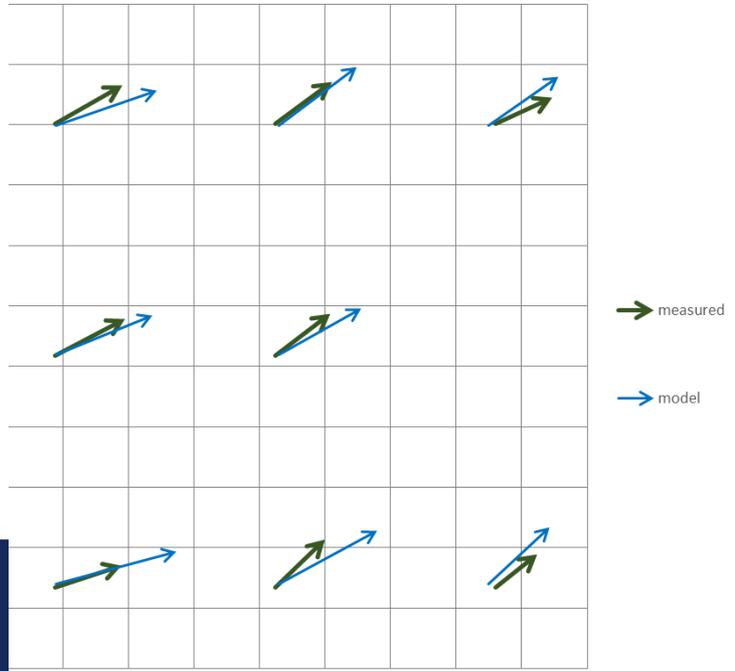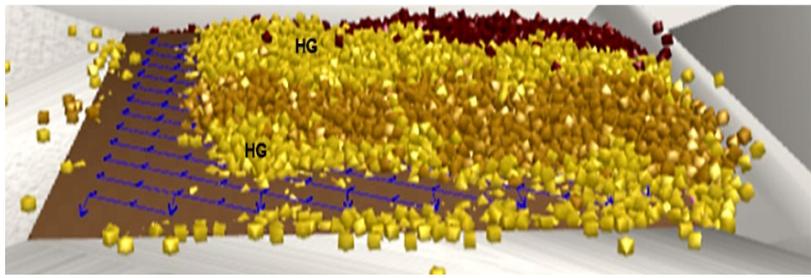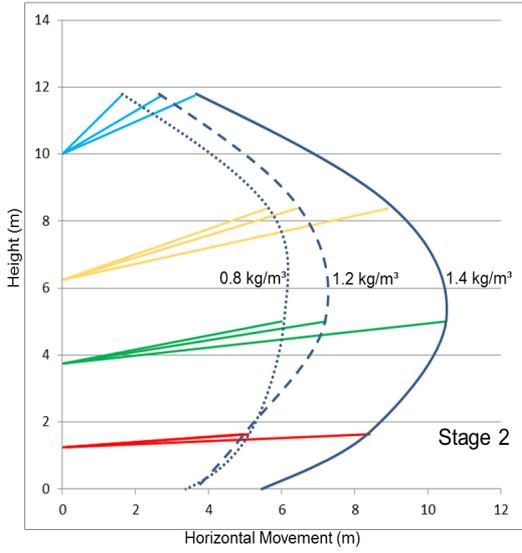
Differential fragmentation
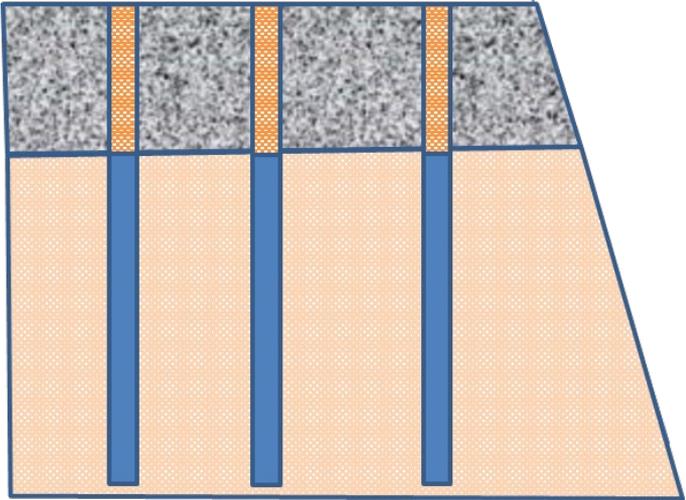
Cap rock:
Insitu block size
$I_{50} = 0.75m$
$Ab = 70$
$UCS = 100\ Mpa$
$Density = 2.85$

Soft rock:
Insitu block size
$I_{50} = 0.15m$
$Ab = 150$
$UCS = 30\ Mpa$
$Density = 2.5$

CAPROCK

SOFT ROCK

P80

1000

750

500

250

0
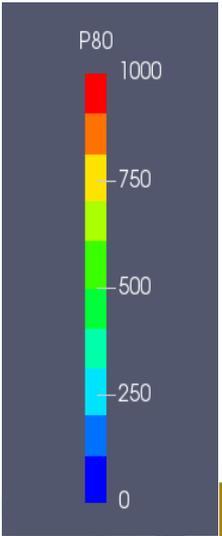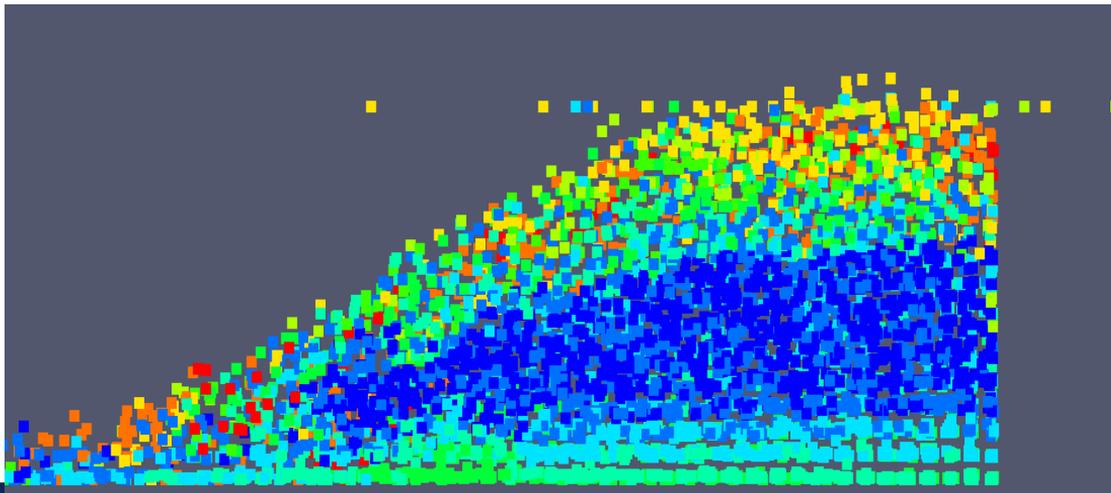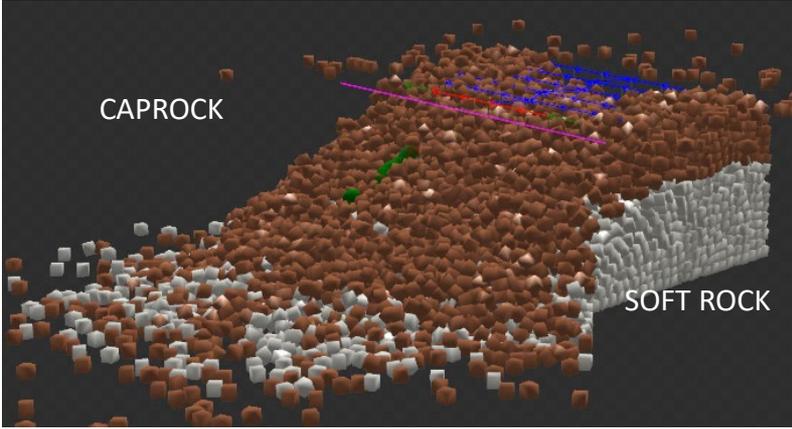
Value based grade control

Grade

Hardness

Fragmentation
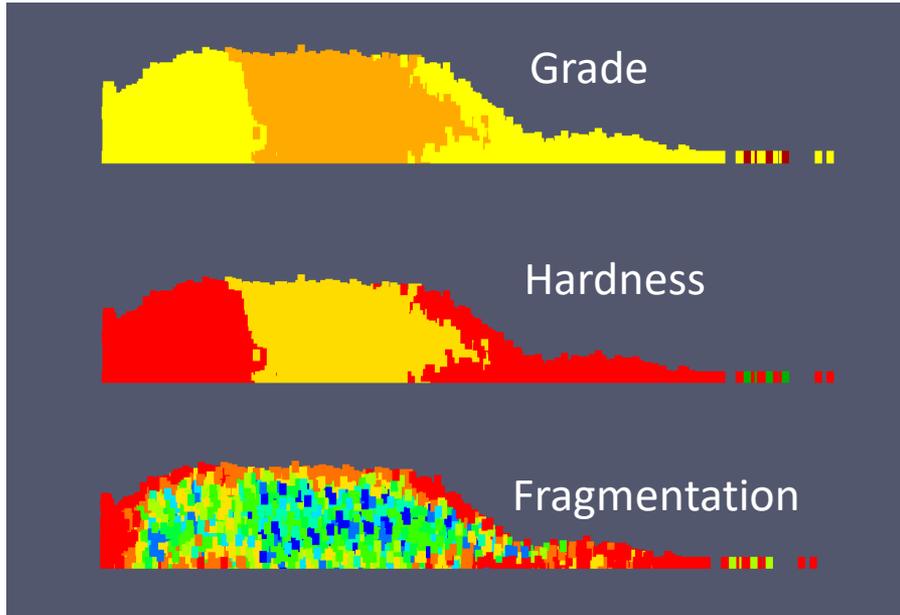
Integrated Process Model

Tph
Recovery
Kwh/t
$/t
Value / block

Value per block
- 700
- 650
- 600
- 550
- 500
- 450
- 400
- 350
- 300
- 250

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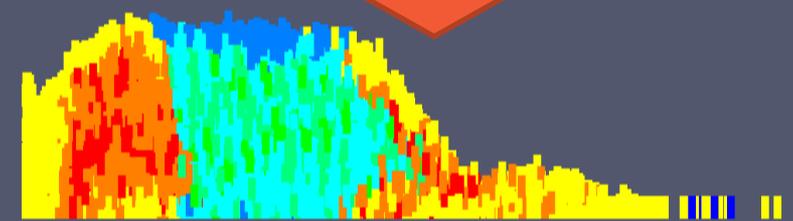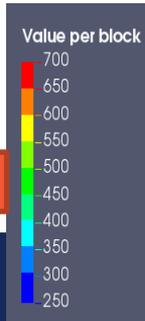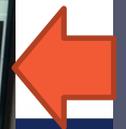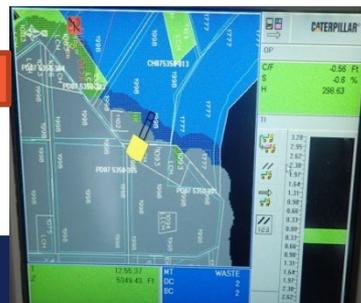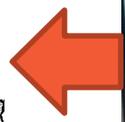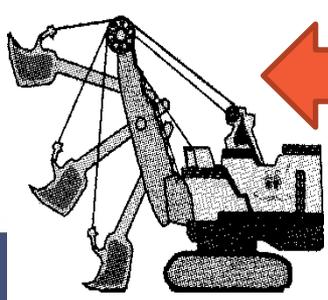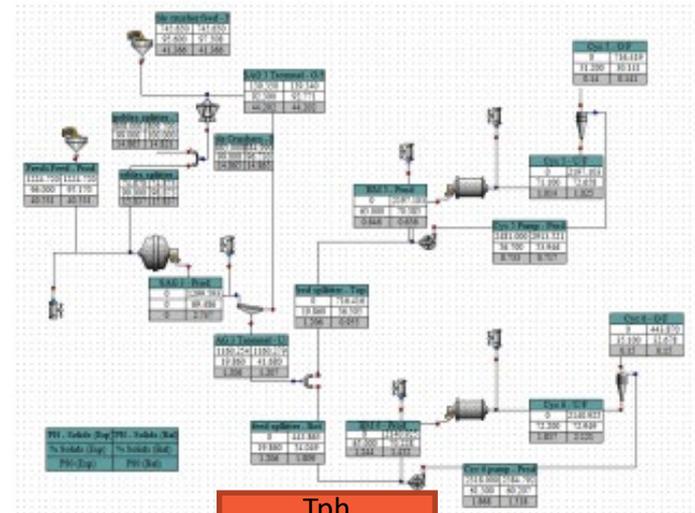
Our Vision

Model informed process control and optimisation

Process control - What do we do currently ?
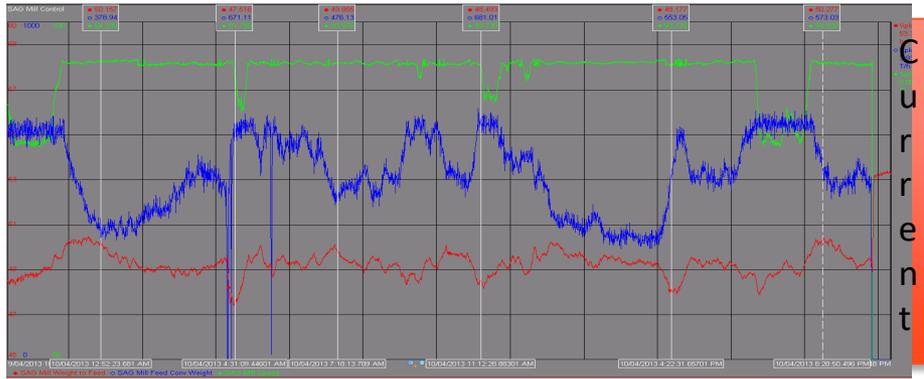
History

Operator

?

Future

Model informed process control & optimisation

Update ore body knowledge

Self-Learning System Building Ore Body Knowledge

Rock mass characteristics
- Geological Model
- Face Mapping
- Measure While Drilling
- Blast hole logging

Mining characterisation
e.g. Blasting and blending

Process characterisation
e.g. Grinding and flotation

Process performance indices
- Grade
- Blastability
- Grindability
- Separability
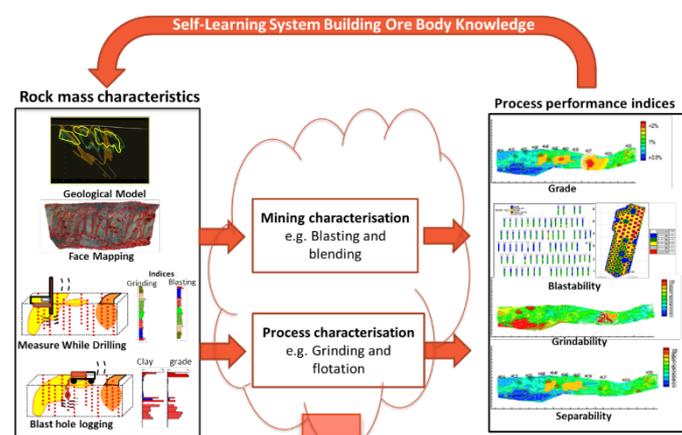
Ore characteristics

Update models
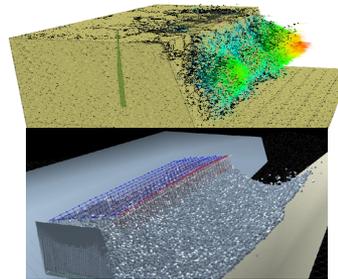
Blast Modelling

Process models

Operator

History

Future Predictions