



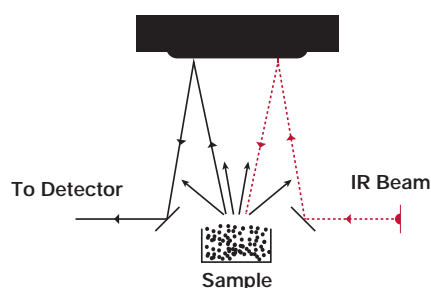
**BUREAU
VERITAS**

SPECTRAL SERVICES & MACHINE LEARNING

Bureau Veritas Minerals' latest innovation has been the development and application of spectral services through the combination of near infrared (NIR), short wave infrared (SWIR) and Fourier Transform Infrared (FTIR) spectroscopy.

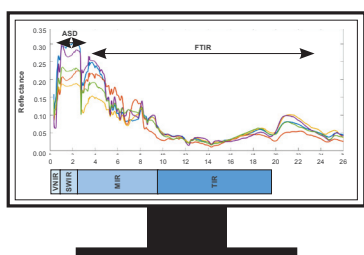
The application of spectral services and machine learning is a highly beneficial tool to add to your mining program to assist in the analysis and evaluation of your ore-body and the performance of your process.

1



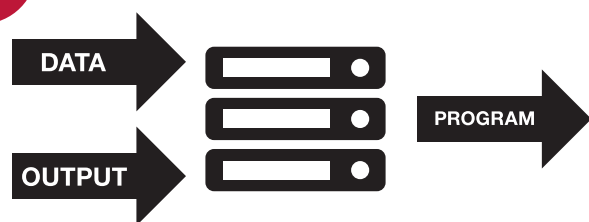
COLLECT SPECTRAL SIGNATURE

2



CREATE A DIGITAL FINGERPRINT FOR EACH OF YOUR SAMPLES

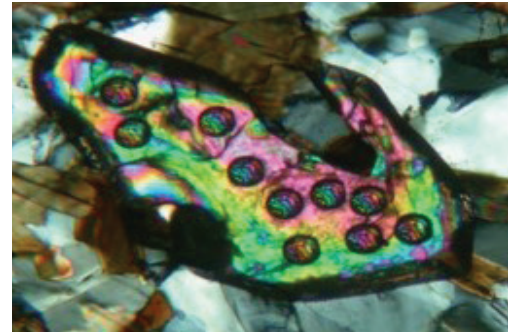
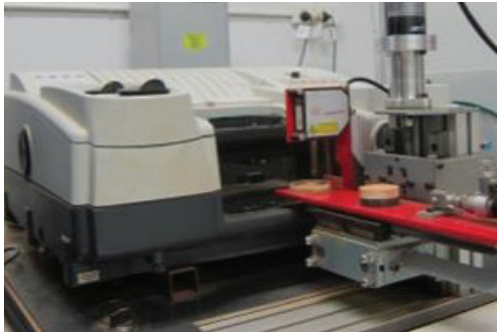
3



PREDICT ANALYTES BY MACHINE LEARNING

WHY CHOOSE SPECTRAL ANALYSIS & MACHINE LEARNING?

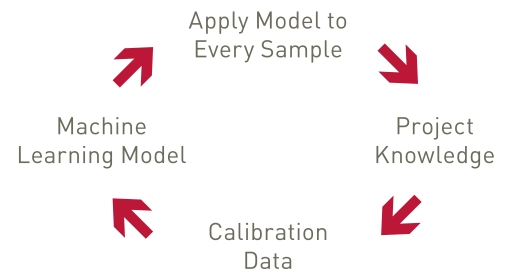
- ✓ Low cost analysis – fast spectral collection
- ✓ No additional sample preparation required
- ✓ Obtain a complete mine picture from routine laboratory samples
- ✓ Create a digital mine record for the future
- ✓ Predict:
 - ✓ Future processing conditions
 - ✓ Metallurgical parameters
 - ✓ Mineralogical parameters
 - ✓ Chemistry
 - ✓ Physical properties



BUILD A DIGITAL MINE PLAN WITH MACHINE LEARNING

Use Machine Learning to:

- Identify relationships between spectral features and critical variables
- Discover and capture associations and patterns within spectra
- Learn and predict



Quantitative knowledge

PROVIDES IMMEDIATE CORRELATION TO MINE AND PROCESS KNOWLEDGE

Including but not limited to:

Mineralogy

- Hematite
- Goethite
- Quartz
- Kaolinite etc.

Chemistry

- Major Elements
- Elemental Speciation

Physical Properties

- Loss on Ignition
- Specific Gravity
- Bulk Density

Metallurgical Parameters

- Comminution Energy (BWI)
- Recovery
- Acid Consumption

Classification knowledge

PROVIDES IMMEDIATE CORRELATION TO MINE AND PROCESS DECISIONS

Including but not limited to:

- Plant feed options
- Geological and ore type classifying
- Stockpile and blending parameters



1300 MIN LAB (1300 646 522)



bvaus@au.bureauveritas.com

www.bureauveritas.com.au



BUREAU
VERITAS