HyLogging™

HYPERSPECTRAL mineralogical logging and imaging of drill core and chips

da new set of eyes to rapidly and objectively quantify minerals
FLSmidth proudly announces the signing of a Technology Licence and Transfer Agreement with the CSIRO to develop, produce, distribute and support the innovative hyperspectral logging technology known as HyLogging™ and integrated software for industry use.

HyLogger™ systems are an outcome of many years of extensive research and development in the area of hyperspectral science and borne out of remote sensing research. In recognition of the technology’s potential, the research was supplemented by industry sponsors and has been extensively tested in actual industry applications.

As a reputed supplier of innovative technology with an ongoing development relationship with the CSIRO, FLSmidth’s agreement allows us to bring HyLogger to the market in the form of accessible and easy-to-use units. These units provide accurate and comprehensive data, enabling geologists to develop validated interpretations.

Key Benefits

- **Rapid collection of high density spectral reflectance measurements**
- **Continuous high-resolution colour imagery**
- Objective, consistent and effective core logging
- Increased geological knowledge
- Near real time analyses
- High resolution digital images
- Non destructive
- Samples measured in their original trays
- Maximises the value of drilling expenditure
- Improved geometallurgical understanding
- Historical digital archive of all cores and rock chips
- Addresses shortage of skill and expertise
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Innovation

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The Technology

Hylogger systems facilitate the rapid collection of high quality spectral data and continuous high-resolution colour imagery of drill core, drill chips and drill powders. Hylogger systems provide a means to routinely and objectively capture detailed mineralogical data with the aim of improving the efficiency and productivity of geological interpretation. HyLogger provides an additional ‘set of eyes’ for the mapping of minerals and associated alterations. It offers an extra set of data against which geologists can validate analyses.

Hylogger allows the identification of an extensive list of minerals, improving understanding of the presence of valuable ores, including gold and diamonds. Mineral deposits and their related indicator materials have unique spectral signatures based on relative compositions. Hyperspectral reflectance data can be used to identify concentrations of target mineral deposits over large areas.

The large volumes of multidimensional data collected by HyLogging systems provide a rich source of data for use in both mineral exploration and mining. These data sets can be applied to a number of disciplines within different industries, including agriculture, environmental monitoring, soils characterisation and medical applications.

The HyLogger measures and photographs your samples (A), collects tens of thousands of visible and infrared reflectance spectra (B) and enables TSG to create a variety of mineralogical logs (C-D) that permit you to “discover what you cannot see”.
HyLogger improves the efficiency and productivity of geological analysis by rapidly and objectively mapping minerals associated with alteration, mineralisation, host rock formations and the regolith. HyLogger analyses at high spatial resolution, on very large numbers of samples, so it can be used to capture highly detailed information on ore system mineralogy, characterising and revealing previously undetected rock volumes and mineralogical signatures. Collected spectra are then matched with a spectral library within The Spectral Geologist™ software or interpreted with user defined spectral indices. HyLogging systems have been used pre-commercially and commercially as well as in government research projects.

A HyLogger system typically comprises:
- Integrated visible, near and shortwave infrared spectrometers covering the 400 to 2500 nanometre spectral range
- A robotic x/y table for moving samples in their original containers beneath the spectrometers
- A digital camera capable ~ 0.2 mm resolution
- A laser profilometer for determining sample height or core breaks
- Control plus processing and analysis software

The CSIRO-developed The Spectral Geologist (TSG™) data interpretation and analysis software is provided as part of the HyLogger system. TSG is a specialist processing and analysis software program designed specifically for the exploration and mining geoscientist who wishes to integrate spectral data with other geological data sets. TSG organises spectral data into a single file structure allowing the data and analysis results from a project, drill hole or geochemical grid to be stored and analysed together. TSG provides increasingly integrated multi-wavelength analysis functions, a broad spectral library and advanced interpretation tools.

TSG results can be composited and exported to mine planning and visualisation packages such as Vulcan, Surpac and Leapfrog.
Why Use HyLogging Technology?

Smart logging technologies for improved consistency, supporting skilled professionals and increasing mineralogical knowledge across the industry

Value
HyLogger provides improved quantity and quality of results from expensive drilling. HyLogging technology promotes a better understanding of the links between mineralogy, geotechnical and metallurgical properties of ore systems. This allows geologists to refine exploration, mining and processing strategies and enables whole-of-life use of exploration mineralogy data through to mine closure.

Speed
HyLogger is fast – near real time – in logging data. Minimal sample preparation required as samples only need to be clean and dry.

Safety
The HyLogger process is non-destructive, non-invasive, and involves no radiation, noise, dust or heat. Sample handling is reduced as core is measured in its original trays.

Consistency
HyLogger provides objective scientific results in geological core logging, allowing for greater consistency as well as enabling the development of highly standardised procedures associated with mineralogy and imagery.

Validity
HyLogger associates every spectrum with an image, providing context for the derived mineralogy and improving the geologist’s ability to combine knowledge and experience to interpret the data. This technology is set to transform the industry by standardising and validating mineral analysis.

HyLogger can be programmed to analyse rocks in a variety of spatial sampling patterns, from single to multiple spectral measurements, on small or large grids, using continuous line-profiling (such as drill core) – and with or without imagery. HyLogger can be used on core samples, drill chips and powders. HyLogger can be used in mineral and petroleum exploration, mine sites and mineral processing facilities, geological surveying, and geochemical, government and commercial laboratories for:

- Mining pre-feasibility mineralogical studies
- Resource estimation and project development
- Mine site exploration and grade control
- Mineral processing and monitoring of deleterious materials

HyLogger is being used to analyse a growing diversity of minerals, including:

- FeOx Group (hematite and goethite)
- AlOH Group (paragonite, muscovite, phengite, illite, pyrophyllite, kaolinite, halloysite, dickite, gibbsite and smectite varieties)
- Sulphates (alunite, jarosite and gypsum)
- FeOH Group (saponite and nontronite)
- MgOH Group (chlorites (Mg/Fe), biotite, phlogopite, antigorite, tremolite, actinolite, talc, hornblende and brucite)
- Carbonates (calcite, dolomite, Fe-dolomite, magnesite, ankerite and siderite)
- Copper
- Rare earths
- Nickel
- Oil shale

HyLogger can also identify anhydrous silicates including quartz, feldspars, olivines, pyroxenes, garnets and carbonates, from diagnostic features displayed in the TIR region of the electromagnetic spectrum.
Geological Applications

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