PGNAA elemental logging for Instrumenting the Bench

PROJECT P1-002

To develop a prototype down-hole tool for analysing elemental grades from blast holes.

This project aims to build on CSIRO's historical expertise in the development of PGNAA down-hole sensors. Key objectives of this project are designed to enhance industry uptake of the technology and thus the focus is centred around operability and useability aspects including nuclear source safety in a down-hole environment, integrated winch-depth control and monitoring with high precision operator feedback, data interoperability and system automation. This project progresses deliverables at Technology Readiness Level (TRL) 5.

TRL 1 TRL 2 TRL 3 TRL 4 TRL 5 TRL 6 TRL 7 TRL 8 TRL 9

invent. integrate. implement. introduce.

Research collaboration

CSIRO has over 20 years of experience in development and delivery of neutron activation based logging technology to the mining industry and has developed tools for South American copper application as well as worldwide application for other commodities.

This project will be an extension of current tools that are currently in commercial operation in the mining industry and the new demonstration tool will be developed internally by the CSIRO borehole logging team based at QCAT, Brisbane.

The QCAT nuclear logging team previously delivered a prototype borehole "evaluation" NAA logging tool technology at the end of 2013; then after, following a successful trial, delivered a commercial version of the technology to a commercial supplier for manufacture and distribution in mid-2015.

Program Coordinator:	Paul Revell, CRC ORE
Project Leader:	Craig Smith, CSIRO
Timing:	March 2016 – February 2017
Participants:	CSIRO. Potentially Mining and METS collaborations to develop and test the prototype blast hole NAA logging unit.

Background & aims

Industry adoption of down-hole grade sensing in an operational environment will be driven by a combination of technical efficacy, useability and data-value-drivers. The down-hole PGNAA project is one of several integrated programs designed to demonstrate and deliver new, Grade Engineering® based approaches to mining and mineral process by exploiting the natural heterogeneity of the rock mass.

Prompt gamma neutron activation analysis or PGNAA is a well-established analytical technique and has been applied in laboratories and more recently over conveyor belts. PGNAA has also been developed for down-hole applications; however significant challenges still remain and the technology has yet to be widely adopted by the industry.

Focus on outcomes

- Borehole PGNAA tool for use in blast holes of >150mm diameter.
- Technology using isotopic (Cf-252) sourced radiation.
- Feedback controlled winch system for automated logging speed and depth control.
- Longer term prospect of switchable neutron generator source.
- Integrated operational software.
- Laboratory testing and demonstration in simulated borehole/material.
- Testing of prototype in site borehole replicating real world.

Image: PGNAA downhole sensor, supplied by CSIRO